# EAT5FV- Fruit and vegetable intake in five-year old children living in the Otago region

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# Abstract

**Background:** Fruit and vegetables provide a wide range of essential nutrients, and their intake is considered a marker of a healthy diet. The New Zealand Ministry of Health, Food and Nutrition Guidelines for Healthy Children and Young People (aged 2-18 years) recommend that at the age of five, children should be consuming two or more servings of fruit and three or more servings of vegetables per day. However, the New Zealand 2002 National Children's Nutrition Survey found on the basis of the food frequency questionnaire (FFQ) data, that only half of children aged 2-14 years ate fruit at least twice a day, and vegetables at least three times a day. There are limited studies conducted in New Zealand assessing fruit and vegetable intake, and none have used weighed diet records (WDR) to determine intake in five-year old children.

**Objective:** To determine the fruit and vegetable intake of a sample of five-year old children living in the Otago region and to compare it with the New Zealand Food and Nutrition Guidelines for Healthy Children and Young People (aged 2-18 years).

**Design:** Twenty-five caregivers with a five-year old child were recruited between February and March 2015. A three-day WDR and two FFQs were completed over a four-week period by the caregivers to assess their child's dietary intake. Height and weight of the child were measured. Data were analysed using the dietary analysis software Kai-culator to determine average fruit and vegetable consumption, and nutrient intakes.

**Results:** No children in the EAT5FV study met the New Zealand Ministry of Health recommendations to eat two or more servings of fruit and three or more servings of vegetables per day. Almost half the children (48%) consumed two or more servings of fruit per day, and one child (4%) consumed the recommended three or more servings of vegetables per day.

Fruit and vegetable intakes were positively associated with fibre intake, but no significant associations were seen between fruit and vegetable intake, and vitamin C, body mass index (BMI), or energy intake.

**Conclusion:** Although the sample size was small, these results are consistent with both national and international studies which have found that children are not eating enough fruit and vegetables. The findings suggest that increased efforts are required to promote fruit and vegetable consumption in five-year old children. Further research into current interventions and potential barriers will provide practical information for decision making on how to maximise children's fruit and vegetable intake within the available resources.

# Preface

The concept and overall study design was developed by supervisors Dr Anne-Louise Heath and Associate Professor Rachael Taylor who applied for ethical approval and aided and oversaw all aspects of the study. Liz Fleming provided guidance and supervision regarding the use of Kai-culator. The candidate was responsible for the following under supervision:

- Modification of study protocols- advertising, recruitment, first visit, reminder, second visit, and measurement protocol.
- Modifying the layout, instructions, and examples in the three-day weighed diet record (WDR) to make it more appropriate for parents to record the diet of their five-year old child.
- Adaption of recruitment posters and flyers.
- Advertising and recruitment of participants for the study.
- Posting or emailing study information (adult and child information sheets and consent forms and a map to find the appointment office) to the participants.
- Arranging first and second visits (ensuring the appointment rooms and carparks were available, follow up phone calls and sending text reminders).
- Conducting first visit- Administering FFQ, measuring child's height and weight, and teaching participants how to complete the WDR.
- Conducting second visit- Administering second FFQ, checking completed WDR, and obtaining and distributing grocery vouchers to participants.
- Entering and checking of all demographic information and anthropometric measurements into Excel.
- Entering of all the data from the WDRs into Kai-culator.

- Additional data manipulation to include fruit and vegetables in home-made recipes and mixed dishes.
- Calculating the average weight of an edible serving of fruit using the Ministry of Health recommendations and data from FOODfiles.
- Carrying out the statistical analyses with advice and support from Dr Jill Haszard, biostatistician.
- Mailing individual nutrient analysis letters to participants.

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# List of Abbreviations

| | |
|---|---|
| BMI | Body mass index |
| CDC | Centers for Disease Control and Prevention |
| EAR | Estimated Average Requirement |
| FFQ | Food frequency questionnaire |
| GST | Goods and services tax |
| GUTS | Growing Up Today Study |
| HEHA | Healthy Eating-Healthy Action |
| HSE | Health Survey for England |
| NDNS | National Diet and Nutrition Survey |
| NHANES | National Health and Nutrition Examination Survey |
| NZEO | New Zealand European and Other |
| POI | Prevention of Overweight in Infancy |
| SD | Standard deviation |
| WDR | Weighed diet record |

# 1. Introduction

Fruit and vegetables are a rich source of essential nutrients such as vitamins, minerals, and fibre, and of phytochemicals (2). As part of a healthy diet, children should consume a variety of minimally processed fruit and vegetables (1, 3). For New Zealand children aged five years and over, the recommendations for fruit and vegetable intake (both number and size of servings) are the same as for adults. The New Zealand Ministry of Health recommends that children five years or over should consume at least two servings of fruit and three servings of vegetables per day (1). Fruit and vegetable consumption is vital in all stages of life. However, it is particularly important during childhood (4). This is a crucial period for growth and development, as well as being a time when dietary habits and preferences begin to form (5, 6). Exposure to healthy dietary behaviours such as fruit and vegetable intake is imperative because dietary habits acquired during childhood are likely to be continued into adulthood (7).

There is compelling evidence to suggest that a diet high in fruit and vegetables in childhood is beneficial for both immediate and future health (4, 7-9). Fruit and vegetables may also play a role in weight regulation as they are high in fibre and water content, and low in energy (10, 11). A study using data from the 1997 New Zealand National Nutrition Survey found that approximately 40% of all deaths were caused by nutrition-related risk factors, some of which could be contributed to by inadequate fruit and vegetable intake (12). Therefore, it is important to ensure children are practising healthy eating behaviours, for overall nutritional adequacy as well as for long-term health benefits.

The New Zealand 2002 National Children's Nutrition Survey found that 47% of children aged 5-14 years were eating fruit two or more times a day, and 53% were eating vegetables three or more times a day (13). However, these data were collected using a food frequency questionnaire (FFQ), a method which has been found to overestimate dietary intake (14). The

only other national survey the candidate is aware of which has assessed fruit and vegetable consumption children is the 2008/2009 survey of Children and Young People's Physical Activity and Dietary Behaviours in New Zealand which suggested that only one-third of children between the ages of 5-9 years were meeting the fruit and vegetable recommendations (15). Data for this survey was collected using a dietary habits questionnaire developed based on the previous national survey questionnaires.

There are limited New Zealand studies on the consumption of fruit and vegetables in young children. The last National Children's Nutrition Survey was conducted over a decade ago and since then, a number of healthy eating initiatives have been introduced (16-18). Therefore, it is appropriate to reassess fruit and vegetable intake in five-year old children. Our study will be the first to look at fruit and vegetable intake in this age group using weighed diet records (WDR), which is currently considered the most precise way of measuring dietary intake (14). The aim of this study is to determine the fruit and vegetable intake in a sample of five-year old children living in the Otago region and to compare it with the New Zealand Food and Nutrition Guidelines for Healthy Children and Young People (aged 2-18 years).

# 2. Literature Review

## 2.1 Literature review methods

Literature searches were conducted in September and October of 2014 to find papers on fruit and vegetable consumption in children and their health benefits. The electronic databases used were: MEDLINE (1946-October 2014), Science Direct, Scopus (1823- October 2014) and CINAHL (1982- October 2014). Searches were limited to published, full text, English studies in humans. The New Zealand Ministry of Health website (http://www.health.govt.nz/) was used to identify recommended intakes of fruit and vegetables and the 2002 National Children's Nutrition Survey (13), and the 2008/2009 survey of Children and Young People's Physical Activity and Dietary Behaviours in New Zealand (15) were used to find recent intakes of fruit and vegetables among New Zealand children. Furthermore, reference lists from original and review articles were examined to search for additional relevant studies.

**Figure 2.1 Search strategies and terms used to identify studies**

Key terms used to identify studies on fruit and vegetable intake and health benefits in children

1. Vegetable
2. Fruit
3. Child
4. (1) OR (2) AND (3)
5. Nutrient
6. Dietary variety
7. Energy density
8. (5) OR (6) OR (7)
9. Health benefits
10. Oral Health
11. Cognitive function
12. Gastrointestinal Health
13. (9) OR (10) OR (11) OR (12)
14. Intake
15. (4) AND ((8) OR (13) OR (14))

## 2.2 Health benefits of fruit and vegetable intake

Fruit and vegetables have been associated with both immediate and future health benefits for young children (4, 7-9). In terms of immediate health benefits, a high consumption of fruit and vegetables is considered to be a marker of a healthy diet (1, 3). Also, given the high prevalence of childhood obesity, it is important to identify dietary behaviours such as fruit and vegetable intake which may help reduce this epidemic (19). In regards to future health benefits, dietary habits begin forming from three years of age, and can become difficult to change in children after eleven years of age (5). Hence, childhood fruit and vegetable intake may be a useful predictor of their consumption in adulthood (6, 7). It is therefore, important to ensure that young children are practising healthy behaviours from an early age as this may reduce the risk of developing nutrition-related chronic diseases in later life.

### 2.2.1 Immediate health benefits to school children

#### 2.2.1.1 Nutritional adequacy

A large range of essential nutrients can be found in fruit and vegetables, including vitamin C, vitamin A (carotenoids), potassium, folate, iron, and calcium (2). These nutrients play a crucial role in children's health and development and are required throughout life (20). While most of these nutrients have multiple sources in the diet, vitamin C is almost entirely sourced from fruit and vegetables and will therefore be the primary nutrient focused on in this review.

Vitamin C is an antioxidant found mainly in fruit and vegetables and is essential for tissue growth and repair (21). It plays a vital part in the functioning of the immune system and increases the absorption of non-haem iron from the diet (20). The New Zealand 2002 National Children's Nutrition Survey showed that the median usual daily intake of boys and girls aged 5-6 years was 98 mg and 96 mg respectively, with the prevalence of inadequate intake of

vitamin C very low in these children (0.1%) (13). However, this survey was conducted over a decade ago, and whether children are consuming enough vitamin C now is unknown.

Another way of looking at overall nutritional adequacy is to look at the dietary variety. Dietary variety is important for providing adequate nutrients to the body and ensuring optimal health (2). Studies show that individuals with more varied diets tend to have a higher intake of vitamins, minerals and macronutrients (22). A cross-sectional study by Royo-Bordonada et al. (5) looked at dietary variety and its association with a better food and nutrition profile. The diets of 1112 children aged 6-7 years were examined, and results showed that fruit and vegetable intake were positively associated with dietary variety (5). Dietary variety was also positively associated with plasma α- and β-carotene, retinol, α-tocopherol, lycopene, and vitamin E intakes (5). Although a positive correlation was present between the dietary variety index and energy intake, the increase in energy intake did not significantly increase body mass index (BMI) or the prevalence of being overweight or obese (5). This finding may be explained by the close association between the consumption of fruit and vegetables and dietary variety, and the potential role of fruit and vegetables in weight management (see below). Nonetheless, this study was conducted in Spanish children, and findings may not apply to the diets and lifestyles of New Zealand children (5). Studies in adults have also found similar results indicating that individuals with a diet high in fruit and vegetables have a greater dietary variety (22). These findings are important because we must ensure that growing children are receiving a broad range of nutrients in order to maximise their nutritional status.

#### 2.2.1.2 Weight management

A diet high in fruit and vegetables is thought to facilitate weight management by lowering the energy density of the diet (10, 11). For this reason, The American Academy of Pediatrics recommends the consumption of low energy dense foods such as fruit and vegetables (23). A

systematic review (24) including six prospective studies in children was conducted to determine if an association between dietary energy density and body weight exists. Results showed a positive association between higher fruit and vegetable intake, lower dietary energy density and lower risks of adiposity in children. The authors concluded that a diet high in fruit and vegetables allowed individuals to eat satisfying portions without significantly increasing their energy intake (24).

An analysis of the 2001-2004 National Health and Nutrition Examination Survey (NHANES) (19) data involving 2442 children aged 2-8 years, found that children who consumed a low energy dense diet consumed twice as much fruit and more than twice as many vegetables as those who had a high energy dense diet. Furthermore, when juice and white potatoes were not included as fruit and vegetables, the difference in consumption between the low and high energy dense groups was even more striking (19). The children who were in the lowest quartile for dietary energy density consumed 2 cups of fruit compared to the children who were in the highest quartile who only consumed 0.2 cups of fruit ($p<0.001$) (19). In addition, it was found that children in the lowest quartile of energy density ate nearly twice as much food in terms of food weight, yet they still consumed significantly less energy ($p<0.0001$), as well as less fat and added sugar (19). When examining children across all of the age groups, lean children had a lower dietary energy density than that of obese children ($p=0.002$). The difference in dietary energy density between lean and obese children was only 0.11 kcal/g, but this translated into a difference of about 600 kcal/week (2510 kJ) in energy intake; certainly enough to make a difference in body weight over time (19). This was the first study to examine the relationship between body weight and dietary energy density in a large national dataset of children, using both dietary and anthropometric data. There are, however, several limitations to this study that should be noted when evaluating the results. The NHANES was a cross-sectional study and although a strong association was seen, we cannot determine whether the results are causal. Diet recalls were also self-reported by children with assistance

from their parents or guardians, which may lead to under-or over-reporting of foods. Finally, the diet recall obtained was for only one day which may not be a true representation of the individuals' usual intakes. The study concluded that lowering energy density through substitution of foods high in sugar and fat with fruit and vegetables may be an effective way to manage weight and reduce childhood obesity (19).

Studies have also looked at whether adding fruit and vegetables to the diet by either consuming them before a meal or during a meal would lower the overall energy intake of the diet. An experiment conducted in children examined whether reducing the energy density of a meal by adding extra vegetables and lowering its fat content would affect portion size and meal enjoyment (25). Results showed that children ate similar amounts of food when the energy density of a meal was reduced by 25% and liking of the meal was not changed (25). These findings are consistent with other studies following similar protocols (11).

On the other hand, a number of studies have found no association between fruit and vegetable intake and energy intake and BMI (8, 26). Newby et al. (26), conducted a comprehensive review examining the association between diet and childhood obesity in children aged 2-19 years. The study concluded that fruit and vegetable intake had no protective properties against obesity and future studies should consider taking into account preparation methods. The way fruit and vegetables are prepared can greatly influence the amount of energy it provides in the diet and, therefore, influence study findings (10). Fried potatoes are a commonly consumed vegetable, with the results from the New Zealand Children's Nutrition Survey reporting that 65% of children ate hot potatoes (fries, wedges, hash browns) weekly (13). Frying potatoes will increase the amount of energy provided, weakening potential associations between vegetables and weight or energy intake (27).

A three-year prospective cohort study using data from approximately 15,000 older girls and boys (9-14 years of age) also found no relationship between fruits, vegetables or fruit juice and changes in BMI (8). This study had a large sample size. However, it did not take into account other dietary patterns when examining the impact of fruit and vegetables on BMI. This is important because any protective effects of fruits and vegetables may be diminished if participants consume these with other energy-dense foods such as cheese, sour cream, salad dressings or added sugar and fat. Fruit and vegetable juice are counted as a fruit or vegetable in some countries, however; there is concern that high intakes of juice may lead to weight gain (8, 26, 28-30). Studies that have examined the effects of fruit and vegetable juice and weight have found conflicting results (8, 26, 28-31).

Inconsistent results have been found when examining the relationship between fruit and vegetable consumption and total energy intake. Despite this, a diet high in fruit and vegetables is associated with a lower total energy intake and, therefore, may be a potential strategy in terms of weight management.

#### 2.2.1.3 Gastrointestinal Health

Fruit and vegetables are high fibre foods which aid in digestive function (32). The New Zealand Ministry of Health recommends that children experiencing constipation should increase their intake of fruit and vegetables, such as broccoli, beans, peas, apricots, prunes, and plums (33). Limited studies have been conducted that directly examine fruit and vegetable intake in children and its effects on intestinal health. However, a number of adult studies have shown that fibre is beneficial in the prevention of constipation through its ability to absorb water and add bulk to the stool (34). A study in Hong Kong used survey data from 368 children aged 3-5 years to determine whether dietary fibre was associated with the prevalence of constipation. Results showed that non-constipated children consumed significantly more fruit and total plant foods than constipated children (35). Furthermore,

meals rich in fibre are thought to be processed more slowly, allowing nutrients to be absorbed over a greater time period and promoting longer satiety (36).

#### 2.2.1.4 Other health benefits

There are a number of other potential immediate health benefits to fruit and vegetable consumption for young children such as better dental health, bone health and cognitive function. Data on 4236 children aged 2-5 years were extracted from the NHANES III dataset to examine whether there is an association between healthful eating practices and dental caries (37). Findings showed that children who consumed five or more servings of fruit and vegetables per day experienced significantly fewer dental caries (37). The study also found that children living in poverty below the "200% federal poverty line" had a significantly higher prevalence of caries compared to children above the "200% federal poverty line" (37). However, children who did not experience poverty and did not eat breakfast or ate fewer than five servings of fruit and vegetables per day were more likely to experience caries in their primary teeth compared to children who were in poverty (37). This study highlights that although poverty is an important indicator for caries risk, healthful eating habits such as consuming five or more servings of fruit and vegetables and eating breakfast are more important in determining the risk of childhood dental caries. Interestingly, observational studies have shown that although high sugar consumption is directly associated with higher prevalence of dental caries (38), the naturally present sugar in whole fruits and vegetables seem to pose little, if any, detrimental effects to dental or general health (39, 40). Studies have also investigated fruit and vegetable intake and its connection with bone mass makers in children. Findings have been consistent, concluding that a diet high in fruit and vegetables may be beneficial to bone health (41-45).

It is thought that there is a relationship between diet and academic performance, however, limited studies have investigated the effects of diet quality on academic performance in

children (46). One such study conducted in Canada involving 5,200 fifth grade (age 10-11) students examined whether school performance was associated with diet quality. Results showed that students who had a high fruit and vegetable intake and lower intake of fat were significantly less likely to fail the assessment administered as part of the study (46). Nevertheless, there are a number of factors that influence the academic performance of children, including their overall nutritional status. The authors did adjust for parental education and various other possible confounders such as socio-economic status, gender, parental marital status, education level, and income (46).

### 2.2.2 Possible future health benefits

Extensive research has been conducted in adults examining the relationship between fruit and vegetable intake and disease risk. Many have observed a protective effect of increased fruit and vegetable consumption against chronic diseases such as cancer, diabetes, and heart disease (47-50). However, there have been very few studies examining the long-term health benefits of fruit and vegetable intake in children.

The CHILDREN study (51) involving 646 fifth grade (age 10-11years) students found that after a one year school-based intervention, the intervention group consuming higher amounts of fruits had favourable changes in BMI and blood pressure compared to the control group. BMI and blood pressure are important modifiable risk factors for cardiovascular disease. The Young Finns Study (52) examined childhood diet and the risk of cardiovascular disease. This was a prospective study where children aged 3-19 years were recruited at baseline in 1980 and were followed up for 21 years. Dietary intake was assessed using a 48-hour diet recall in 1980, 1986 and 2001, with a total of 1037 participants completing the study (52). The results suggested that vegetable intake in childhood was a significant determinant of the cardiovascular quality of the adult diet. A strong association was also seen between childhood fruit and vegetable consumption and the quality of diet 21 years later, supporting previous

research that childhood food habits are carried into adulthood (6, 7). Surprisingly, socio-demographic factors such as education did not influence the diet of these participants, however, Finland is a country where social inequalities are small as it provides free education up to University level (52). Another study using the data from the Boyd Orr cohort (7) examined the association between food and nutrient intake measured in childhood (mean age eight years) and cancer risk later in life. The analyses were based on 3878 participants who were followed up for over 60 years (7). The main finding was that increased fruit consumption during childhood was associated with reduced risk of cancer in adulthood ($p=0.02$). Nevertheless, no clear association was found between vegetable intake and cancer risk (7). It is possible that methods involving prolonged cooking of vegetables were widely used at the time of the survey which we know now results in a loss of many vital nutrients. Age, energy intake and sex were adjusted for, and socioeconomic status was also taken into account.

A diet high in fruit and vegetables during childhood may lead to future health benefits via different mechanisms. However, the emphasis on fruit and vegetable consumption should not be based on potential weight regulation benefits, rather, on benefits for overall health. Ensuring children are consuming adequate servings of fruit and vegetables will allow them to develop healthful eating habits from a young age which will hopefully be carried on into adulthood. A healthy diet high in fruit and vegetables may be associated with confounding factors such as an overall healthy lifestyle with adequate physical activity. These habits are in themselves likely to help reduce the risk of obesity, cancer and other diseases later in life.

## 2.3 Fruit and vegetable intake in young school children

The New Zealand Food and Nutrition Guidelines state that individuals over the age of five should be consuming at least three servings of vegetables and at least two servings of fruit daily (1). As mentioned in the previous section, fruit and vegetables contain essential

nutrients required for maintaining optimal health. It is therefore important to determine whether New Zealand school children are meeting these recommendations.

The 2002 National Children's Nutrition Survey was a cross-sectional population survey conducted to determine the food and nutrient intake of New Zealand children. A total of 3275 New Zealand school children between the ages of 5 and 14 years completed the survey (13). Care was taken during recruitment to ensure a nationally representative sample with a range of ethnic groups. Information about participants and their eating patterns were gathered through interviews, and 24-hour diet recalls as well as a qualitative FFQ (13). However, the fruit and vegetable data were collected solely from the FFQ, and data reported frequency of intake, rather than the number of servings, making it difficult to determine the proportion of New Zealand children who are meeting the fruit and vegetable recommendations. The main findings showed that 43% of New Zealand school children ate fruit two or more times a day. Fruit intake was similar between males and females, with younger children (5-6 years) consuming fruit more often than older children (11-14 years). Vegetable intake did not differ by sex or age with 57% of New Zealand children eating vegetables, three or more times a day (13).

Looking specifically at 5-6 year old children, the survey found that 45% of boys and 55% of girls ate fruit two or more times a day (13). A higher proportion of Pacific children ate fruit at least twice a day than Māori and New Zealand European and Other (NZEO) children. Apples and pears were the most commonly consumed fruits, eaten weekly by 83% of New Zealand children. This was followed by oranges and mandarins (67%) and bananas (63%) (13). In regards to vegetable consumption in 5-6 year old children, 53% of boys and 60% of girls ate vegetables three or more times a day. There was no difference in vegetable consumption among the ethnic groups. The most popular vegetable was potatoes (boiled, mashed, baked or

roasted) (87%), followed by carrots (79%), hot potatoes (fries, wedges, or hash browns) (65%), broccoli (60%), peas (59%), and mixed vegetables (58%) (13).

The purpose of the 2002 National Children's Nutrition Survey was to help "develop, monitor and improve health and nutrition policies and services both nationally and locally" (13). After publication of the results, a number of initiatives were set up which aimed to increase fruit and vegetable consumption in children. Some of these were programmes such as 'Fruit in Schools' (16), 'Garden to Table' (17), and 'Healthy Eating-Healthy Action' (HEHA) (18), which promoted the benefits of increasing fruit and vegetables in the diet. However, there does not appear to be more recent data on fruit and vegetable intake in New Zealand children and for that reason, it is not known whether these figures have increased or decreased.

The only other national survey looking at fruit and vegetable intake in children the candidate is aware of is the National Survey of Children and Young People's Physical Activity and Dietary Behaviours in New Zealand 2008/09 (15). This survey found that 68.6% of children had two or more servings of fruit per day while only 39.7% had three or more servings of vegetables per day. Only 31.7% met the guidelines for both fruit and vegetable intake. This study used a dietary habit questionnaire adapted from the 2008/09 New Zealand Adult Nutrition Survey, the 2002 National Children's Nutrition Survey (13), and Youth'07: the Health and Wellbeing of Secondary School Students in New Zealand (4).

Countries such as Australia, the United States and England may have relatively similar diets to New Zealand and have collected more recent data on fruit and vegetable intake in children; therefore, they will also be examined in this review. The 2007 Australian National Children's Nutrition and Physical Activity Survey included a total of 4487 children with at least 1000 children (50% girls and 50% boys) in each of their age groups (2-3 years, 4-8 years, 9-13, and 14-16) (53). Fruit and vegetable data were collected using two 24-hour diet recalls (from a

face-to-face home visit interview and telephone interview). They found that 61% of 4-8 year olds consumed adequate servings of fruit but only 22% of 4-8 year olds consumed the recommended servings of vegetables (53). It is difficult to compare this with New Zealand data, due to differences in the methodology as well as differences in the recommended number of daily servings. New Zealand children are recommended to consume at least two servings of fruit per day, while Australian children are recommended to have one and a half servings per day. Conversely, the recommendation of three servings of vegetables per day set by the New Zealand Ministry of Health is less than the Australian guidelines of four and a half servings per day (beans and legumes are included as a vegetable, unlike in New Zealand) (13, 53). Nevertheless, both surveys found that potatoes were the most commonly consumed vegetable and that the amount of fruit and vegetables consumed by the children declined with age (13, 53).

When comparing the fruit and vegetable intake of New Zealand children with that of United States children, we must keep in mind the differences in the guidelines. In the United States, fruit and vegetable recommendations are based on calorie intake. For example, in a 2000 calorie diet, it is recommended that at least 2 cups of fruit and 2.5 cups of vegetables and legumes are consumed (54). New Zealand children aged 5-6 years are consuming around 1700 calories per day (13), and therefore, would be recommended to consume 3-4 cups of fruit and vegetables per day according to the United States guidelines (55). Data from NHANES 2009-2010 found that around 40% of United States children were meeting the recommended fruit intake and only 7% were consuming the recommended vegetable intake (56). The study concluded that like New Zealand children, a high proportion of United States children are not meeting their fruit and vegetable recommendations.

Although we are unsure whether fruit and vegetable intake in New Zealand has changed since 2002, other countries have found that there has been an increase in fruit and vegetable intake

during the last decade. Using data from the NHANES 2003-2004 to 2009-2010, trends were identified in regards to fruit and vegetable consumption in children aged 2-18 years (56). The diets of 12,459 children were assessed from 2003 to 2010 using a 24-hour dietary recall. The study found that whole fruit consumption had significantly increased (12% per year or 67% over the period) while fruit juice intake had significantly decreased (5% per year or 29% over whole period) (56). Total vegetable intake did not change over time.

Specific reasons for the increase in fruit, but not vegetable intake, among children are not known. It is thought that children's fruit and vegetable consumption may be influenced not just by taste, but also by repeated exposure to fruits and vegetables, social experiences and availability (56). All of these may have changed over time. A number of programmes and policies have been implemented over the last several years with the goal of increasing fruit and vegetable intake in United States children (56). These initiatives could have contributed to the increase in consumption for fruit. Studies have also shown that children have stronger preferences for fruits than vegetables (57, 58) which may make it easier to increase fruit intake. However, we cannot assume that trends in fruit and vegetable consumption in New Zealand children are the same as those in the United States

A similar trend to that seen in NHANES was found in a national survey conducted in England. The Health Survey for England (HSE) was used to monitor fruit and vegetable intake and assess whether the 'five-a-day' guidelines to consume five or more servings of fruit and vegetables a day are being met (59). Information on fruit and vegetable intake was collected using a 24-hour diet recall with participants randomly selected to ensure a representative sample of the population. Data from 2001- 2011 were collected yearly with over 2000 children interviewed per year and over 1000 children followed up with a nurses' visit. The study showed that 21% of five-year old children consumed five or more servings of fruit and vegetables per day in 2011 compared to only 9% in 2001. Results are similar for

other age groups with 17% of six-year olds consuming five or more servings of fruit and vegetables in 2011 compared to 10% in 2001. These data are useful for looking at trends in fruit and vegetable intake. However, no published data are available separating fruit and vegetable intake or for the most commonly consumed fruits and vegetables. Although there appears to have been a significant increase in the number of young children consuming five or more servings of fruit and vegetables a day in this study, it is still a relatively low proportion of the population with most children still not meeting the fruit and vegetable recommendations.

Another survey carried out in England is the National Diet and Nutrition Survey (NDNS) (59). Results from annual surveys in 2008-2012 have been analysed. A total of 3378 children completed a four-day food diary to determine fruit and vegetable intakes (59). On average, boys aged 4-10 years consumed 99 g/day of vegetables and 104 g/day of fruit. Girls of the same age consumed 101 g/day of vegetables and 110 g/day of fruit (59). The study did not identify the percentage of children who were meeting the recommendations, but we can assume from the average that most children in this age group were not meeting their fruit and vegetable intake. Using the definition of a serving size from the Ministry of Health guidelines, one apple, pear, banana or orange is approximately 130 g and half a cup of vegetables is around 50-80 g (1). This shows that the mean intake of fruit and vegetables in the NDNS was 2-3 servings per day which is higher than the results from the HSE. The authors indicated that this could have arisen due to differences in data collection methods. The NDNS used a four-day diet record compared with the 24-hour diet recall used in the previous studies mentioned (including the HSE and the New Zealand National Children's Nutrition Survey). The NDNS estimates may also be higher than HSE because it has taken into account the contribution from composite dishes containing fruit and vegetables. The NDNS also grouped beans and pulses with vegetables which were again, not done in the New Zealand National Children's

Nutrition Survey so results may have overestimated the vegetable consumption as it is delivered in New Zealand.

After examining these studies, it appears that a high proportion of children are not meeting the daily recommendations for fruit and vegetables. Only half of 5-6 year old children in New Zealand were eating fruit two or more times a day and vegetables three or more times a day in 2002. Furthermore, we are unable to determine whether these children are meeting the recommendations as data were gathered using an FFQ, and looked at frequency of intake, rather than the number of servings (which take into account serving size). National survey results from Australia, United States and England suggest that even fewer children may be meeting their recommended fruit and vegetable intake in these countries.

In New Zealand, it is not known whether young school children today are meeting the fruit and vegetable recommendations. The last national survey was more than a decade ago (2002) and, since then, there have been many fruit and vegetable initiatives such as 'Fruit in Schools' (16), 'Garden to Table' (17), and 'HEHA' (18), which may have impacted on the consumption of fruit and vegetables. In England and the United States, fruit and vegetable consumption in young children seems to have increased over the years but we cannot assume the same trend has occurred in New Zealand.

# 3. Objective Statement

The aim of the study was to determine the fruit and vegetable intake of a sample of five-year old children, living in the Otago region using a weighed diet record (WDR); and to compare their fruit and vegetable intake with the New Zealand Food and Nutrition Guidelines for Healthy Children and Young People (aged 2-18 years).

The objectives of the study were:

- To determine fruit and vegetable intake in the EAT5FV sample, and estimate the percentage of study children meeting the Ministry of Health guidelines.
- To identify whether fruit and vegetables were associated with fibre, vitamin C, BMI, and energy intake in this sample of children.
- To calculate the extent to which fruit and vegetable juice, dried fruit and potatoes contribute to total fruit and vegetable intake.

# 4. Methods

## 4.1 Study design

EAT5 is an observational study to validate a Food Frequency Questionnaire (FFQ) for use in five-year old children in the large obesity prevention randomised controlled trial (the Prevention of Overweight in Infancy (POI) study). Adult participants complete two FFQs approximately four weeks apart as well as a three-day weighed diet record (WDR) to assess their child's food, beverage and supplement intake over a four week period. Data from this thesis along with that from other studies conducted by Masters of Dietetic students will be used as one sample to validate the POI FFQ.

## 4.2 Recruitment and participants

EAT5 was approved by the Human Ethics Committee of the University of Otago, Dunedin (Appendix A). Caregivers and their child had the opportunity to ask the candidate any questions before signing the adult and child consent forms on the first visit. (Appendix B).

The candidate aimed to recruit 25 caregivers with a five-year (59-72 months) old child using posters (Appendix C), flyers (Appendix D), emails, social media, and word of mouth (**Table 4.1**). Participants were recruited from the Otago region between February and March 2015 using the advertising (Appendix E) and recruitment protocols (Appendix F). The inclusion criteria for the study were:

- Parent-child pairs with a five-year old child.
- The child had no health conditions that might have affected feeding and/or growth.

Participants could indicate their interest by emailing, texting or calling the candidate. The candidate would follow this up with a call to confirm the participant's eligibility and to

answer any questions or concerns (Appendix F). If the participants were eligible, they had the option of arranging a date and time for their first visit (Appendix G). A cover letter (Appendix H) was then sent confirming their appointment time, along with the information sheets (Appendix I), consent forms and a map (Appendix J). A second visit was also arranged, approximately four weeks after the first, to complete the second FFQ and to collect the completed WDRs and scales. Both visits were carried out in the Department of Human Nutrition research rooms. All participants were reimbursed up to $25, provided as a grocery voucher, and were given a nutrient analysis of their child's diet (Appendix K).

**Table 4.1 Advertising methods used in the EAT5FV study**

| | |
|---|---|
| **Recruitment period** | February – March 2015 |
| **Posters** | Dunedin Hospital, Plunket (South Dunedin), Les Mills Dunedin, Configure Gym, Edgar Center, Moana Pool, Supermarket staff room (Countdown, Pak'n Save, New World, Fresh Choice), Mitre 10 Mega staff room, Ice rink, Chipmunks Dunedin, Otago Children's Athletics, Dunedin School of Ballet and Dance, Warehouse, and a range of Dunedin cafes and dairies. |
| **Flyers** | Configure Gym, word of mouth. |
| **Emails** | One email was sent to all University of Otago staff, emails sent to difference churches. |
| **Facebook pages** | Dunedin News, Active Mums Dunedin, Dunedin Mothers, Dunedin Mummy and Daddy Talk, Economical & Sustainable Dunedin Families, Kidsspot NZ. |
| **Website pages** | Student Job Search, Kidsspot NZ. |

## 4.3 Background characteristics

After informed consent was obtained at the first visit, primary caregivers were asked to complete a demographic questionnaire about the age, sex and ethnicity of themselves and their child, how many children they have had, as well as their relationship to the child participating in the study (Appendix L).

## 4.4 Anthropometric data

The weight and height of the child was taken at the first visit by the candidate following the measurement protocol (Appendix M).

Weight was measured using a bioelectrical impedance scale (Tanita BC-418 Illinois, USA) - placed on a flat hard even surface. The child was asked to stand with his/her feet slightly apart in the centre of the scale wearing limited clothing (e.g., shorts and t-shirt). Duplicate measures were taken (to the nearest 0.1 kg), with a third measurement taken if the first two measurements differed by more than 0.1 kg. The closest two measurements were then averaged.

The height of the child was taken using a Leicester wall stadiometer (Tanita, Illinois, USA), - placed on a hard flat surface against a wall. The child was asked to remove their shoes, socks, excess clothing and any hair ornaments that would affect the measurements. The candidate checked to ensure the child was standing up straight with their feet slightly apart, and with the back of their head, shoulder blades, buttocks, calves, and heels touching the vertical board. The child's head position was redirected if needed to the Frankfurt Plane, and all measurements were recorded in centimetres to the nearest 0.1 cm. Duplicate measures were taken, with a third measurement taken if the first two differed by more than 0.7 cm. The closest two measurements were then averaged.

## 4.5 Dietary Assessment

### 4.5.1 FFQ Administration

The EAT5 FFQ (Appendix N) contains 125 foods, divided into the following categories: bread, crackers and breakfast cereals; rice and pasta; fruit; vegetables; meat, chicken, fish, eggs, beans; spreads; cakes, biscuits and snacks; milk and dairy products; puddings; drinks; and takeaways. The FFQ was administered by the candidate at both visits, approximately four weeks apart. The candidate asked participants questions about how often their child usually consumed each food over the past month. The options for frequency were, not eaten this month, less than once a week, once a week, 2 times a week, 3 times a week, 4 times a week, 5 times a week, 6 times a week, everyday, if more than once a day - how many times a day. If consumed in the past month, usual amounts were asked and recorded either in a number of items (e.g., one banana) or in an estimated number of millilitres indicated by the participant using food models. The food models comprised of measuring utensils, beans, and rice, allowing the participant to show the candidate an estimated amount eaten by their child. The only data used from the FFQ by the candidate in this study were the questions assessing the frequency of fruit and vegetable consumption by each child over the past month. The rest of the data will be used at a later date for the validation of the POI FFQ.

### 4.5.2 Weighed diet record

On the first visit, participants were taught how to complete a three-day WDR and were provided with a food diary (Appendix O), dietary scales (Salter Electronic Model 2200, Victoria, Australia) and a spare set of batteries. The food diary contained instructions and examples of how to fill out the diary. The candidate went through an example with plastic food to ensure the participant understood the instructions and was comfortable with operating the scales.

Participants were assigned three days (one weekend day, and two week days) over a 3-4 week period to complete the WDR, with the first day of recording being the day after the initial visit. The rest of the days were assigned so that all the days of the week would be equally represented after collecting the data from all the participants in the study. On these assigned days, participants were asked to weigh and record all foods and drinks (including water) consumed by their child. Detailed information about the name, brand and cooking methods of the food, as well as where and when it was consumed, was also recorded. Caregivers were asked to weigh and record the weight of the empty bowl, plate or mug, and then weigh and record each food item without pressing the tare button between food items. After the child had finished with their food or drink, the caregivers were asked to weigh all the leftovers and estimate the amount of each food making up the leftovers (e.g., quarter of apple, no toast leftover, half a cup of milk). This would allow the candidate to calculate the difference between the amount of food offered and the amount of leftovers to determine the amount eaten by the child.

At the top of each diet record day, caregivers indicated whether their child was feeling unwell on the day of the recording, and whether this may have increased or decreased their child's appetite. Information on supplements was also obtained, and a recipe page was provided at the end of each day for participants to record any recipes they used. At the back of the food diary, a supplementary page containing photographs of takeaway foods and their weights, along with a ruler and a set of circles for participants to estimate the weight or amount of the food their child was offered when weighing was not an option.

Participants were contacted after their first day of recording to check how the WDR had gone and to answer any questions that they may have had. After that, a reminder text was sent the day before each of the diet recording days (Appendix P). At the second visit (Appendix Q),

participants returned the diet records and scales. The candidate then checked the WDR to identify and clarify any mistakes, missing information or illegible handwriting.

## 4.6 Data entry

Demographic and anthropometric data were entered into a Microsoft Excel 2013 spreadsheet (15.0.4701.1001; Microsoft Corporation, Redmond, Washington, United States). Completed diet records were entered into Kai-culator (Version 1.11s, Department of Human Nutrition, University of Otago), a programme developed by the Department of Human Nutrition at the University of Otago. Kai-culator analysed the WDRs using the 2010 New Zealand FOODfiles (60). Food and beverages were entered in 24-hour time. The amount consumed by the child was calculated and entered as a weight (g), volume (mL), or a description size provided by Kai-culator. Homemade recipes recorded by the participants were entered as raw ingredients and converted to cooked amounts using conversion factors supplied by Food Standards Australia New Zealand (61). The proportion of the recipe given to the child was calculated and entered. Once diet records were entered into Kai-culator, fruit and vegetables were assigned food groups (fruit, fruit juice, dried fruit, vegetables, vegetable juice, fried potatoes, and other potatoes). All diets were checked for accuracy and consistency of data entry, and participants were contacted for more information where required.

## 4.7 Calculating fruit and vegetables in recipes

Additional data manipulation was undertaken to ensure that fruit and vegetables in recipes (provided by FOODfiles and participant's homemade recipes) were included in the analyses in order to determine an accurate fruit and vegetable intake. This was achieved by exporting all foods consumed by the sample of children into an Excel spreadsheet. Once in Excel, columns were added entitled: all fruit, fruit juice, dried fruit, all vegetables, vegetable juice, fried potatoes, other potatoes. The candidate then calculated the proportion of each recipe that

was fruit and vegetables as an amount per 100 g. Foods that did not include these categories were given a 0 so they did not receive any of these 'food categories'. Whole fruit and vegetables such as raw apples and carrots were given 100 g under the "all fruit" or "all vegetables" category. In Kai-culator, each ingredient in the recipes was able to be viewed as a percentage contribution to the total recipe and this information was used to determine the proportion per 100 g of fruit and vegetables in the recipes. The Excel spreadsheet was then loaded back onto Kai-culator, and total fruit and vegetable intakes were calculated.

## 4.8 Variable definitions

Where caregivers identified themselves or their child being of more than one ethnicity, ethnicity was prioritised in the following order: Māori/Pasifika, Asian, and other. The BMI percentiles were based on the Centers for Disease Control and Prevention (CDC) growth charts (62). Children who had a BMI between the $85^{th}$ and $95^{th}$ percentile were classified as overweight, and those with a BMI above the $95^{th}$ percentile were classified as obese.

For children aged five years and over, the recommendations for fruit and vegetable intake are the same as for adults. To convert the weight (g) of fruit and vegetables into the number of servings, the average weight of a typical serving size of a fruit or vegetable was used. As the Ministry of Health recommends half a cup of cooked vegetables (broccoli, peas, corn) weighing 50-80 g (1), 80 g was used as the standard serving size for vegetables. For fruit, 130 g is suggested by the Ministry of Health as the standard serving size as this is the average weight of most commonly consumed fruits (banana, apple, orange, and pear) (1). However, while vegetables tend to be mostly edible, fruit often have an inedible skin, and/or core. Therefore, an average edible weight was calculated using data from FOODfiles 2014 Version 01 (63) for a more appropriate serving size since all our data were in terms of amount eaten. The percentage of the edible portion of a banana, apple, orange and pear was averaged, and multiplied by the 130 g recommended by the Ministry of Health, resulting in 100 g as the

final weight of a serving size of fruit for these analyses. This is similar to the data found in the diet records, showing on average the skin and core of bananas and apples were between 20-40 g. There was no modification to the Ministry of Health recommendations for vegetables as most of the vegetables consumed by the children were 100% edible. If dried fruit, fruit or vegetable juice were consumed, they contributed up to one serving of the total recommended number of fruit or vegetable servings.

## 4.9 Statistical Analysis

All statistical analyses were conducted using Microsoft Excel 2013 (15.0.4701.1001; Microsoft Corporation, Redmond, Washington, United States), or Stata version 12.1. Variances between groups were checked graphically (using Stata's dot plot command). The mean and SD were calculated for the male and female children, and unpaired two-tailed t-tests were conducted to identify whether differences were present between the groups. For skewed data, the median, $25^{th}$ and $75^{th}$ percentiles were calculated. The strength of the relationship between fruit and vegetable intakes and energy, fibre, and vitamin C were assessed using the Person's correlation coefficient. These associations were plotted on a scatterplot, and if the correlation was statistically significant, then a fitted line was also plotted. P-values less than 0.05 were considered significant.

The Estimated Average Requirement (EAR) cut-point method was used to determine the proportion of children with an adequate intake of the nutrients of interest. This was calculated by counting the children with a dietary intake above the EAR (64).

# 5. Results

## 5.1 Participant response rate

Thirty-four potential participants were sent information sheets and consent forms during the recruitment period (February 2015-March 2015). Of these 34, 25 attended the first visit with their child (two could not take part due to transport problems, three did not meet the inclusion criteria, and four decided not to take part due to time restraints). All 25 completed the study, resulting in a 100% completion rate.

## 5.2 Sample characteristics

**Table 5.1** summarises the characteristics of the caregivers and children who took part in the study. Caregivers had a mean age of 36.2 years with most being the child's mother (92%), one being the father (4%), and one being the grandmother (4%). Interestingly, 84% of the caregivers were identified as New Zealand European while only 68% of their children were identified as New Zealand European. The children had a mean age of 5.5 years at the initial visit, and there were a similar number of males (n=12, 48%) and females (n=13, 52%). Seven (28%) children were classified as overweight ($85^{th}$-$95^{th}$ percentile), and one (4%) child was obese (>$95^{th}$ percentile) (62). Four caregivers reported that their child was feeling unwell resulting in a total of four unwell days over all of the diet recording days (5.3%), although only two of those days were thought to result in a decrease to the child's appetite. Four children consumed dietary supplements on at least one of the diet record days.

**Table 5.1: Baseline characteristics of participants (n=25)**

| | Mean (SD) | n (%) |
|---|---|---|
| **Parent/primary caregiver** | | |
| Age (years) | 36.2 (7.5) | |
| Number of children (including study child) | 2.4 (1.0) | |
| Ethnicity (%)[1] | | |
| New Zealand European | | 21 (84) |
| Māori/ Pasifika | | 2 (8) |
| Asian | | 1 (4) |
| Other | | 1 (4) |
| **Child** | | |
| Sex | | |
| Male | | 12 (48) |
| Female | | 13 (52) |
| Age (years) | 5.5 (0.3) | |
| Ethnicity (%) | | |
| New Zealand European | | 17 (68) |
| Māori/ Pasifika | | 4 (16) |
| Asian | | 2 (8) |
| Other | | 2 (8) |
| Anthropometric Measurements | | |
| Weight (kg) | 20.7 (2.0) | |
| Height (m) | 1.13 (4.4) | |
| BMI (kg/m$^2$) | 16.4 (1.1) | |

[1] The order of prioritisation used was: Māori/Pasifika, Asian, and Other

## 5.3 Energy and Nutrient intakes

**Table 5.2** reports the mean intakes of energy and selected nutrients measured using the three-day weighed diet record (WDR). All of the 25 children met their protein and vitamin C requirements. However, only 64% of the children met their daily fibre intake, and 68% met the requirements for calcium intake. Only 32% of the children met the requirements for potassium. There was no significant difference between the energy and nutrient intakes of male and female children (data not shown).

**Table 5.2: Children's average nutrient intake from the three day weighed diet record compared with nutrient reference values (mean (SD))**

| Energy or nutrient | 3 day weighed diet record (n=25) | Estimated Average Requirement[1] | Adequate intake[1] |
|---|---|---|---|
| Energy (kJ) | 6081 (1418) | - | - |
| Protein (g) | 54 (12) | 16 | |
| Total fat | | - | - |
| Amount (g) | 56 (19) | | |
| Percent energy (%) | 34 | | |
| Total Carbohydrate | | - | - |
| Amount (g) | 187 (42) | | |
| Percent energy (%) | 49 | | |
| Fibre (g)[2] | 18 (4) | - | 18 |
| Calcium (mg) | 673 (357) | 520 | - |
| Vitamin C (mg) | 75 (24) | 25 | - |
| Potassium (mg) | 2041 (378) | - | 2300 |

[1] The Estimated Average Requirement and Adequate Intake were from the Australian and New Zealand nutrient reference values (65)
[2] Total dietary fibre was the FIBTG value from FOODFILES (i.e. determined gravimetrically by the AOAC total dietary fibre method) (60)

## 5.4 Average daily intake of fruit and vegetables

**Table 5.3** shows the average daily intake of fruit and vegetables obtained from the three-day WDR. The mean daily intake of fruit was 197 g (SD 93) and mean daily vegetable intake was 144 g (SD 60). Of the 25 children, 20 (80%) consumed potato on the diet record days. Four (20%) of these children only consumed potatoes in a fried form, while eleven (55%) consumed potato prepared using alternative methods (mashed, boiled, baked or roasted), and five (25%) consumed both fried potato and potato cooked in other ways. Vegetable juice, fruit juice and dried fruit were consumed in relatively low amounts and never exceeded one serving. There was no significant difference in fruit and vegetable intake between the males and females for any of the categories.

**Table 5.3: Children's average daily intake of fruit and vegetables (g/day) obtained from the three-day weighed diet record (mean (SD))**

| | **Total sample (n= 25)** | **Males (n= 12)** | **Females (n= 13)** | **P-value [11]** |
|---|---|---|---|---|
| | **Mean (SD) [1]** | **Mean (SD)[1]** | **Mean (SD) [1]** | |
| All fruit [2] | 197 (93) | 176 (96) | 217 (93) | 0.279 |
| Fruit juice[4] | 0 (0, 8)[3] | 0 (0, 23)[3] | 0 (0, 1)[3] | - |
| Dried fruit[5] | 0 (0, 5)[3] | 1 (0, 8)[3] | 0 (0, 2)[3] | - |
| All vegetables[6] | 144 (60) | 162.9 (59) | 127 (60) | 0.141 |
| Fried potatoes[7, 8] | 0 (0, 28)[3] | 0 (0, 42)[3] | 0 (0, 15)[3] | - |
| Other potatoes[9] | 28 (0, 34.5)[3] | 27 (0, 43)[3] | 28 (0, 34)[3] | - |
| Vegetable juice[10] | 0 (0, 0)[3] | 0 (0, 0)[3] | 0 (0, 0)[3] | - |
| Fruit and vegetables combined [2, 6] | 341 (92) | 338 (91) | 344 (99) | 0.883 |

[1] Mean (SD) unless stated otherwise
[2] All fruit- Includes all types of fruit and up to one serving of fruit juice or dried fruit as recommended by the Ministry of Health guidelines (1)
[3] Expressed as median (25th percentile, 75th percentile)
[4] Eight of the twenty-five children consumed fruit juice, hence median is 0
[5] Nine of the twenty-five children consumed dried fruit, hence median is 0
[6] All vegetables - root staples plus other vegetables and up to one serving of vegetable juice as recommended by the Ministry of Health guidelines (1)
[7] Fried potatoes= hot potato chips, kumara chips, wedges or hash browns
[8] Nine out of the twenty-five children consumed fried potato, hence median is 0
[9] Other potatoes= boiled, mashed, baked or roasted
[10] Four of the twenty-five children consumed vegetable juice, hence, median is 0
[11] P-values were not calculated for skewed values

**Table 5.4** presents the average number of fruit and vegetable servings over the three diet record days. Of the 25 children, almost half (n=12, 48%) met the Ministry of Health fruit guidelines to consume two or more servings of fruit per day and one (4%) met the vegetable guidelines to consume three servings or more servings of vegetables per day. However, no child met both the fruit and vegetable recommendations. On average, from the three-day WDRs, children's actual portion size of vegetables was 30-40 g, considerably lower than the guideline, while fruit portions were variable (data not shown). There were no differences between the number of servings of fruit and vegetables consumed by the male and female children.

**Table 5.4: Number of servings of fruit and vegetables based on the three-day weighed diet record (n (%))**

| | | **Servings[2] of vegetables/day (%)** | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3+ |
| **Servings[1] of fruit per day (%)** | 0 | 0 (0) | 2 (8) | 1 (4) | 1 (4) |
| | 1 | 1 (4) | 4 (16) | 4 (16) | 0 (0) |
| | 2 | 1 (4) | 3 (12) | 4 (16) | 0 (0) |
| | 3+ | 1 (4) | 3 (12) | 0 (0) | 0 (0) |

[1] A serving of fruit is defined as 100 g (the Ministry of Health guidelines recommend a range of serving sizes, we chose one banana, orange or apple of 130 g minus the inedible weight of the fruit, see section: 4.6 )
[2] A serving of vegetable is defined as 80 g (the Ministry of Health guidelines recommending half a cup of vegetables between 50-80 g)

Did not meet either fruit or vegetable guideline
Met the fruit guideline
Met the vegetable guideline
Met both the fruit and the vegetable guideline

**Table 5.5: Combined usual frequency of fruit and vegetable consumption based on the first administered food frequency questionnaire (n=25)**

| | | Frequency of vegetables/day (%) | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3+ |
| **Frequency of fruit per day (%)** | 0 | 1 (4.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | 1 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | 2 | 1 (4.0) | 5 (20) | 2 (8.0) | 0 (0.0) |
| | 3+ | 1 (4.0) | 4 (16) | 9 (36) | 2 (8) |

Did not meet either fruit or vegetable guideline[1]
May meet the fruit guideline[1]
May meet the vegetable guideline[1]
May meet both the fruit and the vegetable guideline[1]

[1] The key is only applicable if the frequency is equal to the number of servings so should be treated with caution.

**Table 5.6: Usual fruit and vegetable consumption frequency based on the first administered food frequency questionnaire (n (%))**

| Frequency of intake | Total Sample (n=25) | Males (n=12) | Females (n=13) |
|---|---|---|---|
| **Fruit** | | | |
| Less than once a day | 1 (4) | 1 (8) | 0 (0) |
| Once a day | 0 (0) | 0 (0) | 0 (0) |
| Twice a day | 8 (32) | 2 (17) | 6 (46) |
| Three times a day | 8 (32) | 7 (58) | 1 (8) |
| Four or more times a day | 8 (32) | 2 (17) | 6 (46) |
| **Vegetables** | | | |
| Less than once a day | 3 (12) | 2 (17) | 1 (8) |
| Once a day | 9 (36) | 3 (25) | 6 (46) |
| Twice a day | 11 (44) | 6 (50) | 5 (39) |
| Three times a day | 2 (8) | 1 (8) | 1 (8) |
| Four or more times a day | 0 (0) | 0 (0) | 0 (0) |

**Table 5.5** and **Table 5.6** present the reported frequency of fruit and vegetable intake based on the first administered food frequency questionnaire (FFQ). **Table 5.6** shows that most of the participants (96%) reported that their child had fruit at least twice a day. For vegetable intake,

most reported that their child consumed it once (36%) or twice (44%) a day. There were no differences between the male and female children.

## 5.5 Correlation between fruit and vegetable intake and energy, fibre and vitamin C intake

There was no association found between fruit and vegetable intake and energy intake in this sample of children. However, fibre intake was significantly correlated with fruit and vegetable intake r=0.42 (p=0.034). Vitamin C and fruit and vegetable intake also showed a positive tendency, but the results were not statically significant r=0.38 (p=0.064).

**Figure 5.1: Correlation between average energy intake (kJ/d) and average fruit and vegetable intake (g/d)**

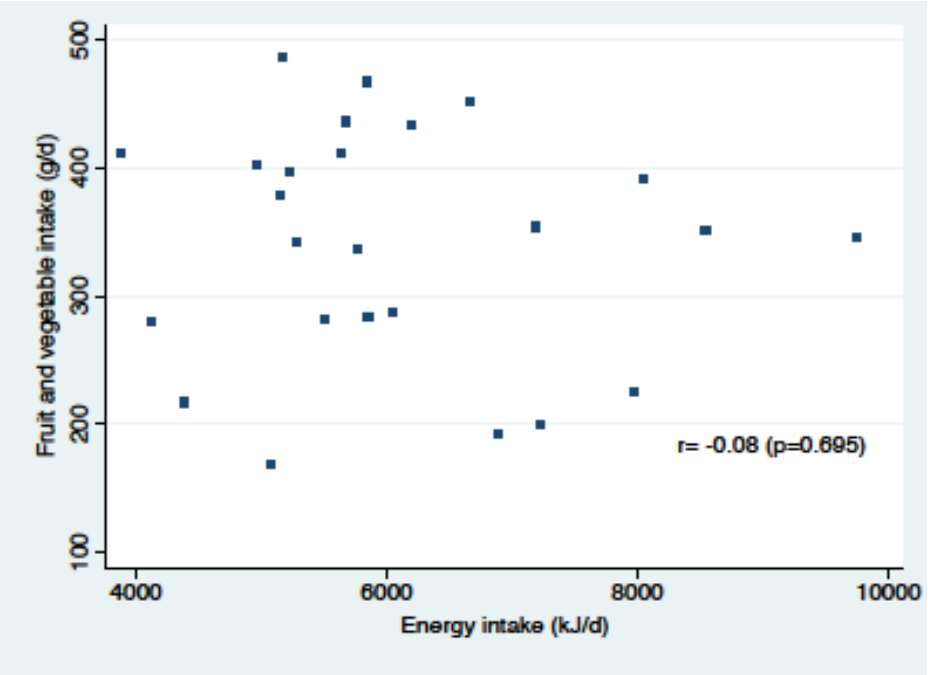


**Figure 5.2: Correlation between mean daily intake of fibre (g/d) and fruit and vegetable intake (g/d)**

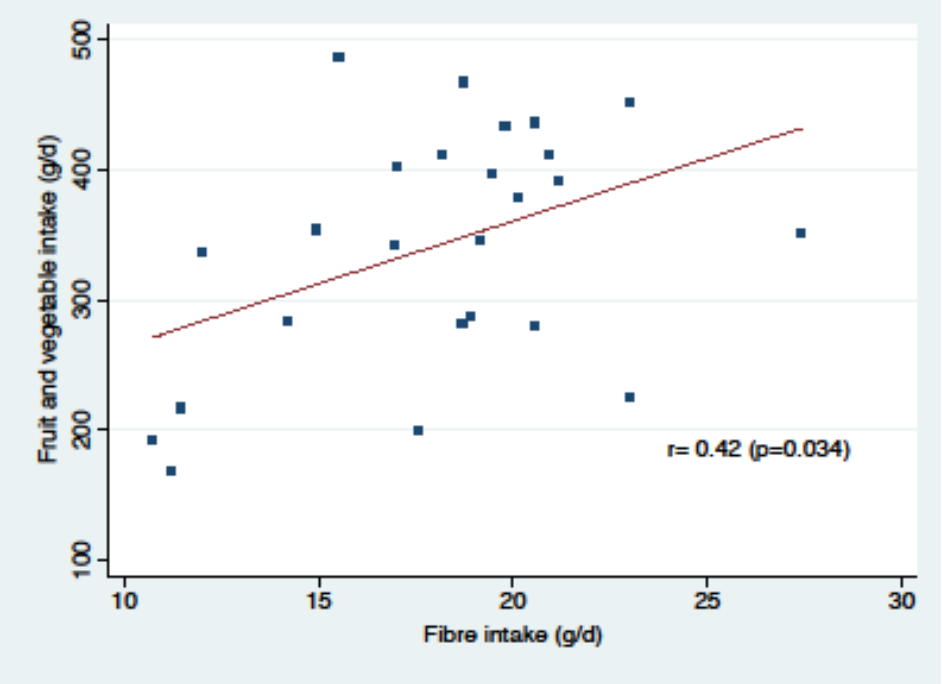
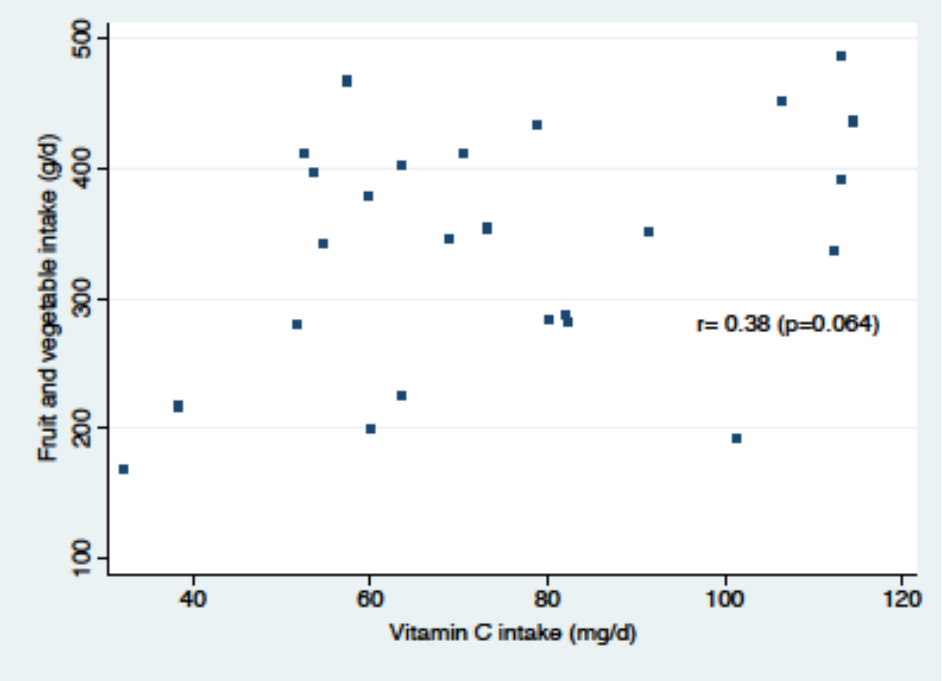



**Figure 5.3: Correlation between average vitamin C intake (mg/d) and fruit and vegetable intake (g/d)**



# 6. Discussion

No children in the EAT5FV study met the New Zealand Ministry of Health recommendations to eat two or more servings of fruit and three or more servings of vegetables per day (1). Almost half the children (48%) consumed two or more servings of fruit per day, but only one child (4%) ate the recommended three or more servings of vegetables per day. On average, female children had a slightly higher fruit consumption, but no other differences in vegetable, energy and nutrient intake were observed between the sexes. Eighty-percent of the study sample consumed potatoes, and vegetable juice, fruit juice and dried fruit were consumed in relatively low amounts. As expected, fibre was positively, but moderately, associated with fruit and vegetable intake. Surprisingly, vitamin C was not. No trends were observed between fruit and vegetable intake and energy intake and BMI.

Variability in study designs makes it difficult to compare the results found in this study with other similar studies. Not only are different dietary assessment methods used, but fruit and vegetable guidelines and definitions can also differ considerably between studies. Weighed diet records (WDR) have a relatively high respondent burden (14), resulting in larger studies favouring the use of food frequency questionnaires (FFQs) and diet recalls (8, 13, 15, 66-70). Classification of fruits and vegetables varies across studies, with foods such as pulses and nuts, starchy tubers, fried vegetables, and juices being classified as fruits or vegetables in some studies, but not in others. For example, the World Health Organisation recommends 400g of fruit and vegetables per day, excluding potatoes and starchy tubers (71). The EAT5FV study classified potatoes as a vegetable, with 80% of the study sample consuming potatoes, so if we were to exclude potatoes from our data, fruit and vegetable consumption would be even lower than that reported here. The EAT5FV study also measured fruit and vegetables in mixed dishes and homemade recipes, whereas some studies have not.

Regardless of these differences, research in this area has consistently found that children are not eating enough fruit and vegetables (13, 15, 29, 53, 68, 72, 73).

In accordance with other studies (15, 29, 68, 70), the EAT5FV study found that more children were meeting the fruit recommendation (48%) than the vegetable recommendation (4%). On average, the EAT5FV children ate 53 g more fruit than vegetables, which is approximately half a serving. Children often have an innate preference for sweet foods (57, 58), so it is not surprising that some children may prefer fruit over vegetables, which often have a more bitter taste. The recommendation for vegetables are also set higher than fruit, which further explains why fewer children are meeting the vegetable recommendations in comparison to those for fruit. In the EAT5FV diet records, fruit was consumed both between, and during, main meals, while vegetables were predominately eaten at the evening meal and less frequently throughout the day. Compared to vegetables, fruit may be more convenient to prepare and pack in school lunches and can be easily offered alone as a snack. This was confirmed by our FFQ data where 96% of the EAT5FV caregivers reported that their child ate fruit at least twice a day, while only 8% reported that their child ate vegetables three or more times a day. However, WDRs showed that only 48% met the fruit recommendations and 4% met the vegetable recommendations. This is presumably because children's portion sizes were much smaller (on average 40 g) than the recommended serving size (80-100 g). These data suggest that fruit, and especially vegetables, should be offered more frequently and incorporated into snacks as well as meals, to increase the potential for children to meet the recommended guidelines. This is likely to be more achievable than trying to double the serving size.

Although it is difficult to compare the EAT5FV results directly with other studies, our findings are consistent with previous New Zealand studies which have found that five-year old children are not eating enough fruit and vegetables. The 2002 National Children's Nutrition Survey reported that 43% of New Zealand 5-6 year olds ate fruit two or more times

a day, and 57% ate vegetables three or more times a day (13). Interestingly, fruit and vegetable juices were categorised under beverages rather than fruit or vegetables in the Children's Nutrition Survey. Fruit consumption might be expected to be higher than that reported in the survey, as previous international research has shown that fruit juice contributes approximately 50% of fruit intake in young children (28, 29, 70, 74). However, contrary to this, our results found relatively low fruit juice and vegetable juice consumption. This may be a result of increased awareness of the high sugar and low fibre content of juice over recent years, but such data is not available. It is important to remember that data from the Children's Nutrition Survey was collected using an FFQ, where questions were based on the frequency of consumption, rather than the number of servings. As suggested earlier, children of this age may need to be offered fruit and vegetables more frequently, in portion sizes that are smaller than the standard serving size, to meet the recommendations. Therefore, these data cannot be directly compared with our results or used to determine whether these children are meeting the Ministry of Health recommendations. The 2008-2009 New Zealand National Survey of Children and Young People's Physical Activity and Dietary Behaviours reported higher fruit and vegetable intake than that in EAT5FV. The survey found 74.9% of children between the ages of 5-9 years had two or more servings of fruit per day, and 36.6% had three or more servings of vegetables per day and 30% had five or more servings of fruit and vegetables per day (15). This is considerably more than that reported in EAT5FV. It is possible that this is explained by the use of a questionnaire to collect data, which has been shown to overestimate intake (75).

It is of no surprise that the EAT5FV study found no associations between fruit and vegetable intake and BMI, or total energy intake. With the rising rates of childhood obesity, the proposed role of a diet rich in fruit and vegetables in preventing excess weight gain and obesity has been extensively researched (8, 10, 26, 66, 70, 76). However, the results have been inconsistent (10, 11, 24-26, 66, 70, 76-78). Differences in the definition of fruit and

vegetables may be the reason for this as previously stated. Basch et al. (70) excluded fried vegetables as a vegetable and found an inverse association between percentage of calories from fat and vegetable intake. Conversely, Patterson et al. (66) included fried vegetables and found that fruit and vegetables were positively associated with calorie intake. However, fat intake was also higher in those who consumed more fruit and vegetables, and therefore we cannot conclude whether the additional calories were due to the fruit or vegetables alone (66). This is often because fats such as butter, margarine, and oil can be added to potatoes, and used in salad dressings. Neither study found an association between BMI and fruit and vegetable intake (66, 70). This illustrates that it is possible to consume a diet rich in calorie-dense foods as well as fruit and vegetables. In our study, fried potatoes were included as a vegetable, furthermore, fruit and vegetables in mixed dishes, such as fruit in desserts or baking, were also included. These items are high in fat and sugar while also contributing to the total fruit and vegetable intake. This, along with the small sample size in the EAT5FV study, and the likelihood that children who eat more food in general, may also be eating more fruit and vegetables (we did not adjust for energy intake), may be reasons the EAT5FV study did not see an association. As expected, a positive association was found between fruit and vegetable intake and fibre intake ($r= 0.42$, $p=0.034$), as supported by previous research (29). However, no associations were seen with protein, carbohydrate, calcium, and potassium, which may be a result of our small sample size. The correlation between fruit and vegetable intake and vitamin C ($r=0.38$) was close to a p-value of 0.05 ($p= 0.064$).

Research on fruit and vegetable consumption in children has consistently found that a large proportion of children are not meeting the recommended fruit and vegetable guidelines. Consequently, this has led to uncertainty regarding whether these recommendations are suitable for this age group. The Ministry of Health recommendations for fruit and vegetable intake are the same for children above the preschool age as they are for adults. However, studies conducted in both New Zealand and other countries have found that younger children

consume more fruit and vegetables than older children or adolescents (13, 15, 79). Furthermore, a high proportion of New Zealand adults are not meeting the fruit and vegetable recommendations. The latest New Zealand Adult Nutrition Survey found that approximately two-thirds of New Zealand adults were eating the recommended two or more servings of fruit per day and three or more servings of vegetables per day (80). Research has shown that a whole family approach is highly beneficial, as parental intakes, encouragement, and home availability of fruit and vegetables have a strong influence on children's consumption (81). Therefore, fruit and vegetable recommendations should not be lowered based on current intakes; instead, increased efforts are required to promote fruit and vegetable consumption in the whole population.

Interestingly, a recent study using data the from the England Health Surveys found that people who were consuming seven or more servings of fruit and vegetables per day had the lowest risk of mortality (50). This association was even stronger when those who died within the first year of the study were excluded, and physical activity was adjusted. The study concluded that '5 a day' may not be enough, and fruit and vegetable recommendations may need to be increased to seven plus a day (50). In fact, in 2005, the Australian Government launched the 'Go for 2+5' campaign, which advises two portions of fruit (150 g per portion) and five portions of vegetables (75 g per portion) daily (although beans and legumes are included as a vegetable while in New Zealand they are not) (82). However, for Australian children (4-8 years), recommendations are approximately half a portion smaller than for older age groups, with 1.5 portions of fruit and 4.5 portions of vegetables recommended daily. This acknowledges that children may not be eating a full portion size (150 g, 75 g) at each sitting and that recommendations do not need to be set at full numbers. Nevertheless, when comparing weight, Australian children are recommended to consume 600 g of fruit and vegetables per day, which is larger than the 440 g (100 g for a serving of fruit, 80 g for a serving of vegetables) we calculated for the EAT5FV study based on the New Zealand

Ministry of Health recommendations. Recommendations are set with the purpose of maximising health, leaving the door open in the future to increase the recommended fruit and vegetable intakes. While increasing the recommended number of servings may seem futile with our current low intakes, recommendations need to be set based on evidence. If evidence conclusively suggests that we should increase the required daily servings of fruit and vegetables, additional resources would be imperative in the struggle to increase the numbers meeting the fruit and vegetable recommendations.

This study has several limitations including the small sample size, recruitment bias, no adjustment for possible confounding factors, and the short study duration. Caution must be applied when interpreting the findings due to our small sample size, and the results cannot be generalised to all New Zealand school-aged children. Nevertheless, we aimed to recruit a diverse sample by using several different advertising methods. A further limitation is that participants who volunteered for the study are likely to be more health conscious and motivated than the general public. We were unable to control for confounding factors such as energy intake and physical activity due to the sample size. Finally, data were collected over a one-month period, therefore, seasonal variation in the diet could not be measured, and intake of foods commonly eaten at Easter was higher than might be seen at other times of the year.

This study has a number of strengths, including the use of a three-day WDR, consistent data collection and analysis, including fruits and vegetables from mixed dishes, and using calculated edible weights of fruits. WDRs are currently the most precise dietary assessment method for estimating dietary intake (14). Caregivers were assigned two non-consecutive weekdays and one weekend day to reflect their child's usual intake as closely as possible without resulting in too much participant burden. A New Zealand study conducted in toddlers found sickness was common in young children (83). Therefore, unwell days from the EAT5FV study were included to obtain a representative estimate of usual intake. Diet

recording for some participants took place over the Easter period, and the candidate noticed high amounts of chocolate being consumed by some children, indicating that caregivers followed the assigned days without altering their child's diet for recording. Another strength of the study was that the candidate collected and analysed all the data, which ensured consistent results. This also allowed the candidate to notice that the majority of vegetables were being consumed in homemade recipes and mixed dishes, which would not be included in a standard food group analysis. The candidate therefore assigned each recipe a set of calculated fruit and vegetable proportions so that recipes could be included in the count of fruit and vegetable intakes. Lastly, because all data were collected as the amount eaten, an edible serving size for an average piece of fruit was calculated. The candidate noticed that the range of recommendations provided by the Ministry of Health (e.g., 130 g for banana) appeared to be for weight as purchased. Therefore data from FOODfiles (e.g., 41% inedible weight for banana, giving an edible weight of 77 g) was used to calculate a more appropriate, as eaten, serving size to be used when comparing the EAT5FV study intakes with the Food and Nutrition Guidelines for Healthy Children and Young People.

No children in the EAT5FV study met the New Zealand Ministry of Health recommendations to consume two or more servings of fruit and three or more servings of vegetables per day. Although our sample is small, there is sufficient evidence from both national and international studies to conclude that not enough children are meeting the recommendations. Given that there is compelling evidence that a diet high in fruit and vegetables is associated with positive health outcomes, and considering that dietary habits are formed at a young age, these data suggest greater efforts are urgently required to increase the consumption of fruit and vegetables during this crucial period. Further investigation into current strategies and barriers will provide practical information for decision making on how to maximise children's fruit and vegetable intake with the available resources.

# 7. Application to Dietetic Practice

The EAT5FV study, alongside other national and international studies, highlights the need to increase efforts to promote fruit and vegetable intake in five-year old New Zealand children. Dietary habits for children are formed within the family setting, and are influenced by the broader environment, society, and economy (84). Therefore, dietitians should work towards reducing the behavioural and environmental barriers to fruit and vegetable consumption in children, as well as targeting barriers which may influence caregiver's choices when providing fruit and vegetables to their child, such as cost and convenience. In order to implement widespread, sustainable changes in dietary behaviours, broader initiatives may be required to increase fruit and vegetable consumption in not only children but the whole population.

When aiming to increase children's fruit and vegetable consumption, focus should be placed on increasing availability, and targeting behavioural factors such as taste and acceptance. Children are more likely to eat fruit and vegetables if they enjoy the taste, rather than for the health benefits. A 2009 study conducted in New Zealand children found school lunches contained low amounts of fruit and vegetables (85). Additionally, even when fruit and vegetables were included, they were the foods that were most likely to be uneaten (85). It is common for children to be reluctant to try new foods (86). Consequently, caregivers should be encouraged to continue offering fruit and vegetables, even if their child is not eating it. Dietitians can also provide education on different cooking methods, ways to increase variety, and presentation of fruit and vegetables, as well as encouraging caregivers to involve children in food preparation.

Young children spend the majority of their time at home or at school, making these environments ideal targets for implementing good dietary habits. Children model behaviours

around the environments they spend time in, and the people they spend time with. Caregivers have the most influence over their child at this point in their life. Therefore, it is important to ensure that advice is aimed at the whole family. Fruit and vegetables should be available, offered, and encouraged, with and between meals. The EAT5FV study found that children's portion sizes were often smaller than a serving size, so fruits and vegetables would need to be offered more frequently than two or three times a day to meet the Ministry of Health guidelines. Public health dietitians should work towards reinforcing clear and consistent messages about what the current fruit and vegetable recommendations are, and ensuring that the public is aware of the differences between "serving size" and "portion size".

Caregivers are responsible for ensuring that fruit and vegetables are available to their child. However, factors such as the cost and convenience of purchasing and preparing fruit and vegetables influence how much the child will receive. One-third of New Zealanders reported that cost was a major barrier associated with purchasing fruit and vegetables (87). Affordability could be increased by suggesting cheaper alternatives such as frozen vegetables, canned fruit and purchasing seasonal fruits and vegetables. Dietitians can also provide caregivers with ideas on easy and fast ways to incorporate fruit and vegetables into the diet. Our results found that the EAT5FV children were consuming relatively low amounts of fruit and vegetable juice. While juice may provide a convenient serving of fruit or vegetables, it is a high sugar, low fibre alternative and should not be encouraged.

Dietary habits are influenced by a wide range of factors and to increase fruit and vegetable intake on a national level, we must target all aspects. Currently, there is a "Garden to Table" initiative, run by the Garden to Table Trust, which works alongside a number of partners, supporters, volunteers and donors (17). This initiative has shown an increased knowledge and more positives attitudes towards fruits, vegetables, cooking and gardening among school children. However, no effect was seen on fruit and vegetable consumption (88). Another

initiative, the “Fruit in Schools” initiative, provides free fruit and vegetables to children in decile one and two primary and intermediate schools (16). This programme is funded by the Ministry of Health and was developed by a number of health and educational groups. This programme has been successful in increasing children’s fruit (and vegetable) consumption in school, as well as supporting a healthy home environment (89). However, fruit in schools is only targeting the school environment. For children who are attending low decile schools, a dominating barrier is the availability of fruit and vegetables at home. Another problem may be that because this programme is only implemented in decile one and two schools, it will not benefit those who struggle to afford fruit and vegetables, but do not attend these schools. Therefore, this intervention must be coupled with other interventions such as the “Fruit and Vegetable Co-op”, which provides fruit and vegetables at a low cost. The fruit and vegetable co-op was started by Community and Public Health in Christchurch and relies heavily on the power of direct bulk buying from suppliers and volunteer workers (90). This initiative provides five servings of fruit and vegetables daily for four people, for only $12 per week. A variety of seasonal fruit and vegetables are available, and recipes are provided for those fruits and vegetables that are less commonly cooked.

For fruit and vegetable intake to increase in children, we need to increase the consumption of the entire population. We cannot expect one intervention to target all the barriers, rather, multiple large scale interventions are needed, which combined will address all potential barriers. Successful initiatives should be widespread as health education without changing the environment will only increase inequalities. Dietitians should add pressure to policy makers for further support, especially towards fiscal policies such as GST cuts for fruit and vegetables and adding tax to nutrient-poor foods and beverages.

Further research into the effectiveness of current programmes may provide justification for further funding to expand these programmes nationwide. It may also provide insight as to

why there is still a high proportion of children who are not meeting the fruit and vegetable recommendations, to further develop strategies to increase consumption in the population. Low fruit and vegetable intake is among the top ten selected risk factors for global mortality (71). Therefore, increasing fruit and vegetable intake is likely to contribute to the prevention of chronic disease, which is key to reducing the growing burden on the healthcare system.

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# 9. Appendices

A Human ethics approval letter

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Q Second visit protocol

# Appendix A

# Human ethics approval letter

UNIVERSITY OF OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

Academic Services
Manager, Academic Committees, Mr Gary Witte

**H14/154**

16 February 2015

Dr A Heath
Department of Human Nutrition
Division of Sciences

Dear Dr Heath,

I am again writing to you concerning your proposal entitled "**EAT5: What are New Zealand 5 year olds eating?**", Ethics Committee reference number **H14/154**.

Thank you for your e-mail of 12th February 2015 addressing the issues raised by the Committee.

The Committee accepts your comment relating to Peer Review noting that the study uses a similar design to your study "EAT3 - What are New Zealand 3-year olds eating?" (ethics reference H14/083) and the original "EAT" study in toddlers which has been accepted for publication.

The Committee thanks you for the further comment provided in relation to the potential issue of contamination with the Prevention of Overweight in Infancy (POI) study and notes your reasons for why you do not expect this to be a concern.

Thank you for providing the Information Sheet and Consent form for Children and the revised Information Sheet for parents.

On the basis of this response, I am pleased to confirm that the proposal now has full ethical approval to proceed.

The standard conditions of approval for all human research projects reviewed and approved by the Committee are the following:

Conduct the research project strictly in accordance with the research proposal submitted and granted ethics approval, including any amendments required to be made to the proposal by the Human Research Ethics Committee.

Inform the Human Research Ethics Committee immediately of anything which may warrant review of ethics approval of the research project, including: serious or unexpected adverse effects on participants; unforeseen events that might affect continued ethical acceptability of the project; and a written report about these matters must be submitted to the Academic Committees Office by no later than the next working day after recognition of an adverse occurrence/event. Please note that in cases of adverse events an incident report should also be made to the Health and Safety Office:

http://www.otago.ac.nz/healthandsafety/index.html

Advise the Committee in writing as soon as practicable if the research project is discontinued.

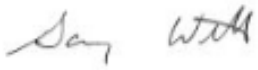
Make no change to the project as approved in its entirety by the Committee, including any wording in any document approved as part of the project, without prior written approval of the Committee for any change. If you are applying for an amendment to your approved research, please email your request to the Academic Committees Office:

gary.witte@otago.ac.nz

jo.farrondediaz@otago.ac.nz

Approval is for up to three years from the date of this letter. If this project has not been completed within three years from the date of this letter, re-approval or an extension of approval must be requested. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing.

Yours sincerely,



Mr Gary Witte
**Manager, Academic Committees**
Tel: 479 8256
Email: gary.witte@otago.ac.nz

c.c. Professor S Samman Department of Human Nutrition

# Appendix B

# Consent forms

# EAT5: What are New Zealand 5 year olds eating?

## Consent Form for Participants

Following signature and return to the research team this form will be stored in a secure place for ten years.

**Name of participant:** _____

1. I have read the Information Sheet about this study and understand the aims of this research project.

2. I have had enough time to talk with people of my choice about taking part in the study.

3. All my questions about the project have been answered to my satisfaction, and I understand that I am free to ask for more information at any stage.

4. I know that taking part in the project is entirely voluntary, and that I am free to withdraw from the project at any time without disadvantage.

5. I know that as a participant I will complete three questionnaires and write down what my child eats and drinks for 3 days, and that my child's height and weight will be measured.

6. I know that when the project is completed all personal identifying information will be removed from the paper records and electronic files which represent the data from the project, and that these will be placed in secure storage and kept for at least ten years.

7. I understand that the results of the project may be published and be available in the University of Otago Library, but I agree that any personal identifying information will remain confidential between myself and the researchers during the study, and will not appear in any spoken or written report of the study.

_____ _____

*Signature of participant:* *Date:*

Principal Investigator: Dr Anne-Louise Heath
Email: anne-louise.heath@otago.ac.nz
Phone: 479-8379

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

# EAT5: What are New Zealand 5 year olds eating?

## Consent Form for Children

1. Someone has told me about the study and I know what it is about

2. I don't have to be in the study if I don't want to

3. Anytime I want to stop that's okay

4. If I don't want to answer some of the questions or do some of the measurements that is okay

5. If I have any questions I can ask the researchers or mum/dad

6. The researchers will write up the results for their work but my name will not be mentioned

I agree to be in the EAT5 study

Name: _____

Signed: _____

Date: _____

# Appendix C

# Advertising poster

# EAT5 – What are New Zealand 5 year olds eating?



The aim of the EAT5 research study is to find out what New Zealand 5 year olds are eating, and at the same time to develop a new, and much quicker, way of measuring what they eat.

We are looking for parents who have a 5 year old child who would like to know more about what their child is eating.

Participants will be reimbursed up to $25 as a grocery voucher at the end of the study. Participation will take a maximum of about 3½ hours over a month.

If you are interested or would like further information please contact:
Name: Renee Yu
Email: yure1721@student.otago.ac.nz or reneeyu@hotmail.co.nz
Phone: 021 1423657

This project has been reviewed and approved by the University of Otago Human Ethics Committee (Health). Reference: H14/154.

eat5

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NEW ZEALAND

EAT5 study. For info call 021 1423657 or email yure1721@student.otago.ac.nz
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EAT5 study. For info call 021 1423657 or email yure1721@student.otago.ac.nz

# Appendix D

# Advertising flier

# EAT5 – What are New Zealand 5 year olds eating?



The aim of the EAT5 research study is to find out what New Zealand 5 year olds are eating, and at the same time to develop a new, and much quicker, way of measuring what they eat.

We are looking for parents who have a 5 year old child who would like to know more about what their child is eating.

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eat5

University of Otago

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# EAT5 – What are New Zealand 5 year olds eating?



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Phone: 021 1423657

eat5

University of Otago

This project has been reviewed and approved by the University of Otago Human Ethics Committee (Health). Reference: H14/154.

# Appendix E

# Advertising protocol

*Protocol is based on the EAT-3 Advertising protocol, prepared by Jia Yun Fam*

## P1. Advertising protocol

**Objectives:**

1. To identify locations for recruitment advertising that parents of five-year old (59-72 months) children are likely to see
2. To gain permission to advertise in these locations
3. To distribute posters and emails
4. To arrange meetings in person with mothers and parenting groups

## Step – Before

**Equipment required:**

- Posters
- Blue tack
- Drawing pins
- Cellotape

## Step – During

**a) Putting up posters in public spaces**

Permission is to be obtained, and posters are to be distributed to the following public spaces:

- Dunedin City Library
- Dunedin Hospital
- Local GP practices (list: http://www.southernpho.health.nz/info.php?rid=2)
- Local cafes and take-away stores
- Local supermarket
  - Centre City: New World, Countdown, Pac N' Save
  - Gardens: New World
  - Roslyn: New World, Fresh Choice
  - St Clair: Four Square
  - Anderson Bay: Woolworths
- Dairy
- Moana pool
- Chipmunks (http://www.chipmunks.co.nz/stores/dunedin/)
- Children clothing stores

**b) Putting up a notice on public Facebook pages and online websites**

- Economical & Sustainable Dunedin Families
- Dunedin mummy and daddy talk
- Student job search
- Kidsspot social

**Ask permission to advertise:**

***In person:***

Hi, my name is Renee Yu, I'm a Master's student at the University of Otago. I'm studying the food intake of five-year olds (59-72 months) and I need to recruit 30 parents to take part in the study.

Would it be possible to put a recruitment poster in/on (name specific locations of place)?

Thank you.

***By email:***

To Whom It May Concern (or Dear name if known):

My name is Renee Yu. I am a student dietitian doing my master's degree through the University of Otago. I am studying the food intake of five-year olds (59-72 months), and I need to recruit 30 parents to take part in the study.

I am hoping it would be possible to put up recruitment posters (see attached) in (name specific locations) of your (practice, library etc). I would very much appreciate it if you could let me know whether this would be acceptable, and whether you have any rules about poster placement that I should follow.

Thank you for your time. Please do not hesitate to contact me by email or phone if you have any questions.

Kind regards,

Renee Yu

Student Dietitian, Department of Human Nutrition

yure1721@student.otago.ac.nz

021 142 3657

***Follow-up phone call:***

If emails have not been replied to after three-days, ring the respective settings to see if they got my email enquiry.

**c) Email sent to all University of Otago staff and postgraduate students based at the Dunedin campus**

See recruitment protocol page...

## Steps – After

**a) Complete Advertising Tracking Sheet I (posters)**

- Person giving permission
- Number of posters put up and where
- Date put up, date to check/replace

**b) Complete Advertising Tracking Sheet II (emails/phone call recruitment)**

- Person emailed/called/visited
- Contact details
- Date contact made, date of next attempt (if contact unable to be made)
- Outcome
- Date and venue of meeting
- Comments

# Appendix F

# Recruitment protocol

*Protocol is based on the EAT-3 Recruitment Protocol, prepared by Jia Yun Fam*

## P2. Recruitment Protocol

**Objectives:**

1. To ensure uniform recruitment procedures among participants
2. To ensure the safety of the participants throughout the study
3. To distribute information sheets, consent forms, letter, and map within one week of first contact
4. To make the first appointment

## Steps – Before

**Recruitment participants:**

Parents of five-year old (59-72 months) children (n = 25-30)

**Equipment required:**

- Tracking sheet
- Information and consent forms
- Diary

Check student email account twice a day from Monday to Friday and check cell phone regularly

## Steps – During

a) **Email response:**

- Respondents will email me at yure1721@student.otago.ac.nz if they are interested in being part of the study.
- Respondents will receive a reply email giving them further details about the study and attaching the information sheet and consent form.
- Respondents will be asked to reply to the email with phone number and postal address.
- Respondents will be expected:
    a) To receive a phone call (not more than two days after they replied) from me to check their eligibility and arrange a time for the first appointment.
    b) To receive a hard copy of the information and consent forms, cover letter, and map within one week of first contact.

- If all participant positions have been occupied, further respondents will receive a reply email that will explain that they are on a waiting list.

***Responding to email enquiries:***

Dear (name),

Thank you for your interest in taking part in the EAT5 study.

Attached is an information sheet and consent form with further details about the study and what is involved.

Please reply to this email with your:

**Phone number -**

**Postal address –**

**Best time to call -**

I will then call you to confirm whether you would like to take part, and if so, to check your eligibility and arrange a time to meet. I will also post a hardcopy of the information sheet and consent forms for you to fill out once your participation in the study is confirmed.

Please do not hesitate to contact me if you have any questions.

Kind regards,

Renee Yu

Student Dietitian, Department of Human Nutrition

yure1721@student.otago.ac.nz

021 142 3657

*If all participant positions have been occupied,*

Dear (name),

Thank you for your interest in taking part in the EAT5 study. Unfortunately all our participant positions are full at the moment; however we will keep your name on our waiting list if a position becomes available.

Thank you very much.

Kind regards,

Renee Yu

Student Dietitian, Department of Human Nutrition

yure1721@student.otago.ac.nz

021 142 3657

***Follow up phone call:***

Hi I'm Renee Yu calling from the EAT5 Study. Thank you for your interest in taking part in the study. Is now a good time for you to talk?

If **NO** - when would be a good time for me to call back?

If **YES** - would you like me to explain some more about the study?

I am looking at the food intake of five-year olds (59-72 months) as part of my master's degree.

Would you like me to tell you very briefly what would be involved in taking part?

- Before our first meeting I will post you the information sheet and consent forms and ask you to read them and fill them out.
- At our first meeting I will ask you to fill out a food questionnaire about what your child has eaten over the past month, and ask some brief questions about you and your family. I will also measure your child's weight and height. This appointment will take about an hour at the most.
- I also show you how to weigh and write down what your child eats for three days over the next month.
- At the second meeting I'll collect the food diary, and ask you to fill in the food questionnaire for a second time. This second appointment should take about half an hour of your time.

We will be giving parents a grocery voucher of up to $25 dollars as a thank-you for taking part.

Does that all sound alright with you?

If **NO** – Thank you for your time today

If **YES** – can I ask you a few questions to check that you are eligible to take part?

- When is your child's birth date?

  If your child was born before 25/02/2009 – unfortunately you are not able to participate because your child is outside our age range. Thank you very much for your interest though.

  If your child was born between 01/04/2010-01/09/2011 - unfortunately you are not able to participate at the moment because your child is too young. We are going to be recruiting later on this year and next year – is it OK if I take your details now and someone will contact you after your child's 5th Birthday? Thank you very much for your interest in the study.

  If you child was born between 25/02/2009- 01/04/2010 – Thank you.

- Is your child affected by any health condition that would affect his eating and growth?

  If **YES** – unfortunately you are not able to participate. Thank you very much for your interest though.

  If **NO** – you are eligible to take part

  - Ask if have any questions
  - Ask if want to participate

    If **NO** – Thank you for your time today

    If **YES** –

    - Arrange time for first appointment
    - Tell them that a copy of the information sheets, and consent forms will be posted to them shortly
    - Ask them to read the information sheet and read the child information sheet to their child, sign the consent forms if they are willing to participate and bring them to the first appointment.
    - Do you mind me asking what your child's name is?

    If **MAYBE** – follow-up with a phone call within a week

- Thank them for their interest

**b) Phone response:**

- Respondents will reach me at 021 142 3657 if they are interested in being part of the study
- I will:
  a) Explain study in more detail
  b) Check respondent's eligibility
  c) Ask for respondent's email address, postal address, and phone number
  d) Arrange a time for the first appointment
- Respondents will be expected to receive a hard copy of the information and consent forms within one week of first contact

***Picking up phone calls***

Hi, thank you for calling and showing an interest in our study.

My name is Renee Yu. I'm doing The EAT5 Study looking at the food intake of 5 year olds (59-72 months) as part of my master's degree.

Would you like me to tell you very briefly what would be involved in taking part?

- Before our first meeting I will post you the information sheet and consent forms and ask you to read them and fill them out.
- At our first meeting I will ask you to fill out a food questionnaire about what your child has eaten over the past month, and ask some brief questions about you and your family. I will also measure your child's weight and height. This appointment will take about an hour at the most.
- I also show you how to weigh and write down what your child eats for three days over the next month.
- At the second meeting I'll collect the food diary, and ask you to fill in the food questionnaire for a second time. This second appointment should take about half an hour of your time.

We will be giving parents a grocery voucher of up to $25 dollars as a thank-you for taking part.

Does that all sound alright with you?

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If **YES** – can I ask you a few questions to check that you are eligible to take part?

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  If you child was born between 25/02/2009- 01/04/2010 – Thank you.

- Is your child affected by any health condition that would affect his eating and growth?

  If **YES** – unfortunately you are not able to participate. Thank you very much for your interest though.

  If **NO** – you are eligible to take part

  - Ask if have any questions
  - Ask if want to participate

    If **NO** – Thank you for your time today

    If **YES** –

    - Arrange time for first appointment
    - Tell them that a copy of the information sheets, and consent forms will be posted to them shortly
    - Ask them to read the information sheet and read the child information sheet to their child, sign the consent forms if they are willing to participate and bring them to the first appointment.
    - Do you mind me asking what your child's name is?

    If **MAYBE** – follow-up with a phone call within a week

  - Thank them for their interest

**c) Recruit through University email**

Dear all,

My name is Renee Yu and I am a student dietitian from the Department of Human Nutrition at the University. I am currently doing the EAT5 study as part of my Master's of Dietetics

degree. The EAT5 study is looking at the food intake of five-year old (59-72 months) school children in Dunedin.

I am writing to ask you if you would be interested in participating in my research study. You are eligible to be in the EAT5 study if you have a five-year old (59-72 months) child who is healthy.

If you decide to participate in this study, you will be asked to fill out some questionnaires and to weigh and record what your child eats for three days over the next month. We will lend you some scales to do this. I will also measure your child's height and weight at our first appointment. Attached are our information sheets and consent forms with further details about the study and what it would involve.

If you'd like to participate, or have any questions about the study, please email or call me at yure1721@student.otago.ac.nz or 021 142 3657.

Thank you very much.

Kind regards,

Renee Yu

Student Dietitian, Department of Human Nutrition

yure1721@student.otago.ac.nz

021 142 3657

## Steps – After

**a) After email reply:**

- Record on participant tracking sheet next to appropriate ID number
  - Parent's name
  - Email address, postal address and phone number
  - Date of reply
  - Date of giving a phone call (not more than two days)

**b) After phone reply:**

- Record on participant tracking sheet next to appropriate ID number
  - Parent and child's name
  - Date, time and outcome of attempt at making contact – allow three attempts
  - Participate (Yes/No/Maybe)

- Date for first appointment
- Date to follow up if maybe
- Eligibility
- Print sheet of sticker labels of all reminders/appointments to put in diary

- Post information and consent forms no more than two days after phone reply.

**c) After recruiting in person:**

- Record on participant tracking sheet next to appropriate ID number
  - Parent and child's name
  - Participate (Yes/No/Maybe)
  - Date for first appointment
  - Documents given (information and consent form)
  - Date to follow up if maybe
  - Eligibility
  - Print sheet of sticker labels of all reminders/appointments to put in diary

# Appendix G

# First visit protocol

## P3a. First Visit protocol

**Objectives:**

1. To obtain consent to participate, and collect consent forms
2. To have demographic questionnaire filled out by participant
3. To administer FFQ to participant for the first time
4. To explain and demonstrate to participant how to complete the three day weighed diet record
5. To measure the height and weight of the participants child
6. To leave diet record, scales and batteries with participant
7. To arrange a time to come back for second FFQ and collection of records

## Steps – Before

**Equipment required:**

- Dairy for appointments
- Demographic questionnaire
- FFQ
- Blank diet food record
- Plate, two food items
- Dietary scales and batteries
- Calibrated scales
- Calibrated Stadiometer
- Pens

    - Text /call/email participant the day before to confirm time and place of meeting
    - Ensure you are similar and comfortable with this protocol
    - Record ID number on FFQ and diet record
    - Record dates for diet record to be completed according to diet record plan

## Step – During

1. **Introduction**
    - Introduce yourself/ if first contact was not made face to face
    - Thank participant for taking the time to meet today
    - Check they have read and understood the information sheet and whether there are any questions

2. **Consent forms**

- Collect forms and put away in a file

3. **Demographic questionnaire**
   - Give parent demographic questionnaire to fill out. Collect questionnaire and put away in file.

4. **Administering Food Frequency Questionnaire**
   - Explain that I will ask the questions and fill it in
   - Explain that there are no right or wrong answers
   - Complete the FFQ according to the instructions preceding the FFQ

5. **Take weight and height of child**
   - Refer to P3b, Measurement Protocol

6. **Teach Participant to use the three day weighed diet records and scales**
   - Show participants the food diary
   - Get the scales out, show them where the batteries are, and how to use the scales. Let them know the batteries may go flat, so they may need to change them. Show them how to change batteries if they do go flat.

**Explain:**

- The instruction in the weighed diet records
- Demonstrate with the food items; sequential recording and leftovers
- To fill in the record for three days over the next three weeks. These are the days written on the front of the diet record
- Explain why it is important to record on these days
- How to contact me with any questions while filling in the record

Finally, that while I realise it may take some time to record what your child eats, it is very important that we get a picture of their normal eating patterns, so please don't change what your child would normally eat because of it, and please record everything your child eats on the days you're recording- even if they only have a bite or sip of a food or drink.

7. **Any Questions?**

8. **Wrap up**
   I would like to arrange a time in one month to meet up with you again, to collect the food dairy, and to ask you to complete the FFQ for the second time. Do you know a day and time that would be suitable for you then, or would you like ne to ring you close to the time?

(If they know a time and day, write collection date on their food record for them, and record time, date, name in my dairy. If not, then record a reminder to contact them in dairy during the third week of food recording)

Thank parent for their time today- their participation is extremely helpful to this valuable research and is very much appreciated.

Leave contact details with parent in case they have further questions

## Steps– After

- Filling FFQ, demographic questionnaire and consent forms
- Record reminder dates in dairy according to diet record plan
- Record next appointment date and reminder

# Appendix H

# Cover letter

Date
Name
Street no and name
Suburb
Town/city

Dear [Name of participant],

Thank you for your interest in our EAT 5 study at the University of Otago.
Please find enclosed in this envelope:

- Adult and Child information sheets
- Adult and Child consent forms
- Map showing how to get to our meeting location

Please read the information sheet carefully before signing the consent form. We would appreciate it if you could read out the child information sheet to your child and ask them to sign or mark the consent form. Don't worry if you don't have time to do this before our meeting – we can go over it together then. I look forward seeing you at [place] on [Day] the [Date] of [Month]. I have attached a map so that you know how to get to the office where our meetings will be held.

I would like to thank you again for your interest and time. Your participation will be extremely helpful to this research and is very much appreciated.

If you have any questions, please do not hesitate to contact me.

Kind regards,

Renee Yu, Student Dietitian
Department of Human Nutrition
yure1721@student.otago.ac.nz
0211423657

# Appendix I

# Information sheets

# EAT5 - What are New Zealand 5 year olds eating?

## Participant Information Sheet

Thank you for your interest in the EAT5 study. Please read this information sheet carefully and take time to think about whether you would like to participate. You might also want to talk with relatives or friends before making your decision.

If you decide to take part we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

## Why?

The aim of this study is to find out what New Zealand 5 year olds are eating, and at the same time to develop a new, and much quicker, way of measuring what they eat, called a "food frequency questionnaire". The study is being carried out by Master of Dietetics students who are being supervised by University staff.

## Who is funding the project?

The EAT5 study is being paid for by University funds.

## Who can participate?

We are seeking 30 parents of healthy 5-year olds.

## What will I be asked to do?

We will ask you to:

- Fill out a short questionnaire about yourself and your child, and a food frequency questionnaire about how often your child has different types of foods. We will post these out so that you can complete them at home. This will take about 30 minutes of your time.
- Then we'll ask you to come to a meeting at our research rooms where we will measure your child's height and weight, and show you how to complete a weighed food record. This will take about an hour of your time.
- We'll ask you to fill out a weighed food record over the next 3-4 weeks – recording what your child eats and drinks on 3 different days. We will lend you some electronic scales to make this easier. This will take about 30 minutes of your time on each of the days.
- Finally, we will ask you to come back to our research rooms to fill out anther food frequency questionnaire. This will take about 30 minutes of your time.

We estimate that the EAT5 study will take a maximum of 3½ hours of your time over about a month. We are able to reimburse you at the end of the study for costs associated with taking part up to $25 (approximately $5 for each of the 5 components of the study).

## What will happen to my information?

We keep the information from the study for 10 years past the end of the study, following University guidelines.

## What about anonymity and confidentiality?

All your information is identified by a number rather than by your name. This keeps all the information anonymous so that you cannot be identified. We keep all the information and questionnaires in locked offices. Group results of the project will be published but you will not be identified.

## If I agree to participate, can I change my mind?

You may withdraw from participating in the project at any time and without any disadvantage to yourself.

## Any questions?

If you have any questions now or in the future, please feel free to contact us:

Name: Dr Anne-Louise Heath
Position: Co-Principal Investigator
Department: Human Nutrition
Contact phone number: 479 8379
Email: anne-louise.heath@otago.ac.nz

Student Dietitian: Renee Yu
Email: yure1721@student.otago.ac.nz
Phone: 021 142 3657

*This study has been approved by the University of Otago Human Ethics Committee (Health). If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.*

# EAT5: What are New Zealand 5 year olds eating?




## Information Sheet for Children

### What is the EAT5 study all about?

We are doing a study to find out what New Zealand kids just like you are eating. This will also help us create a better and faster way of measuring what children are eating.

### What do I have to do?

Not a lot – mum and dad will do most of it!

If you want to be in EAT5, we will ask you to come and visit us so that we can

- Measure how much you've grown
- Teach your mum or dad how to weigh and write down what you eat and drink
- Ask you to help your mum and dad when they are filling out your food diary over the next 3 or 4 weeks

### Who will I be talking to?

..... is the person you will meet when you come in to see us.

### Do I have to be in the study?

No you don't. You are only in the study if you want to and your mum or dad are keen too. It's OK if you change your mind at any time – even during the measurements.

Only the people who are running the study will be able to see the information you give us.

### Any questions?

If you have any questions now or in the future, please feel free to contact us:

Name: Dr Anne-Louise Heath
Position: Co-Principal Investigator
Department: Human Nutrition
Contact phone number: 479 8379
Email: anne-louise.heath@otago.ac.nz

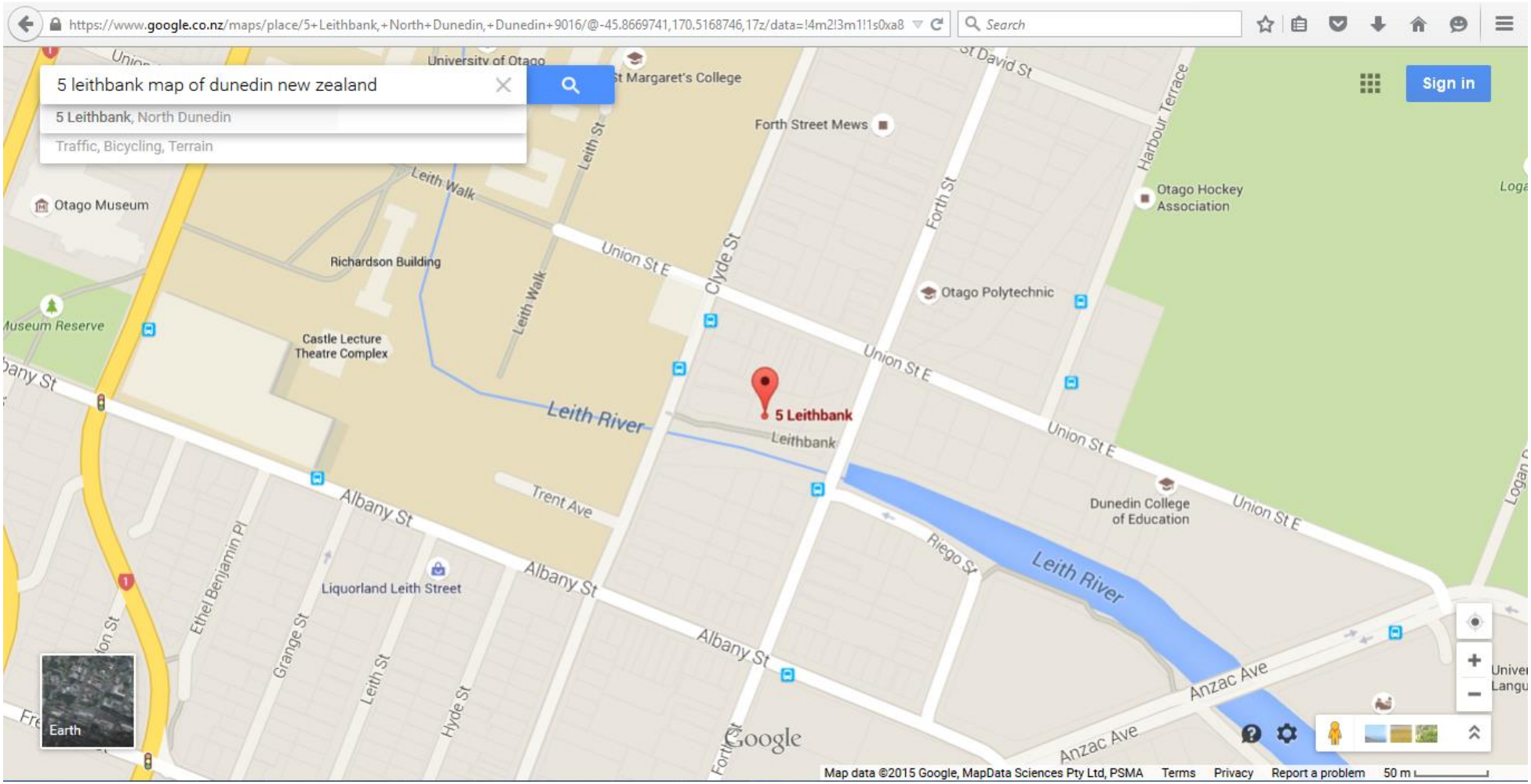
Name: Associate Professor Rachael Taylor
Position: Co-Principal Investigator
Department: Medicine
Contact phone number: 021 479 556

*This study has been approved by the University of Otago Human Ethics Committee (Health). If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.*

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Te Whare Wānanga o Otāgo
NEW ZEALAND

# Appendix J

# Map to appointment room


https://www.google.co.nz/maps/place/5+Leithbank,+North+Dunedin,+Dunedin+9016/@-45.8669741,170.5168746,17z/data=!4m2!3m1!1s0xa8
Search
5 leithbank map of dunedin new zealand
5 Leithbank, North Dunedin
Traffic, Bicycling, Terrain
Sign in
University of Otago
St Margaret's College
Forth Street Mews
Harbour Terrace
Otago Hockey Association
Otago Museum
Leith Walk
Richardson Building
Union St E
Clyde St
Forth St
Otago Polytechnic
Museum Reserve
Castle Lecture Theatre Complex
5 Leithbank
Leithbank
Leith River
Trent Ave
Albany St
Dunedin College of Education
Riego St
Liquorland Leith Street
Ethel Benjamin Pl
Grange St
Leith St
Hyde St
Anzac Ave
Earth
Google
Map data ©2015 Google, MapData Sciences Pty Ltd, PSMA
Terms
Privacy
Report a problem
50 m

# Appendix K

# Nutrient analyses letter

Date:
Dear Name,

Thank you very much for participating in the EAT5 study. Please find enclosed [child]'s nutrient results. The recommendations we have used in this letter are based on the Nutrient Reference Values for Australian and New Zealand children who are 4 to 8 years of age. They should be relevant to [child]'s diet, as long as the foods recorded in the three day weighed diet record are fairly typical of what [she/he] eats. For more information on recommended nutrient intakes you can visit:
https://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/n36.pdf

**Good intake (above the RDI)**
After analysing the weighed diet record you completed, the results show that [child] is eating a well-balanced diet, with all of the analysed nutrients falling within the recommended ranges.

**OR, Possibly a good intake (between the RDI and EAR)**
After analysing the results of [child]'s diet record, we have concluded that your child is eating a well-balanced diet with most of the nutrients fitting within the recommended ranges. However, [child]'s [nutrient] intake might be slightly low. This is unlikely to be much of a problem, however, as these recommendations are set at a level that makes sure that every child aged 4-8 years will get enough if they eat this much. In reality, some adults and some children need less than others. To ensure that [child's name] gets enough [nutrient], you may like to try offering more foods rich in [nutrient] as described on the last page of this letter.

**(AND)OR, Low intake (below the EAR)**
After analysing the results from [child]'s diet record, the results suggest that your child's diet may be a bit low in [nutrient]. We would recommend you try and offer more foods rich in [nutrient], as described on the last page of this letter.

We have very much appreciated you and [child's] help with the EAT5 study, I hope this information is reassuring and useful for you and your family.
Please do not hesitate to contact me if you have any further queries.

Kind regards,

Renee Yu
Student Dietitian, Department of Human Nutrition
reneeyu@hotmail.co.nz

**Nutrient Analysis**

| Nutrient | "Estimated Average Requirement" (per day) | "Recommended Dietary Intake" (per day) | "Adequate Intake" (per day) | [child]'s average daily intake |
|---|---|---|---|---|
| Energy[1] (kJ) | - | - | - | |
| Protein (g) | 16 | 20 | - | |
| Total Fat[2] (%) | | 20-35% dietary energy intake | | |
| Total Carbohydrate[2] (%) | | 45-65% dietary energy intake | | |
| Total Fibre (g) | - | - | 18 | |
| Calcium (mg) | 520 | 700 | - | |
| Iron (mg) | 4 | 10 | - | |
| Vitamin C (mg) | 25 | 35 | - | |

[1] Exactly how much energy your child needs is difficult to determine because it can be influenced by many different things including physical activity. However, [child] falls within the healthy BMI for (his/her) age. Therefore, we can assume [child's name]'s energy intake is adequate for normal growth at this time.

Weight- kg Height- cm BMI-

Above 95th percentile for BMI- [1] Appropriate energy intake is difficult to determine because it can be influenced by many different things including physical activity. [Child] is currently above the 95th percentile for BMI. This means that if [Child's name] is in a room with 100 other [boys/girls] of the same age, his/her weight for height will be higher than 95 of the other children in the room. This means that your child is carrying more weight than recommended for [his/her] height), but it is important to remember that this value is only based on one measurement and children change rapidly. If you have any concerns about your child's weight, we recommend you check with you G.P. the next time you are there.

[2] For total fat and total carbohydrate, there are not set recommendations for intake in children.

**What can this nutrient analysis tell me?**

This nutrient analysis shows [child]'s average intake of nutrients over the three days you kept the food diary. From this you can see how likely it is that they are getting enough of each nutrient. Please note – if your child has a low intake of a nutrient this does not necessarily mean they are deficient in that nutrient. The only way to diagnose a nutrient deficiency is from tests such as blood tests.

**What is the "Recommended Dietary Intake?" (RDI)**

The Recommended Dietary Intake (you may have seen it called "RDI" on food packets is the daily intake of a nutrient that will meet the needs of almost every child aged 4-8 years. If your child has a nutrient intake that is the same as, or higher than, the RDI it is very likely they are getting enough of that nutrient.

**What is the "Estimated Average Requirement?" (EAR)**

The Estimated Average Requirement or EAR is the daily intake of a nutrient that will meet the needs of half of all 4-8 year old children. If your child has nutrient intakes that are the same as, or above, the EAR, there is still a good chance they are getting enough of the nutrients they need.

**Adequate Intake (used when an RDI cannot be determined)**

The Adequate Intake or AI is the average daily nutrient intake that has been observed in healthy 4-8 year olds. If your child has a nutrient intake that is the same as, or above, the AI they are assumed to be adequate.

**What does it mean if my child has nutrient intake below the RDI?**

If your child has a nutrient intake below the RDI but above the EAR, there is still a good chance they are getting enough of that nutrient. If you're concerned you could try offering more foods that contain that nutrient.

**What does it mean if my child has a nutrient intake below the EAR?**

If your child has a nutrient intake below the EAR, then it's possible they may not be getting enough of that nutrient. See the last page for some ideas about what foods to offer to boost their intake of the nutrient or nutrients you're concerned about.

**What does it mean if my child has a nutrient intake below the AI?**

Unfortunately it isn't possible to know whether your child is getting enough of a nutrient if they are having less than the AI. If their intake of fibre is less than the AI but they are not constipated then they are possibly having enough fibre.

**How accurate is this nutrient analysis?**

The accuracy of this nutrient analysis depends on how accurate and detailed the food diary was. There are also other factors that can affect the accuracy of the nutrient analysis, for example, if your child was unwell and had a decreased appetite while you were keeping the food diary, their nutrient intake may actually be higher than this analysis has shown. There's also a chance that the three days of recording weren't representative of what your child usually eats – for example if on the three days you were recording your child didn't eat any of a particular food that they usually eat then the analysis may not be an accurate reflection of their nutrient intake.

The next page contains some examples of foods to increase intake of these nutrients. For more information you can visit the Ministry of Health at: www.health.govt.nz.

**Protein**

Protein is necessary to build, maintain and repair tissue and is essential for growth. Good sources of protein include: meat, chicken, fish, eggs, milk, yoghurt, beans (e.g. baked beans, kidney beans), lentils, and tofu.

**Fibre**

Dietary fibre is required for adequate function of the bowel. Wholegrain breads and cereals, legumes, vegetables and fruits are good sources of dietary fibre and many other nutrients. Introduce foods high in fibre gradually along with adequate fluids to avoid any abdominal discomfort.

**Calcium**

Calcium is essential for healthy bones and teeth. Milk products and calcium fortified milk alternatives are good sources of calcium. These include cow's milk, yoghurt, cheese, calcium-fortified soy milk and calcium-fortified yoghurt. Non- dairy sources of calcium include canned fish with bones, green leafy vegetables, legumes, nuts and seeds. Children require two to three servings of milk and milk products each day to meet their calcium requirements.

**Iron**

Iron needs are highest during periods of rapid growth, such as early childhood, and the time of the adolescent growth spurt. Iron is an essential component of haemoglobin, the component of red blood cells that transports oxygen. Good sources of iron are: beef, other meats, chicken, fish, shellfish, eggs, beans, lentils, tofu, and breakfast cereals (if they have iron added to them- see ingredient list on packet).
Eating vitamin C containing foods (see list below) at the same time as iron-containing foods increases the amount of iron your body is able to use.

**Vitamin C**

Vitamin C is essential for normal growth and development. Foods high in vitamin C include: fruit such as orange and mandarins, kiwifruit, berries, apples, pineapple and colourful vegetables such as tomatoes, capsicum, broccoli, cauliflower, and cabbage.

# Appendix L

# Demographic questionnaire

# EAT5 Demographic Questionnaire

1. How are you related to the child in this study? _____

2. What is your date of birth? _____ *day/month/year*

3. How many children do you have? _____

4. To which ethnic group(s) do you belong? *Please tick all the boxes that apply*
   - ☐ NZ European
   - ☐ Maori
   - ☐ Samoan
   - ☐ Tongan
   - ☐ Cook Island Maori
   - ☐ Niuean
   - ☐ Chinese
   - ☐ Indian
   - ☐ Other

   If other, please state: _____

5. If Maori, please provide your tribal affiliations _____

6. What is your child's date of birth? _____ *day/month/year*

7. What is your child's sex?: Male / Female *(please circle)*

8. To which ethnic group(s) does your child belong?
   - ☐ NZ European
   - ☐ Maori
   - ☐ Samoan
   - ☐ Tongan
   - ☐ Cook Island Maori
   - ☐ Niuean
   - ☐ Chinese
   - ☐ Indian
   - ☐ Other

   If other, please state: _____

9. If Maori, please provide the tribal affiliations for your child _____

10. Is your child descended from Maori (that is do they have a Maori birth parent, grandparent or great-grandparent etc)? Yes / No / Don't know *(please circle)*

# Appendix M

# Measurement protocol

## P3b. Measurement Protocol

**Objectives:**

1. To undertake anthropometric measurements (weight, and height) of five-year old children
2. Record measurements immediately in the anthropometry data sheet.
3. Enter the measurements into Excel.

## Equipment requirement

**Measurement Protocol**
**Anthropometric data sheet**
**Tracking sheet containing child's name parents' names and their addresses**
**Stadiometer**
**Equipment Bag:**
- **Scale**
- **Hand sanitizer**
- **Pencil (for recording results on data sheet)**
- **Eraser**
- **Wipes**
- **A measurement Card (to copy child measurements to mother).**

**Measuring equipment**

1) **Tanita WB-100 MA/WB -110 MA weighing scale**: portable electronic scale that have taring capability and calibrated to 0.1kg.
2) **Leicester wall stadiometer:** to measure child's height to the nearest 0.1 cm.

- All measuring equipment must be highly accurate, precise, sturdy and portable.
- Scales and stadiometers should be calibrated before measurement.
- Stadiometers should be calibrated with a standard length rod.
- Scales should be calibrated with standard weights.

## Steps- Before

1) All equipment should be checked prior to first measurement of the day.
2) Confirm that all supplies needed for the measurements are available and accessible.
3) Information should be entered on data sheet including:

1- Date 2- Measure's Name. 3- Child's Name

## ***Remember***

1) Measurements should be taken and recorded twice.
2) It is important to follow the same technique and protocol during successive measurements.
3) Any measurements falling outside the maximum allowed differences should be repeated and entered in designated boxes on the data sheet.
4) Data should be entered on the sheet using a pencil.
5) Immediately record the measurement after it is read, it helps to have your pencil and data sheet near you.
6) Record the measurement directly onto the data sheet. The more times the measurement is copied, the more chances of error there are.
7) Record measurements clearly and neatly, the same way every time.

**Steps- During**

1) Introduce yourself
2) Thank for taking time to meet today
3) Ensure that the parent and the child understand what is happening and they are comfortable with the process.
4) Go over what will be covered in today's session:
    - Child height and weight.

**General Guidelines for Measuring and Recording**

**1) Always tell the participant what you are going to do before you do it.** Explain what you are doing and why, such as before adjusting the pants down to measure the waist circumference. Remain unaffected by tattoos, piercings, etc. and **do not comment** about the **participant**'s body. Maintain professionalism at all times.

**2) Avoid parallax when taking measurement readings.** Parallax describes the phenomenon where an observer reads a different value on a measuring device depending on the angle from which it is viewed. Parallax is a common cause of data error especially for measurements obtained using the height equipment. The examiner should read the measurement with his or her line of sight directly in front of the value rather than at an angle or from even slightly off to the side.

**3)** Exam staff must carefully **watch children at all times** because they can quickly and easily hurt themselves.

## ***Child Measurements***

1) Explain to the mother that information will only be used for this study.

2) Confidentiality of information must be assured.

3) The anthropometrist's confidence and poise is important for reassuring both the mother and child, and includes maintaining eye contact and talking to the child in calm, reassuring voice.

## ***The best order to carry out the measurements is:***

1. ***Ask the mother to undress the child up to a singlet and underwear.***
2. ***Child's weight 1.***
3. ***Child's height 1.***
4. ***Child's weight 2.***
5. ***Child's height 2.***
6. ***If the child refused to stand on the scale alone, record the weight of the mother, tare the scale and ask the mother to hold the child and record his/her weight.***
7. ***Check that differences between measurements 1 and 2 are acceptable. If not, then repeat measurement a third time now.***
8. ***Now child can get dressed***

***The following table shows the maximum allowable differences between the two measurements***

| Measurement | Maximum allowable difference |
|---|---|
| **Weight** | 0.1kg |
| **Length** | 0.7cm |

### ***Weight***

Place the scale on a flat, hard, even surface. Be sure there is adequate light to read measurement.

1) Explain to the participant the procedure for weighing.
2) Ask the mother to remove all the child's clothes up to under wear.
3) Turn on the power key, wait until (0.0) is displayed.
4) Ask the mother to help the child to stand with his/her feet slightly apart in the centre of the scale.
5) Immediately record the measurement to the nearest 0.1kg.
6) Repeat steps 4&5.

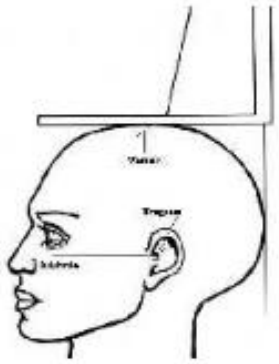
## ***Height***

*Protocol is based on POI study 5year old measurement protocol, prepared by Maha Hanna*

Explain to the mother the procedure for measuring the child's height, the mother will be required to help with measurement and to soothe and comfort the child.

1. Place the measuring board on a hard flat surface against a wall. Make sure the board is not moving.
2. Check that shoes, socks and hair ornaments have been removed.
3. Working with the mother, and kneeling in order to get down to the level of the child.
4. Help the child to stand on the baseboard with feet slightly apart. The back of the head, shoulder blades, buttocks, calves, and heels should all touch the vertical board.
5. Ask the mother to hold the child's knees and ankles to help keep the legs straight and feet flat, with heels and calves touching the vertical board. Ask her to focus the child's attention, soothe the child as needed, and help you to keep the child in position.
6. Position the child's head so that a horizontal line from the ear canal to the lower border of the eye socket runs parallel to the base board (***Frankfurt Plane***). To keep the head in this position, hold the bridge between your thumb and forefinger over the child's chin.
7. If necessary, push gently on the tummy to help the child stand to full height.
8. Still keeping the head in position use your other hand to pull down the headboard to rest firmly on top of the head and compress the hair.
9. Read the measurement and record the child's height in centimeters to the last completed 0.1 cm This is the last line that you can actually see. (0.1 cm = 1mm)





# Appendix N

# EAT5 Food frequency questionnaire

# 5 year Food Frequency Questionnaire




*To be administered to the child's main carer*

EAT5 study number | | | | |

Interview date DD MM YY

Interviewer name _____

**You will need:**

- This questionnaire
- Ready reckoners 1 and 2
- Plate
- Bowl
- Mug
- Glass
- Measuring cup
- Measuring spoons
- Funnel
- Beans
- Rice

## Instructions for the interviewer:

- Please check that the POI study number, the date, and your name are **recorded on the front page** before starting the questionnaire
- Ask each question in turn **as it is worded** in the questionnaire.
- Each food should be **entered only once** and **as separate items** where possible. For example, if they had custard and peaches for pudding, this should be entered as i) custard and ii) peaches – not as "puddings not yet described".
- **Mixed dishes should be entered separately** – so lasagne should be entered as appropriate amounts of "Other pasta (pasta only - not including sauce)", "Mince & patties (from beef or lamb)", and "White or cheese sauce", and "Cooked tomato (pasta sauce, canned tomatoes etc)".
- Room has been left at the bottom of each page to **make comments** that will help with interpreting the data – we would like you to put as much information as possible. For instance a child might have a slice of bread that is from a breadmaker which is much thicker than the standard toaster slice.

### Choosing a frequency

- Enter **only one value for frequency** (that is, how often a week OR day, not both)
- Make sure there is a frequency for **every food** (i.e., use the "not eaten this month" column as appropriate)
- Use "Ready Reckoner 1" if parent says that the child has something **regularly but only for part of the week,** for example, "Beth has a banana twice a day during the week but not at all in the weekend". This will give you the single frequency option to use.
- Use "Ready Reckoner 2" for those **questions that include more than one food,** for example "white buns (not iced), crumpets". This will give you the single frequency option to use.

### Estimating the amount eaten

- **For those foods that have a "standard" unit provided,** the parent needs to estimate how many of these units (or fractions of units such as ¼ or ½) the child would usually eat (1st example on the next page).
- **For those foods with units of ml,** you need to use the beans (larger foods) or rice (smaller foods) to estimate the volume they consume. Ask the parent to pour the beans or rice into the plate or cup (whichever is appropriate) to the level that their child would usually eat. You then pour this amount into the measuring cup and record the volume (2nd example on the next page).

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Example** | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 1 | Instant noodles | | | ✓ | | | | | | | | 1 packet | ¾ |
| 2 | Cornflakes or rice bubbles | | | | | | | ✓ | | | | 140 ml | |

## Instructions for the participant:

- These questions ask how often and how much *child's name* has eaten certain foods or beverages **over the past month.**
- *Child's name* may sometimes be fed by a relative, friend, or someone else. If you know the type of food and approximate amount s/he has eaten at these times please include them.
- Please tell us what they **actually** ate and drank; we are interested in what children actually eat, not the perfect diet.
- All information is stored by study number and not by your name.

## A. Bread, crackers and breakfast cereals

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 1 | White bread | | | | | | | | | | | 1 toaster slice | |
| 2 | White buns (not iced), crumpets | | | | | | | | | | | 1 small bun or 1 crumpet | |
| 3 | Wholemeal bread or bun | | | | | | | | | | | 1 toaster slice or 1 small bun | |
| 4 | Wholegrain bread or bun | | | | | | | | | | | 1 toaster slice or 1 small bun | |
| 5 | Crackers (wheat, rice or corn-based) | | | | | | | | | | | 1 cracker | |
| 6 | Rice cakes or rice wheels* | | | | | | | | | | | 1 rice cake or 17 rice wheels | |
| 7 | Cruskits or crispbreads | | | | | | | | | | | 1 cruskit | |

**Comments?**

* Rice wheel = tiny kids' size rice cake (~ 50 cent coin in diameter)

* Rice cake = puffed rice crackers the size of a large cookie

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 8 | Weet-bix | | | | | | | | | | | 1 weetbix | |
| 9 | Fruity-bix or similar | | | | | | | | | | | _____ ml | |
| 10 | Porridge | | | | | | | | | | | _____ ml | |
| 11 | Cornflakes or rice bubbles | | | | | | | | | | | _____ ml | |
| 12 | Cocopops, honey puffs or puffed wheat cereal | | | | | | | | | | | _____ ml | |
| 13 | Nutrigrain, Milo cereal or similar | | | | | | | | | | | _____ ml | |
| 14 | Muesli and "light" muesli (e.g. "Light and Tasty, Light and Right)" | | | | | | | | | | | _____ ml | |
| 15 | Other breakfast cereal (record name of main one): _____ | | | | | | | | | | | _____ ml | |

**Comments?**

## B. Rice and pasta

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 16 | White rice | | | | | | | | | | | _____ ml | |
| 17 | Brown rice | | | | | | | | | | | _____ ml | |
| 18 | Instant noodles | | | | | | | | | | | 1 packet | |
| 19 | Canned spaghetti | | | | | | | | | | | 1 medium can (420g) | |
| 20 | Other pasta (pasta only - not including sauce) | | | | | | | | | | | _____ ml | |
| 21 | Pizza (not takeaway) – base only | | | | | | | | | | | 1 slice | |

**Comments?**

## C. Fruit

22 How often has your child had fruit in the past month?

_____ less than once a week OR _____ times a week OR _____ times a day

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 23 | Banana | | | | | | | | | | | 1 banana* | |
| 24 | Apples (fresh or canned) | | | | | | | | | | | 1 apple | |
| 25 | Apricots, plums or peaches (fresh or canned) | | | | | | | | | | | 1 apricot or 1 plum, or ½ peach | |
| 26 | Pears (fresh or canned) | | | | | | | | | | | 1 pear | |
| 27 | Raisins or sultanas | | | | | | | | | | | 1 small box (12g) | |
| 28 | Dried apricots or prunes | | | | | | | | | | | 1 prune | |
| 29 | Oranges, mandarins | | | | | | | | | | | 1 orange or 2 mandarins | |

**Comments?**

*2 bobby bananas = 1 medium banana

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 30 | Kiwifruit | | | | | | | | | | | 1 kiwifruit | |
| 31 | Green grapes | | | | | | | | | | | 1 grape | |
| 32 | Black or red grapes | | | | | | | | | | | 1 grape | |
| 33 | Berries or cherries (fresh or frozen) | | | | | | | | | | | _____ ml | |
| 34 | Avocado | | | | | | | | | | | 1 avocado | |
| 35 | Rhubarb | | | | | | | | | | | _____ ml | |
| 36 | Other fruit | | | | | | | | | | | _____ ml | |

**Comments?**

## D. Vegetables

37 How often has your child had vegetables in the past month?

_____ less than once a week OR _____ times a week OR _____ times a day

| | | **How often have they eaten this food this month?** *Complete one frequency column only per food* | | | | | | | | | | **How much did they eat each time?** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 38 | Potato salad or other potato eaten cold | | | | | | | | | | | _____ ml | |
| 39 | Potato or kumara (boiled, baked, microwaved, mashed) eaten warm or hot | | | | | | | | | | | _____ ml | |
| 40 | Hot chips, potato shapes, roast potato or kumara cooked at home eaten warm or hot | | | | | | | | | | | _____ ml | |
| 41 | Yams | | | | | | | | | | | _____ ml | |
| 42 | Carrot | | | | | | | | | | | _____ ml | |
| 43 | Pumpkin | | | | | | | | | | | _____ ml | |
| 44 | Green peas | | | | | | | | | | | _____ ml | |
| 45 | Green beans | | | | | | | | | | | _____ ml | |

**Comments?**

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 46 | Sweet corn | | | | | | | | | | | _____ ml | |
| 47 | Broccoli | | | | | | | | | | | _____ ml | |
| 48 | Cauliflower | | | | | | | | | | | _____ ml | |
| 49 | Capsicum (peppers) | | | | | | | | | | | _____ ml | |
| 50 | Red cabbage | | | | | | | | | | | _____ ml | |
| 51 | Green cabbage | | | | | | | | | | | _____ ml | |
| 52 | Spinach or silverbeet | | | | | | | | | | | _____ ml | |
| 53 | Lettuce or salad leaves | | | | | | | | | | | _____ ml | |
| 54 | Cucumber | | | | | | | | | | | 1 slice | |
| 55 | Raw tomato | | | | | | | | | | | 1 tomato | |
| 56 | Cooked tomato (pasta sauce, canned tomatoes, tomato sauce) | | | | | | | | | | | _____ ml | |
| 57 | Leeks | | | | | | | | | | | _____ ml | |
| 58 | Other vegetables: _____ | | | | | | | | | | | _____ ml | |

**Comments?**

## E. Meat, chicken, fish, eggs, beans

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 59 | Chicken nuggets or shapes | | | | | | | | | | | 1 nugget | |
| 60 | Fish fingers or shapes | | | | | | | | | | | 1 fish finger | |
| 61 | Battered or crumbed fish | | | | | | | | | | | 1 fillet | |
| 62 | Other chicken (eg. roast, stir-fry, BBQ) | | | | | | | | | | | 1 drumstick | |
| 63 | Other fish (eg. canned, pan-fried) | | | | | | | | | | | _____ ml | |
| 64 | Sausages, saveloys (including vegetarian) | | | | | | | | | | | 1 sausage | |
| 65 | Ham, bacon, luncheon, salami | | | | | | | | | | | 1 slice | |
| 66 | Meat pies | | | | | | | | | | | 1 pie | |
| 67 | Sausage rolls | | | | | | | | | | | 1 roll | |
| 68 | Mince & patties (from beef or lamb) | | | | | | | | | | | _____ ml | |

**Comments?**

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 69 | Steak, chops or roast (beef or lamb) | | | | | | | | | | | _____ ml | |
| 70 | Pork and other meat | | | | | | | | | | | _____ ml | |
| 71 | Eggs | | | | | | | | | | | 1 egg | |
| 72 | Hummus (chickpea dip) | | | | | | | | | | | _____ ml | |
| 73 | Baked beans | | | | | | | | | | | 1 medium can (420g) | |
| 74 | Canned or home cooked beans, chickpeas or lentils | | | | | | | | | | | _____ ml | |
| 75 | Nuts (any sort but not peanut butter) | | | | | | | | | | | _____ ml | |

**Comments?**

## F. Spreads

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 76 | Jam or honey | | | | | | | | | | | _____ ml | |
| 77 | Marmite or Vegemite | | | | | | | | | | | _____ ml | |
| 78 | Peanut butter | | | | | | | | | | | _____ ml | |
| 79 | Nutella | | | | | | | | | | | _____ ml | |

**Comments?**

## G. Cakes, biscuits, snacks

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 80 | Biscuits – chocolate coated | | | | | | | | | | | 1 biscuit | |
| 81 | Biscuits – other | | | | | | | | | | | 1 biscuit | |
| 82 | Cakes or slices | | | | | | | | | | | 1 large raisin box | |
| 83 | Muffins or scones | | | | | | | | | | | 1 medium muffin | |
| 84 | Croissant, sweet buns, iced buns, pastries | | | | | | | | | | | 1 item | |
| 85 | Fruit bread, currant buns | | | | | | | | | | | 1 slice | |
| 86 | Chocolate | | | | | | | | | | | 1 square | |
| 87 | Lollies | | | | | | | | | | | 1 lolly | |
| 88 | Crisps, corn chips, corn snacks (e.g. Cheezels) | | | | | | | | | | | 1 snack packet (18g) | |
| 89 | Muesli, nut, cereal or puffed rice bars | | | | | | | | | | | 1 bar | |
| 90 | Fruit leather, fruit strings, fruit roll-ups | | | | | | | | | | | _____ ml | |

**Comments?**

## H. Milk and dairy products

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 91 | Flavoured milk (including Milo, Quick, Drinking chocolate, Up-and-Go) | | | | | | | | | | | _____ ml | |
| 92 | Low-fat cows milk (green, lite blue, yellow-top) **as a drink** | | | | | | | | | | | _____ ml | |
| 93 | Low-fat cows milk **on cereal or other food** (not custard or sauces) | | | | | | | | | | | _____ ml | |
| 94 | Cows milk (blue, silver-top) **as a drink** | | | | | | | | | | | _____ ml | |
| 95 | Cows milk **on cereal or other food** (not custard or sauces) | | | | | | | | | | | _____ ml | |
| 96 | Soy milk **as a drink** | | | | | | | | | | | _____ ml | |
| 97 | Soy milk **on cereal or other food** (including custard or sauces) | | | | | | | | | | | _____ ml | |
| 98 | Other milk (goat, rice) **as a drink** | | | | | | | | | | | _____ ml | |
| 99 | Other milk (goat, rice) **on cereal or other food** | | | | | | | | | | | _____ ml | |

**Comments?**

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 100 | Cheese (including in recipes) | | | | | | | | | | | _____ ml | |
| 101 | Yoghurt or dairy food | | | | | | | | | | | _____ ml | |
| 102 | White sauce or cheese sauce | | | | | | | | | | | _____ ml | |
| 103 | Butter (not in baking) | | | | | | | | | | | _____ ml | |
| 104 | Margarine (not in baking) | | | | | | | | | | | _____ ml | |
| 105 | Cream or sour cream | | | | | | | | | | | _____ ml | |

**Comments?**

## I. Puddings

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 106 | Ice cream | | | | | | | | | | | _____ ml | |
| 107 | Custard and other milk puddings | | | | | | | | | | | _____ ml | |
| 108 | Puddings not yet described | | | | | | | | | | | _____ ml | |

**Comments?**

## J. Drinks

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 109 | 100% orange juice (freshly squeezed or similar) | | | | | | | | | | | _____ ml | |
| 110 | Other fruit juice ("Fresh up", "Just Juice") | | | | | | | | | | | _____ ml | |
| 111 | Fruit drinks, Ribena, cordial, sachets | | | | | | | | | | | _____ ml | |
| 112 | Regular fizzy drinks (lemonade, coke) | | | | | | | | | | | _____ ml | |
| 113 | Diet fizzy drinks (lemonade, coke) | | | | | | | | | | | _____ ml | |
| 114 | Tea (not herbal) | | | | | | | | | | | _____ ml | |
| 115 | Coffee | | | | | | | | | | | _____ ml | |

**Comments?**

## K. Takeaways

| | | How often have they eaten this food this month? *Complete one frequency column only per food* | | | | | | | | | | How much did they eat each time? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Food** | Not eaten this month | Less than once a week | Once a week | 2 times a week | 3 times a week | 4 times a week | 5 times a week | 6 times a week | Every day | If more than once a day – how many times a day | Units | How many [units] would they eat each time? |
| 116 | Chips from a takeaway shop or fast food restaurant (KFC, McDonalds, Burger King) | | | | | | | | | | | _____ ml | |
| 117 | Hotdog, fish, sausage from a takeaway shop | | | | | | | | | | | 1 item | |
| 118 | Burgers from a takeaway shop or fast food restaurant (KFC, McDonalds, Burger King) | | | | | | | | | | | 1 burger | |
| 119 | Other item from a takeaway shop or fast food restaurant (KFC, McDonalds, Burger King (please describe) | | | | | | | | | | | 1 item | |
| 120 | Ready to eat pizza (takeaway shop or supermarket) | | | | | | | | | | | 1 slice | |
| 121 | KFC or other fried chicken | | | | | | | | | | | 1 piece | |
| 122 | Subway sandwich | | | | | | | | | | | 1 6" roll | |
| 123 | Kebabs or wraps (bought) | | | | | | | | | | | 1 wrap | |
| 124 | Sushi (bought) | | | | | | | | | | | 1 piece | |
| 125 | Chinese, Thai, or Indian meal or similar (bought) | | | | | | | | | | | _____ ml | |

**Comments?**

126 On average over the past 4 weeks, how many meals **per week** were given to your child by someone other than yourself? _____ meals

127 If more than 0 meals, how many of these meals have you been able to include in this questionnaire?

☐ None ☐ Some ☐ Most ☐ All

## Thank you for completing this questionnaire

University of Otago
Te Whare Wānanga o Otāgo
New Zealand

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Department of Medicine
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eat5



# Appendix O

# Weight diet record booklet

# EAT5 Food Diary








Please read through these pages before starting your food diary

We would like you to please:

- Write down **everything** your child eats and drinks, when s/he eats it. Please don't rely on your memory at the end of the day.
- Write down any supplements you give your child.
- Weigh your child's food and drink using the scales provided.

On these days:

1. .....
2. .....
3. .....

**Please try not to change what you give your child just because you are keeping a diary!**

Thank you very much for your help

## How to fill out your Diet Record:

- Record the amount and description of **ALL foods and drinks consumed** — all meals and all snacks.
- **Begin each new day on its labelled page** (for example, Day 1) and please fill in all the information at the top of the page (the date, day of the week and the questions about your child's health).
- Use a **new line for each food or drink.** (You can use more than one line for a food or drink, but please start each new food or drink on a separate line).
- Also please remember to **include any additions to foods** (for example, tomato sauce, salad dressing, gravy).

## How to fill out each column

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| Please write down **where** your child ate each meal, snack or drink. | Please write down the **time** your child had something to eat or drink, including **am** or **pm**. | **Name:** Describe the food or drink.<br>**Brand:** Name the brand.<br>**Cooking method:** If the food was cooked write down how it was cooked (roasted, steamed, fried).<br><br>If the food was **coated** in something or you added things like sauce or butter please record this.<br><br>If **a recipe** was used to make a dish please write "see recipe" and write out the recipe on the page labelled "Recipes". | **1) Weigh an empty plate or mug** using the scales provided.<br><br>2) Write down the weight. | 1) Place the first food or drink on the plate/ mug on the scales.<br><br>2) Write down the weight.<br><br>3) If you add several foods to the same plate you will need to write down the **weight of each food** as you add it. | 1) After your child has eaten their meal place the **same plate or mug with all the leftovers** on the scales and write down the total weight of the food or drink and the plate or mug. | 1) Estimate how much of each food was left over (for example, half the potato).<br>"Leftovers" are **everything** that your child didn't eat so please try and scrape everything your child didn't eat back on to the plate and weigh. | Office use |

## An example filled out by the parents of a 5 year old child

*Day 1* Date: *9 March 2015* Day of week: *Monday* Is your child unwell? (YES) / NO

**If unwell,** did this influence your child's appetite? (No)

Yes – decreased appetite Yes – increased appetite

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| *Home* | *7:30am* | *2 slices white bread toast slice, Tip Top, toasted*<br>*Butter, Mainland salted*<br>*Marmite, Sanitarium* | *115g* | *165g*<br>*170g*<br>*179g* | *127g* | | Office use |
| *At Café with Gran* | *10am* | *Fruit cake*<br>*Bobby banana*<br>*Water* | | *4 match boxes*<br>*medium*<br>*1 medium glass* | | | |
| *McDonald's* | *12pm* | *Cheeseburger*<br>*Medium fries (from supplementary page)*<br>*McDonald's lemonade* | | *1*<br>*45g*<br>*small* | | *1/8 leftover*<br>*1/3 leftover* | |
| *Home* | *3pm* | *Tasti milkies muffin bar - choc vanilla* | | *20g* | | | |
| *Home* | *6pm* | *Home-made mince (see recipe)*<br>*Potato, boiled*<br>*Butter*<br>*Peas, frozen, boiled*<br>*Just Juice, Orange and mango fruit juice* | *175g*<br><br><br><br>*42g* | *1/4 of recipe*<br>*414g*<br>*419g*<br>*459g*<br>*210g* | *215g*<br><br><br><br>*44g* | *(half the potato, no peas)* | |

Please write down if you have toast or sandwich slice bread.

If you are having fruit and don't have your scales you can write down whether it is a small, medium or large piece of fruit.

If you don't have your scales with you please estimate the amount.

See page 21 of this diary for takeaway foods size guide.

Please weigh the total amount of food left over + weight of plate or mug.

Then of the total amount that is left over please tell us how much there is of each food (for example, half the potato, no peas).

## Example

### Recipes – Day 1

Please write down:

1. Name of the recipe(s) (ie. the name you used in the diary)
2. Amount of each ingredient (for example, 3 medium carrots, 500g lean beef mince etc)
3. Any water added.
4. The proportion of the whole recipe that your child was served in the diary (for example, write "Home-made mince" in the **"name, brand and cooking method of food or drink"** column, and "one quarter (1/4)" in the **"weight of food or drink"** column ).

Name of recipe: *Home-made mince*

*300g standard beef mince (browned in 1 tablespoon olive oil)*
*50g onion, diced*
*60g carrot, diced*
*1 clove garlic, minced*
*60g beef stock (Campbell's)*
*30g tomato sauce (Watties)*
*60g diced potatoes*
*40g diced kumara*
*40g frozen mixed vegetables (Watties)*
*60g water*
*5g white flour*

Cooking method: *Mince was stewed in a small pot with lid on.*

*One quarter (1/4) of the recipe was served to my child at dinner.*

Please remember to record the amount served to your child in the "weight of food or drink" column in the diary (i.e. 1/4).

## Important things to remember

We are NOT looking for a "healthy" diet. We need to know what children actually eat.

- Always record food eaten at the time it is eaten.
- Please give us as much information as possible about the food.
- Estimate foods if you can't weigh them.
- Record all leftovers.

Remember all information that you give us is **strictly confidential.**

## How to estimate amounts of food when you can't weigh them

Please record an estimated amount in the "weight of food or drink" column.

- **HOUSEHOLD MEASURES** – Household measures like cups, tablespoons and teaspoons can be useful. Please tell us whether it was a heaped or level amount.
- **WEIGHTS MARKED ON PACKAGES** – Use the weight marked on canned or packet foods e.g., quarter of a 420g can of baked beans, one 60g pottle of yoghurt.
- **RULER** – Foods such as cheese, cakes and meat can be measured using a ruler, e.g., slice of luncheon sausage 8cm x 4cm x 1mm (remember to give length, width and depth!).
- **BREAD** – Tell us the number and the size of the slices e.g., sandwich, medium, or toast slice.
- **FRUIT** – Tell us whether the piece of fruit is small, medium or large.

## TAKEAWAY FOODS

The supplementary page provided has photographs of commonly eaten takeaway foods. Please write down the weight from the photograph that best describes the amount of food your child was served and write it in the "Weight of food or drink" column. Your child might not have exactly the amount in the photos so feel free to tell us if she had "two x 40g pizza".

**Day 1** Date: Day of week: Is your child unwell? YES / NO

**If unwell,** did this influence your child's appetite? No

Yes – decreased appetite Yes – increased appetite

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Day 1 continued

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Day 1 continued

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Supplement Use – Day 1

(a) Did your child take any supplements today? Include anything you consider to be a supplement to your child's diet (e.g., multi-vitamin, etc.).

No ☐ (please go to page 10)

Yes ☐

(b) **If yes,** please record the following:

Type of supplement (e.g., cod liver oil): _____

Brand name (e.g., Smith's): _____

Amount (number of mls, drops, tablets, capsules, etc.) taken (e.g., 5mls, 2 x 1000mg tablets): _____

(c) **If yes,** does the supplement contain iron or zinc? (check the label)

No ☐

Yes ☐

**If yes,** please record the type of iron (e.g., ferrous fumarate, ferrous sulphate and anything else with the words "iron", "ferric" or "ferrous") or "zinc" (e.g., zinc sulfate) and the amount of iron or zinc per tablet (e.g., 10mg, etc.):

Type of iron (e.g., ferrous sulphate): _____ Amount per dose (e.g., 7mg in 5ml): _____

Type of zinc (e.g., zinc sulfate): _____ Amount per dose (e.g., 7mg in 5ml): _____

**THE INTERVIEWER WILL HELP YOU FILL IN THIS PAGE IF YOU ARE NOT SURE - please keep the bottle or packet**

## Recipes – Day 1

Please write down:

1. Name of the recipe(s)
2. Amount of each ingredient (for example, 3 medium carrots, 500g lean beef mince, 1 onion, etc.)
3. Record the amount of water added.
4. The proportion of the whole recipe that your child was served in the diary (For example, write "Home-made mince" in the **"name, brand and cooking method of food or drink"** column, and "one quarter (1/4)" in the **"weight of food or drink"** column).

**Day 2** Date: Day of week: Is your child unwell? YES / NO

**If unwell,** did this influence your child's appetite? No

Yes – decreased appetite Yes – increased appetite

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Day 2 continued

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Day 2 continued

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Supplement Use – Day 2

(a) Did your child take any supplements today? Include anything you consider to be a supplement to your child's diet (e.g., multi-vitamin, etc.).

No ☐ (please go to page 15)

Yes ☐

(b) **If yes,** please record the following:

Type of supplement (e.g., cod liver oil): _____

Brand name (e.g., Smith's): _____

Amount (number of mls, drops, tablets, capsules, etc.) taken (e.g., 5mls, 2 x 1000mg tablets): _____

(c) **If yes,** does the supplement contain iron or zinc? (check the label)

No ☐

Yes ☐

**If yes,** please record the type of iron (e.g., ferrous fumarate, ferrous sulphate and anything else with the words "iron", "ferric" or "ferrous") or "zinc" (e.g., zinc sulfate) and the amount of iron or zinc per tablet (e.g., 10mg, etc.):

Type of iron (e.g., ferrous sulphate): _____ Amount per dose (e.g., 7mg in 5ml): _____

Type of zinc (e.g., zinc sulfate): _____ Amount per dose (e.g., 7mg in 5ml): _____

**THE INTERVIEWER WILL HELP YOU FILL IN THIS PAGE IF YOU ARE NOT SURE - please keep the bottle or packet**

## Recipes – Day 2

Please write down:

1. Name of the recipe(s)
2. Amount of each ingredient (for example, 3 medium carrots, 500g lean beef mince, 1 onion, etc.)
3. Record the amount of water added.
4. The proportion of the whole recipe that your child was served in the diary (For example, write "Home-made mince" in the **"name, brand and cooking method of food or drink"** column, and "one quarter (1/4)" in the **"weight of food or drink"** column).

**Day 3** Date: Day of week: Is your child unwell? YES / NO

**If unwell,** did this influence your child's appetite? No

Yes – decreased appetite Yes – increased appetite

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Day 3 continued

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Day 3 continued

| Where | Time of day | Name, brand and cooking method of food or drink | Weight of plate or mug | Weight of food or drink + plate or mug | Weight of leftover + plate or mug | Description of leftovers | Amount eaten |
|---|---|---|---|---|---|---|---|
| | | | | | | | Office use |

## Supplement Use – Day 3

(a) Did your child take any supplements today? Include anything you consider to be a supplement to your child's diet (e.g., multi-vitamin, etc.).

No ☐ (please go to page 20)

Yes ☐

(b) **If yes,** please record the following:

Type of supplement (e.g., cod liver oil): _____

Brand name (e.g., Smith's): _____

Amount (number of mls, drops, tablets, capsules, etc.) taken (e.g., 5mls, 2 x 1000mg tablets): _____

(c) **If yes,** does the supplement contain iron or zinc? (check the label)

No ☐

Yes ☐

**If yes,** please record the type of iron (e.g., ferrous fumarate, ferrous sulphate and anything else with the words "iron", "ferric" or "ferrous") or "zinc" (e.g., zinc sulfate) and the amount of iron or zinc per tablet (e.g., 10mg, etc.):

Type of iron (e.g., ferrous sulphate): _____ Amount per dose (e.g., 7mg in 5ml): _____

Type of zinc (e.g., zinc sulfate): _____ Amount per dose (e.g., 7mg in 5ml): _____

**THE INTERVIEWER WILL HELP YOU FILL IN THIS PAGE IF YOU ARE NOT SURE - please keep the bottle or packet**

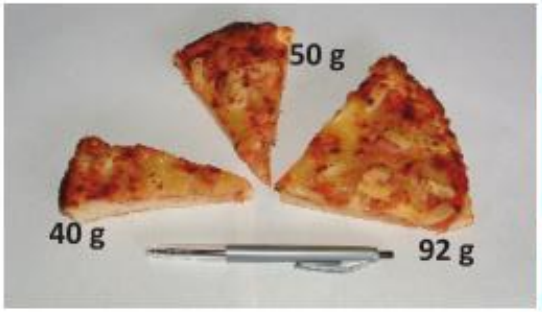
## Recipes – Day 3

Please write down:

1. Name of the recipe(s)
2. Amount of each ingredient (for example, 3 medium carrots, 500g lean beef mince, 1 onion, etc.)
3. Record the amount of water added.
4. The proportion of the whole recipe that your child was served in the diary (For example, write "Home-made mince" in the **"name, brand and cooking method of food or drink"** column, and "one quarter (1/4)" in the **"weight of food or drink"** column).

## Supplementary Pages – Takeaway Foods Estimation Guide

Hawaiian Pizza




Fries

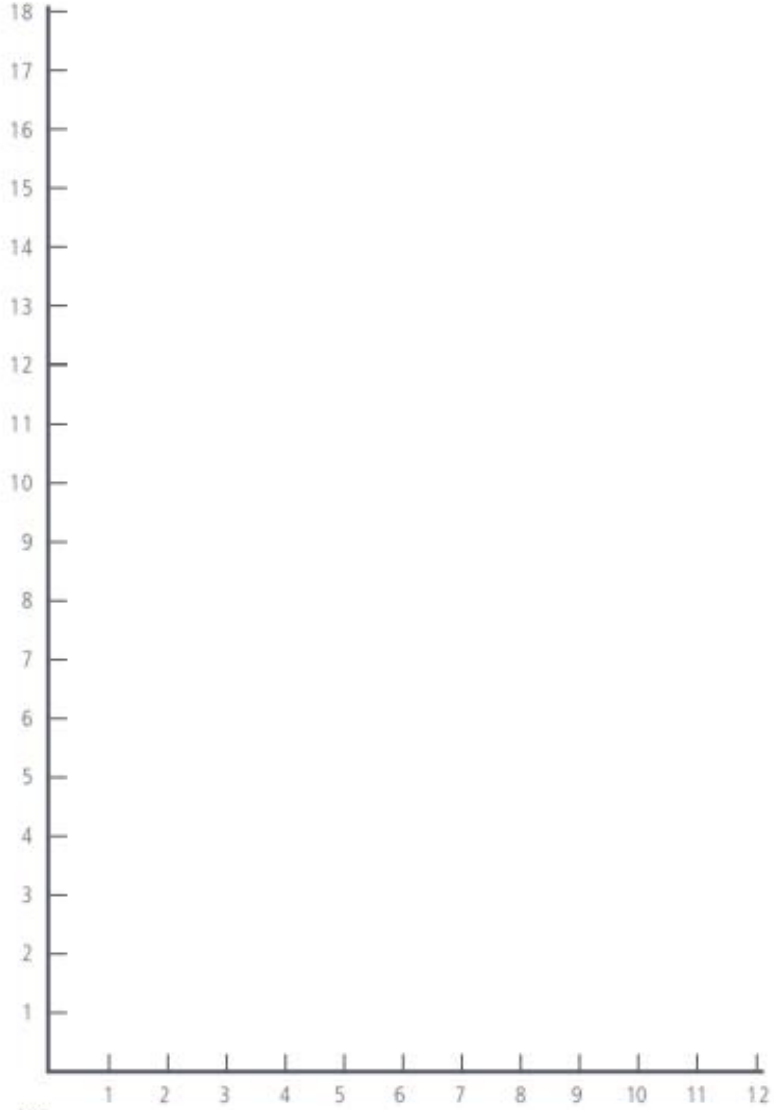


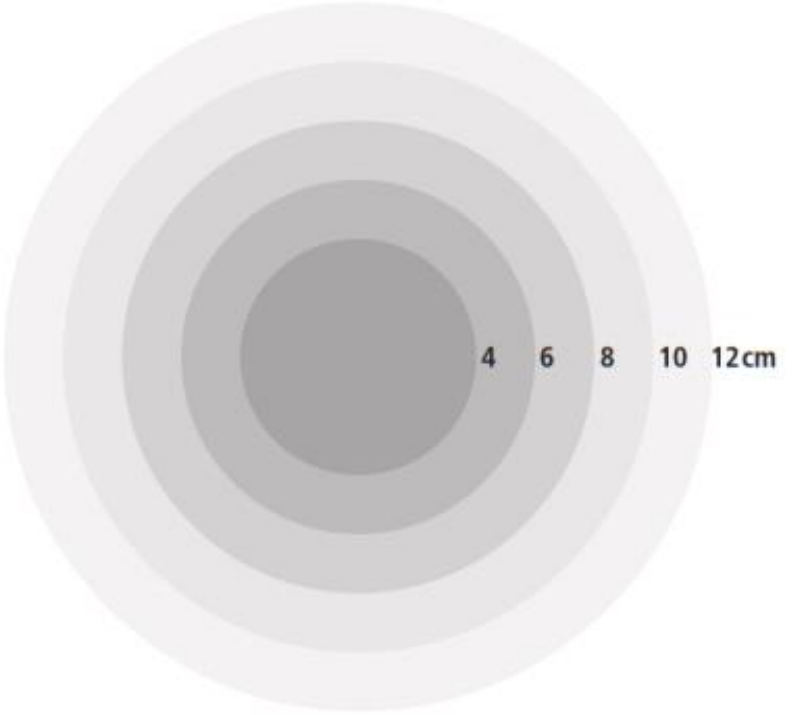

Battered Fish




Chips






Adapted from Adult Nutrition Survey 08/09

# Thank you!

Remember if you have any questions please contact us.
You can email or call us and we'll get back to you.

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

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# Appendix P

# Reminder protocol

# P4. Reminder Protocol

**Objectives:**

1. Confirmation phone call prior to first visit
2. Check-up phone call to be made at end of first day of diet record to check how it went and to answer any questions
3. Text reminders/email to be sent the morning before each day of the three assigned diet record days
4. Phone call to be made before third diet record day

## 1. Text confirmation first visit

Text every participant the day before the first visit

- Confirm time
- Confirm address

## 2. Phone call at the end of day one of the diet record

Phone every participant the evening of their first day of recording the diet record

**Equipment**

- Participant file sheet
- Check participant and child's name
- Check preference for email or text reminder

**Phone call**

Hi, this is Renee Yu calling from the EAT5 study at the University of Otago.

I am calling to ask how things went today recording [child's name] food and drinks today. Did you have any problems today? Is there anything I can help you with?

Just to check that your recording everything correctly, could you please read out to me what you recorded for [child's name] lunch?

- Provide feedback if required on detail of food recorded
- Thank them for completing day
- Remind next day is [x] and I'll send you a text the day before

## 3. Text reminder before day two and three of diet record

Text every participant in the morning the day before the 2nd day of the diet record

**Steps- before**

Every morning check diary for text reminders. Send out before midday and cross off in dairy

**Text**

Hi [name], tomorrow is your 2nd day of the diet record. Please record all foods and drinks [child's name] eats tomorrow. Thank you very much, Renee from EAT5

## 4. Phone call day before day three of diet record

**Phone call**

Hi, this is Renee Yu calling from the EAT5 study.

- Ask how collection of the diet record days went
- Remind of day three tomorrow
- Ask when they are free to come in to do the second FFQ and collect scales and diet record OR confirm if appointment already organised

**Steps- After**

Filing-participant file

Write in diary date/time for second appointment if not already there, highlight once confirmed

# Appendix Q

# Second visit protocol

## P5. Second Visit Protocol

**Objectives:**

1. To Administer FFQ to participant for second time
2. To collect food record and scales from participant
3. To check answers in food record

## Steps – Before

**Equipment required:**

- Pens
- FFQ
- Participant file
- Diary

Ensure you are familiar and comfortable with this protocol and how to complete FFQ

## Steps – During

1. **Introductions**
   - Introduce yourself
   - Thank participant for taking time to come in and meet today
   - Briefly explain what will happen today:
     - Firstly I will fill out questionnaire again by asking you questions about what foods and how much of them you think your child has eaten over the past month
     - After this is completed, I'll go through the diet record with you to ensure everything is OK and collect the scales from you

2. **Administering Food Frequency Questionnaire**
   - Explain that I will ask the questions and fill it in
   - Explain that there are no right or wrong answers
   - Complete the FFQ according to the instructions preceding the FFQ

3. **Check Diet record**
   - Ask to see food diary and scales. Check to see all columns have been filled in correctly. Ask if anything is missing or difficult to understand ask for clarification

4. **Wrap up**
   Thank parent for their time today- their participation is extremely helpful to this valuable research and is very much appreciated.

   Explain individual results can be posted or emailed to them.

## Steps – After

Filling- FFQ, diet record, participant file