EAT5 Drinks - An investigation into the drink intake of five-year old children living in New Zealand.

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Abstract

Background: Children’s drink intake has been assessed in a number of international studies, and frequency of consumption of drinks has been assessed in several New Zealand surveys, the most recent being the 2002 Child Nutrition Survey and 2007 New Zealand Children’s Food and Drinks Survey. However the volume of children’s drink intake has not been reported in New Zealand in national surveys. The quantity of drinks consumed is important, as drinks are an integral part of a child’s diet, providing hydration, nutrients and energy.

Objective: The purpose of this study was to determine the types and amounts of drinks being consumed by 65 five-year old New Zealand children, their contribution to energy and nutrient intake, and the extent to which they meet New Zealand Ministry of Health recommendations.

Design: Data was used from two previous EAT5 component studies, in addition to data that the candidate has collected (total n=65). A total of 65 children aged 5 years old attended two clinic visits one month apart with their parent. During the first appointment anthropometric measurements were taken, an FFQ administered and a three-day weighed diet record was handed out with instructions. At the second appointment the same FFQ was administered and the weighed diet record was collected. Data from the weighed diet records were analysed using Kai-culator (dietary software) to calculate energy, nutrients and the contribution of drinks in the diet.

Results: Only two children (3%) in the study met the World Health Organization and Ministry of Health recommendation of 1200mL from drinks per day for five-year olds. No child in the EAT5 study consumed the New Zealand Ministry of Health recommended maximum of 500mL of milk per day. Overall drinks contributed a small amount of daily energy intake (6%), but a substantial percentage of daily nutrient intake,
in particular calcium (21%). There was a relatively high percentage of five-year olds consuming drinks that are not recommended (63%), the majority being flavoured milk. However, these drinks were only consumed in relatively low amounts, or not consumed daily, and thus contributed relatively little to overall energy intake.

**Conclusion:** In conclusion, this study has shown that drinks are an integral component of a five-year olds diet, providing a small proportion of daily energy intake, but a substantial proportion of daily calcium intake. Public awareness of the negative nutritional implications of flavoured milk is needed, and these drinks should be included as a drink to limit in the Ministry of Health public resource ‘Eating for Healthy Children Aged 2 to 12 years’ as flavoured milks were consumed by a high proportion of children but are currently not included in this resource. Daily fluid intake from drinks was low, so future investigation into the hydration status of New Zealand children may be warranted.
Preface

The EAT5 study design, concept and ethics were developed by supervisors Dr. Anne-Louise Heath and Associate Professor Rachael Taylor. The supervisors applied for ethical approval and oversaw and guided all aspects of this study. Liz Fleming advised and oversaw the use of the food software programme ‘Kai-culator’ used in this study. Jill Hazard provided direction, and carried out some of the statistical analyses. The candidate, under supervision, was responsible for the following:

- Adaptation of recruitment fliers and poster.
- Advertising and recruitment of participants for the study, primarily through local primary schools; secretary or principal.
- Emailing study information to participants who have made contact to be included in the study.
- Arranging first and second appointments at participants’ own homes, reminder text messages and follow up text messages.
- Conducting first visit: distribution of the demographic questionnaire and obtaining signed consent forms, administering the first of two FFQs, taking anthropometric measurements and teaching the participant how to record the WDR.
- Follow-up phone call approximately 3-4 weeks after first meeting to arrange the second meeting.
- Conducting second visit: administering the second of the two FFQs, clarifying any uncertainties in the WDR and distribution of petrol vouchers to participants.
- Entering participant demographic data into an Excel spreadsheet alongside previous EAT5 demographic records.
• Entering all new WDR data (n= 24 three-day WDRs) into Kai-culator.

• Modification of prior students’ diet records in Kai-culator to include all recorded water.

• Modification of both prior students’ and the candidate’s diet records in Kai-culator to include the supplementary column to label each liquid item consumed as ‘Drink’ or ‘Not drink’.

• Carrying out statistical analyses on drinks under the guidance and supervision of Dr. Jill Hazard.

• Mailing individual nutrient analyses and an explanatory letter to participants.
Acknowledgements

There are many people involved in this project that I would like to express gratitude towards. Firstly, my supervisors, Dr. Anne-Louise Heath and Associate Professor Rachael Taylor, thank you for the incredible support system you have both been. Your critical eye for detail and in-depth feedback has been more than appreciated. You have both sparked my interest in research and taught me so much in such a short space of time.

Liz Fleming, for being an absolute hero with Kai-culator, spending over an hour on the phone teaching me the correct way to enter recipes - thank you!

Jill Hazard, your expertise and help with the biostatistics were beyond anything I could have managed by myself.

Renee Yu and Li Kee Chee for providing participant data collected by yourselves along with additional information to guide me in the continuation of EAT5.

To my participants, thank you for being a great group of people, I enjoyed meeting and chatting to every single one of you. The time and effort you took out of your schedule to contribute was inspiring and selfless.

To my family, thank you for your support throughout my entire University career and giving me the push that I often needed to pick myself back up and soldier on.
Last but not least, to my friends, flat mates, social netball team, Daisy and Camille, I thank you for being a fun escape and always making me laugh. Thank you for listening to me stress, drinking coffee, eating cake with me, thank you for your words of encouragement when I needed to hear them.
# Table of Contents

Abstract ........................................................................................................................................ iii
Preface ........................................................................................................................................... v
Acknowledgements ...................................................................................................................... vii
List of Tables ................................................................................................................................. xi
List of Figures ............................................................................................................................... xii
List of Abbreviations .................................................................................................................. xiii

1. Introduction ................................................................................................................................. 1

2. Literature Review ...................................................................................................................... 3
   2.1 Literature Review Methods ................................................................................................. 3
   2.2 Recommendations regarding drinks for school age children ........................................ 4
   2.3 Health Benefits ................................................................................................................... 5
       2.3.1 Water .......................................................................................................................... 5
       2.3.2 Milk ............................................................................................................................ 6
       2.3.3 100% Fruit and Vegetable Juice ............................................................................... 7
       2.3.5 Diet drinks ................................................................................................................ 8
   2.4 Health Risks ......................................................................................................................... 8
       2.4.1 Water .......................................................................................................................... 8
       2.4.2 Whole-fat milk ........................................................................................................... 9
       2.4.3 Sugar sweetened beverages ..................................................................................... 9
       2.4.4 Fruit Drinks ............................................................................................................... 11
       2.4.5 Diet drinks ................................................................................................................ 11
       2.4.6 Caffeine ..................................................................................................................... 11
   2.5 Challenges ............................................................................................................................ 12
   2.6 Drink intakes of school children ....................................................................................... 13
       2.6.1 Total fluid intake from drinks .................................................................................. 13
       2.6.2 Energy contribution from beverages ....................................................................... 14
       2.6.3 Drink types ............................................................................................................... 15
   2.7 Conclusion ............................................................................................................................ 17

3. Objective Statement .................................................................................................................. 18

4. Subjects and Methods .............................................................................................................. 19
4.1 Study Design ................................................................. 19
4.2 Recruitment and participants............................................. 19
4.3 Data collection .................................................................. 21
  4.3.1 Demographic ............................................................... 21
  4.3.2 Food Frequency Questionnaire ..................................... 21
  4.3.3 Anthropometry ............................................................. 22
  4.3.4 Weighed diet records .................................................... 22
4.4 Data entry ................................................................. 24
4.5 Statistical analysis .......................................................... 25
4.6 Classification according to Ministry of Health recommendations ......... 25
  4.6.1 Classification of ‘Recommended’ and ‘Not Recommended’ Drinks .......... 26
5. Results ........................................................................ 29
  5.1 Sample characteristics .................................................... 29
  5.2 Average daily intake of drinks ......................................... 33
    5.2.1 Drink intake in comparison to government recommendations ............... 36
  5.3 Contribution of drinks to energy and nutrient intake .................. 39
6. Discussion ..................................................................... 42
7. Application to Practice .................................................... 50
8. References .................................................................... 52
9. Appendices ................................................................. 57
List of Tables

Table 2.1 Search terms used to identify relevant studies for the Literature Review.3
Table 5.1 Participant demographic characteristics (n=65)........................................... 31
Table 5.2: Total energy and nutrient intakes calculated from three-day weighed
diet records...................................................................................................................... 32
Table 5.3: Average daily amount and type of drink intakes calculated from three-
day weighed diet records. ......................................................................................... 35
Table 5.4 Comparison of energy and nutrient contribution from food and drink to
the overall diet.............................................................................................................. 41
List of Figures

Figure 5.1: Data pool for EAT5 Drinks study................................................................. 29

Figure 5.2: Percentage contribution of drink types to total drink intake. ................. 36

Figure 5.3: Percentage contributions of different milks types to overall daily milk intake............................................................................................................................................................................. 37

Figure 5.4: Combinations of ’Not Recommended’ drinks consumed during the three-day weighed diet record................................................................................................................................. 38
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AI</td>
<td>Adequate Intake</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>CNS</td>
<td>Children’s Nutrition Survey</td>
</tr>
<tr>
<td>EAR</td>
<td>Estimated Average Requirement</td>
</tr>
<tr>
<td>EFSA</td>
<td>European Food Safety Authority</td>
</tr>
<tr>
<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NHANES</td>
<td>National Health and Nutrition Examination Survey</td>
</tr>
<tr>
<td>NZEO</td>
<td>New Zealand European and Other</td>
</tr>
<tr>
<td>SSB</td>
<td>Sugar Sweetened Beverages</td>
</tr>
<tr>
<td>TDI</td>
<td>Total Drink Intake</td>
</tr>
<tr>
<td>WDR</td>
<td>Weighed Diet Record</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
1. Introduction

Drinks are an integral part of a child’s diet providing hydration, nutrients, protein and energy. As part of a healthy diet children should consume many small drinks throughout the day, alongside meals and in-between. The Ministry of Health (MOH) recommends water and milk, preferably low fat, as ‘every-day’ drinks. Children aged 4-8 years of age should be consuming 1.2L of fluid per day from drinks, the majority as water. Five-year olds should not exceed 500mL of milk per day to avoid displacing solids. Fruit juice, if consumed, should be diluted to a 50:50 ratio, drunk at meal times, and to a daily maximum of one cup (diluted). Flavoured milk should be limited and should not be the main contributor of milk. Sugar-sweetened drinks and diet drinks are ‘occasional’ drinks and, if consumed, should not exceed one cup (250mL) per week. Five-year old children should not consume tea, coffee or guarana containing drinks (New Zealand Ministry of Health, 2012).

Water is an essential nutrient for numerous metabolic and physiological functions (Popkin, D'Anci, & Rosenberg, 2010). Inadequate water intake can lead to dehydration (Cian, Barraud, Melin, & Raphel, 2001a), which can impair children’s cognitive performance (Edmonds & Burford, 2009; Edmonds & Jeffes, 2009). International literature has reported inadequate intakes of water in children (Ozen, Bibiloni Mdel, Pons, & Tur, 2015). Milk is the key contributing food source to calcium in the diets of New Zealand children (Parnell, Scragg, Wilson, Schaff, & Fitzgerald, 2003). Maintaining adequate calcium intake during childhood and adolescence is important in reducing the risk of fractures and osteoporosis when older (Greer & Krebs, 2006).
There are two main health risks associated with sugar-sweetened beverages (SSB). First, there is a positive correlation between SSB and dental caries frequency (Australian Government & National Health and Medical Research Council, 2013; Lee & Brerley-Messer, 2011; Popkin et al., 2010). Second, they provide extra calories which in turn can lead to weight gain (Te Morenga, Mallard, & Mann, 2013). There is a recognized international trend of milk intake decreasing, while SSB intake increases with age (Ozen et al., 2015; Popkin et al., 2006). This is a concern as nutrient-rich drinks are being replaced with caloric, nutrient-poor drinks.

The 2002 Children’s Nutrition Survey (CNS) and the 2007 Food and Drink Survey (FDS) are the most recent nationally representative assessments of New Zealand children’s diets. The CNS found that powdered fruit drinks and food drinks such as Milo were the most commonly consumed SSBs by 5-6 year olds (Parnell et al., 2003) whereas, the 2007 FDS found that fruit juice and fruit drinks were the most commonly consumed SSBs (National Research Bureau Ltd, 2008). Beverages and milk each contributed 6% to overall energy intake (Parnell et al., 2003). The USA have reported up to 21% of daily energy intake coming from drinks (Coppinger, Jeanes, Mitchell, & Reeves, 2013), whereas the UK has reported less than 10% (Whitton et al., 2011).

Drinks can have both positive and negative effects on a child’s health, depending on drink type, and amount consumed. If a connection between a drink type and health outcomes is identified the most effective time for dietary interventions is in childhood (World Health Organization, 2012). The purpose of this study is to determine the types and amounts of drinks being consumed by 65 five-year old New Zealand children, their contribution to energy and nutrient intake, and the extent to which these intakes meet New Zealand Ministry of Health recommendations.
2. Literature Review

2.1 Literature Review Methods

A search strategy was developed to identify studies that discussed the relationship between drink intake and school aged children as outlined in Table 2.1 using the electronic databases WEB OF SCIENCE and SCOPUS. Furthermore, reference lists of original and review articles were reviewed to search for more studies. Google was also used for government publications relating to recommendations for drinks. Food and Nutrition Guidelines were obtained from government sites for the countries of New Zealand, Australia, United States of America and Canada. Only those that were published as full-length articles and in English were considered.

Table 2.1 Search terms used to identify relevant studies for the Literature Review.

<table>
<thead>
<tr>
<th>The following terms were used in search engines:</th>
<th>The following combinations of terms were used for recommendations(^1):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Drinks</td>
<td>1) (1) AND (2) AND (3) AND (4)</td>
</tr>
<tr>
<td>2) School</td>
<td></td>
</tr>
<tr>
<td>3) Children</td>
<td></td>
</tr>
<tr>
<td>4) Recommendations</td>
<td>2) (1) AND (2) AND (3) AND (5)</td>
</tr>
<tr>
<td>5) Intake</td>
<td></td>
</tr>
<tr>
<td>6) Milk</td>
<td></td>
</tr>
<tr>
<td>7) Bone health</td>
<td></td>
</tr>
<tr>
<td>8) Calcium</td>
<td>3) (3) AND (6) AND (7)</td>
</tr>
<tr>
<td>9) Water</td>
<td>4) (3) AND (6) AND (8)</td>
</tr>
<tr>
<td>10) Fluoride</td>
<td>5) (3) AND (9) AND (13)</td>
</tr>
<tr>
<td>11) Dental caries</td>
<td>6) (3) AND (9) AND (10) AND (11)</td>
</tr>
<tr>
<td>12) Soft drinks</td>
<td></td>
</tr>
<tr>
<td>13) Cognition</td>
<td>7) (3) AND (16) AND (17)</td>
</tr>
<tr>
<td>14) Caffeine</td>
<td></td>
</tr>
<tr>
<td>15) Alcohol</td>
<td></td>
</tr>
<tr>
<td>16) Fruit Juice</td>
<td></td>
</tr>
<tr>
<td>17) Benefits</td>
<td>8) (3) AND (6) AND (18)</td>
</tr>
<tr>
<td>18) Risks</td>
<td>9) (3) AND (12) AND (18)</td>
</tr>
<tr>
<td>19) New Zealand</td>
<td>10) (3) AND (12) AND (11)</td>
</tr>
<tr>
<td></td>
<td>11) (3) AND (14) AND (18)</td>
</tr>
<tr>
<td></td>
<td>12) (3) AND (15) AND (18)</td>
</tr>
<tr>
<td></td>
<td>13) (3) AND (16) AND (18)</td>
</tr>
</tbody>
</table>

\(^1\) All searches were completed with and without the search term (19)
## 2.2 Recommendations regarding drinks for school age children

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Water</th>
<th>Milk</th>
<th>Fruit Juice</th>
<th>Sugar-sweetened beverages</th>
<th>Artificially sweetened beverages</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>Majority of total fluid. AI for 4-8 years is 1.2L/day (drinks).</td>
<td>Low fat &gt;2 years As a snack between meals</td>
<td>Not recommended Limit to 1 glass/day Limit 125mL/day 50:50 dilution Consume with meals</td>
<td>Less than once/week Maximum 250mL Consume with meals</td>
<td>Not recommended Less than once/week</td>
<td>Caffeine drinks, sports drinks and alcohol not recommended</td>
</tr>
<tr>
<td>Australia</td>
<td>Recommended majority of intake AI for 4-8 years is 1.2L/day (drinks)</td>
<td>Low fat &gt;2 years.</td>
<td>-</td>
<td>Limit to one serve/day (600kcal)</td>
<td>-</td>
<td>Limit caffeine containing drinks</td>
</tr>
<tr>
<td>U.S.A</td>
<td>Drink between meals AI – 1.2L/day from drinks</td>
<td>Two cups of fat-free milk/day Drink with every meal</td>
<td>100% fruit juice as a snack or treat. Limit to 250mL/day Monitor in obese/overweight children</td>
<td>Maximum for 1-6 year olds: 180mL/day Maximum for 7-18 year olds: 350mL/day</td>
<td>-</td>
<td>Limit caffeine containing drinks and sports drinks</td>
</tr>
<tr>
<td>Canada</td>
<td>Water is beverage of choice</td>
<td>Two cups/day recommended Either 1% or 2% milk.</td>
<td>100% fruit juice is recommended</td>
<td>Limit intake</td>
<td>-</td>
<td>Under 12 years old: no more than 2.5mg per kg bodyweight</td>
</tr>
</tbody>
</table>
2.3 Health Benefits

Internationally, water and low-fat milk are the only drinks recommended to be consumed daily by five-year olds. Water provides essential hydration and contains fluoride (in fluoridated or naturally fluoride containing areas), which has a positive impact on oral health (New Zealand Ministry of Health, 2015; Popkin et al., 2010). Low fat milk is an important source of calcium, protein, and other essential nutrients while containing less energy than full fat milk (Popkin et al., 2006; Weinberg, Berner, & Groves, 2004). Fruit juice can be an important source of vitamins and minerals but should be limited and diluted when drunk by five year olds due to its high sugar and energy content (New Zealand Ministry of Health, 2012). Diet drinks provide less energy than sugar-sweetened beverages which can aid in weight loss, but should be avoided by five year olds due to the acidity of the drink causing tooth erosion, and the possibility it may increase the preference for sweet drinks (New Zealand Ministry of Health, 2012; Raben, Vasilaras, Moller, & Astrup, 2002).

2.3.1 Water

Water, as a drink, is essential for numerous metabolic and physiological functions such as cell integrity, maintaining the viscosity of blood, elimination of byproducts of metabolism, digestion, and as a transporter of nutrients and oxygen (Popkin et al., 2006). Inadequate water intake can cause the water content of the body to be too low which in turn leads to dehydration (Popkin et al., 2006). As little as a 2% loss of body water can have detrimental effects such as decreased cognitive function, moodiness, reduced alertness, decreased performance and short-term memory loss (Cian, Barraud, Melin, & Raphel, 2001b; Ritz & Berrut, 2005). Two intervention studies investigating cognitive performance in school
children aged 6-7 years found that children who received water ad libitum had improvements in visual attention tests and spot the difference memory tests compared to baseline and in comparison with students who did not receive water (Edmonds & Burford, 2009; Edmonds & Jeffes, 2009). Test groups for these studies were relatively small (n=23 and n=58). A larger intervention trial (n=168) found a significant negative correlation between dehydration, defined as urine osmolarity greater than 800 mOsm/kg H2O, and auditory number span but, unexpectedly, a positive relationship between dehydration and verbal analogy (Fadda et al., 2012) An observational study collected 3-day diet records to obtain total water intake, and found a significant correlation with reaction times for those children above the median intake (Khan et al., 2015). In New Zealand, most water sources became fortified with fluoride in the mid 1970s (Cressey, Gaw, & Love, 2010). Fluoride is a mineral that helps prevent tooth decay by making the tooth more resistant to acidic attacks from plaque bacteria and sugars in the mouth (New Zealand Ministry of Health, 2015). Among children, the proportion of 12-13-year-olds who were dental caries-free almost doubled between 1988 (29%) and 2009 (51%) (New Zealand Ministry of Health, 2010). A Public Health Commission review reported that 13 out of 15 New Zealand studies showed significant benefit from fluoridation (New Zealand Ministry of Health, 2010). Water is calorie-free, sugar-free and, in terms of cost, free. Water is recommended as the main fluid source in a child’s diet.

2.3.2 Milk

Milk is a key food source of vitamin D, calcium, and other essential nutrients (Popkin et al., 2006). Data from the National Health and Nutrition Examination Survey (NHANES) and
Continuing Survey of Food Intakes by Individuals (CSFII) indicate that as the consumption of milk products increases, so does the intake of calcium, magnesium, potassium, zinc, iron, vitamin A, riboflavin, and folate (Weinberg et al., 2004). Maintaining adequate calcium intake during childhood and adolescence is necessary for the development of peak bone mass which is important in reducing the risk of fractures and osteoporosis later in life (Greer & Krebs, 2006). In growing children, long-term avoidance of cow milk is associated with small stature and poor bone health (Black, Williams, Jones, & Goulding, 2002). Pre-pubertal fractures have also been associated with low milk intake (Goulding et al., 2004). Fracture histories of 50 children (3-13 years) who had avoided drinking cows milk for prolonged periods were compared with those in a birth cohort of over 1,000 children with significantly more fractures occurring in the milk avoidance group (Goulding et al., 2004).

2.3.3 100% Fruit and Vegetable Juice

It is considered more satiating and nutritious to consume fruit intact rather than as juice, although the nutritional value of whole fruit and vegetables, except fibre, may be retained with appropriate methods of juicing and storing (Clemens, Drewnowski, Ferruzzi, Toner, & Welland, 2015). Internationally there is a need to increase fruit and vegetable intake with many countries, New Zealand included, not meeting fruit and vegetable intake guidelines (Lynch et al., 2014; Yu, 2015). However the health benefits of 100% fruit and vegetable juice, such as reduced obesity and improved cardiovascular health are controversial with studies providing differing conclusions (Clemens et al., 2015; Popkin et al., 2006). What juices do seem to improve, if consumed in moderate amounts, are vitamin and mineral intakes without a significant increase in calories (Clemens et al., 2015).
2.3.5 Diet drinks

Diet drinks or non-calorically sweetened beverages are not recommended for children due to their acidity, and the risk of conditioning a child’s preference for sweetness, but it is argued that these drinks are an appropriate substitution for calorically sweetened beverage (New Zealand Ministry of Health, 2012). These beverages generally supply very little in terms of nutritional value but studies have shown that these drinks, when ingested in similar amounts to calorically sweetened beverages, can cause weight loss in overweight individuals (Raben et al., 2002).

2.4 Health Risks

The dominant health risk associated with non-recommended drinks is the tendency to consume higher amounts of energy, which in turn can lead to weight gain. Non-recommended drinks such as whole-fat milk, calorically sweetened beverages and fruit drinks have all been linked to increased weight gain (Gibson, 2008; Lee & Brearley-Messer, 2011; Te Morenga et al., 2013). Non-calorically sweetened beverages do not provide excess kilojoules but may contribute to an increased preference for sweet drinks (New Zealand Ministry of Health, 2012).

2.4.1 Water

In excess, water can cause detrimental effects in the body, but this is a rare occurrence in healthy individuals with functioning kidneys (Ellis, 1995). Overhydration can lead to dangerous low sodium concentrations and, if untreated, can result in unconsciousness or coma (Ellis, 1995).
2.4.2 Whole-fat milk

Although providing the same minerals and nutrients as skim milk, whole fat milk can contribute excess saturated fat to an individual's diet (Popkin et al., 2006). Excess saturated fat has been attributed in many studies to weight gain (Field, Willett, Lissner, & Colditz, 2007). Milk-type preference is often decided in childhood and continued into adulthood (New Zealand Ministry of Health, 2012). Even at a young age, a diet high in saturated fats may predispose children and adolescents to the development of cardiovascular disease later in life (Australian Government & National Health and Medical Research Council, 2013).

2.4.3 Sugar sweetened beverages

Sugar-sweetened beverages are receiving a lot of attention in the media currently regarding their potential role in the obesity epidemic. A systematic review and meta-analysis comparing the relationship between dietary sugars and body weight found that increased sugar intake was associated with a significant increase in body weight (Te Morenga et al., 2013). When looking specifically at sugar-sweetened beverages, the odds ratio for being overweight or obese after one-year follow-up was 1.55 among groups with the highest intake compared to the lowest (Te Morenga et al., 2013).

There seem to be differing findings in the literature but the influence on obesity only seems to be apparent at high doses. A study of 1944 children aged 4-12 years in Victoria, Australia found that those regularly drinking sweet drinks, and those who had drunk more than two serves of juice, cordial or soft drink on the day prior to the survey day, were twice as likely to be overweight or obese (Lee & Brearley-Messer, 2011). In a systematic review by Gibson (2008), 22 out of 44 studies found a significant association between sugar-
sweetened drinks and BMI, weight, adiposity or weight gain in at least one subgroup (Gibson, 2008). These studies seem to be over dominated by American populations where consumption of these beverages is higher. Most studies individually suggest that the intake of sugar-sweetened beverages has only a small effect on weight gain, except in higher quantities or susceptible individuals (Gibson, 2008). Inconsistencies in design, definition, statistical treatment and interpretation make it difficult to conclude that SSB beverages are causative of weight gain or whether other diets and lifestyle factors are responsible (Field et al., 2007; Gibson, 2008). The most reliable evidence comes from long-term intervention trials (Concato, Shah, & Horwitz, 2000). Three long-term interventions (>6 months) investigated replacing sugar-sweetened beverages with diet versions. One study reported a decrease in obesity prevalence but no change in mean BMI (Gibson, 2008). The other two studies found a significant BMI reductions (0.2kg/m² and 0.14kg/m² respectively) but only among children already overweight at baseline (Gibson, 2008).

Studies internationally link sugar-sweetened beverages with dental caries frequency in children (Australian Government & National Health and Medical Research Council, 2013; Lee & Brearley-Messer, 2011; Popkin et al., 2006; Smith, Jenkin, Signal, & McLean, 2014). The World Health Organization (WHO) recommends limiting total sugar intake to less than <10% of daily energy intake to help prevent dental caries. Sugar-sweetened beverages have also been recently associated with asthma prevalence in US children aged 2-9 years old (DeChristopher, Uribarri, & Tucker, 2015). Children consuming apple juice, fruit drinks or soda 5 or more times a week were five times more likely to develop asthma than children consuming these beverages less than once a month (DeChristopher et al., 2015).
2.4.4 Fruit Drinks
Similar to sugar-sweetened beverages, there is no specific need to consume fruit drinks. Fruit drinks are defined as: a blend of fruit juice (s) with other ingredients such as sucrose, concentrate or water. These drinks need only to contain 5% fruit juice or pulp. As shown above, fruit drinks can contribute to weight gain in similar ways to soft drinks and cordial (Gibson, 2008; Lee & Brearley-Messer, 2011) and have been associated with increased asthma prevalence (DeChristopher et al., 2015).

2.4.5 Diet drinks
Although a lower energy choice than sugar sweetened beverages, research suggests that high consumption of these beverages may lead to an increased preference for sweetness and can still cause tooth erosion (New Zealand Ministry of Health, 2012).

2.4.6 Caffeine
Coffee, black teas, and herbal teas are not recommended for children five years of age. Children are often advised to avoid caffeine-containing beverages. Paediatric research on caffeine intake is limited but there are concerns that high consumption disturbs sleep patterns and can cause detrimental effects on the developing nervous system (Nawrot et al., 2003). A study of 3-6 year olds found that caffeine consumers had an average reduction of 42 minutes of sleep time per day (Owens, Mindell, & Baylor, 2014).
2.5 Challenges

There are a number of challenges when collecting data on drink intake in children. Diet records and questionnaires are most commonly used to collect drink consumption data, but these often have large error (Gandy, 2015). First, when recording food intake participant bias and non-respondent bias contribute to diet record error. Under reporting of perceived ‘bad’ items and over-reporting of ‘good’ items in diet records is common. (McDiarmid & Blundell, 1998) In studies of drinks this would be likely to result in over-reporting of water and milk and underreporting of sugar sweetened beverages and alcohol. Diet records also require a certain standard of literacy and numeracy thereby unintentionally narrowing the education level of the audience (McDiarmid & Blundell, 1998). Second, when collecting diet records from children, caregivers are usually required to fill in their child’s diet record. But, with one third of nutrient and energy intake being consumed during school hours (Rockell, Parnell, Wilson, Skidmore, & Regan, 2011) multiple caregivers may be filling in diet records or the sole-caregiver may complete the diet record with inaccurate data. Therefore, during school day intakes, inter-personal error and intra-personal error may occur (Rockell et al., 2011). Third, when specifically looking at diet records and drinks, consumption of beverages occurs throughout the day and often in the absence of energy intake. Therefore a diet record that focuses on the recording of three main meals is unlikely to be sensitive enough to capture all drinking occasions (Gandy, 2015).

Approximately 70% of fluid intake comes from beverages alone and the remaining 30% from food (Gandy, 2015), so it is important for studies to clearly state whether they are measuring total fluid or fluid from drink intake. The proportion of fluid intake that comes from drinks will differ by culture, for example Asian cuisines where broth dishes are
popular. These methodological limitations need to be taken into consideration when comparing studies looking at fluid from drinks or fluid from total diet data.

Challenges also arise when interpreting the collected data, as each child has differing fluid requirements. Currently only Adequate Intakes (AIs) can be set for fluid requirements as each individual’s need is different depending on physical activity, heat exposure, other environmental conditions and dietary intake (Gandy, 2015). These AIs are applicable in moderate environmental temperatures and moderate physical activity states, but many studies do not take into account either of these conditions (Rowland, 2011). Adequate hydration can also be achieved with a wide range of fluid intakes due to homeostatic control (Gandy, 2015). This not only makes it hard to compare individuals, but also to describe the hydration status of populations.

The gold standard for assessing hydration status in children would involve collection and analysis of urine osmolality (Ozen et al., 2015). Unfortunately, a study of this kind hasn’t been published in the international literature (Guelinckx et al., 2015) presumably because of the logistic difficulty of collecting and analyzing first void samples from large numbers of school children.

2.6 Drink intakes of school children

2.6.1 Total fluid intake from drinks

The 2002 Children’s Nutrition Survey (CNS) and the 2007 Food and Drink Survey (FDS) are the most recent nationally representative assessments of New Zealand children’s diets.
In the 2002 CNS, a 24-hour diet recall was used in conjunction with a Food Frequency Questionnaire (FFQ) (Parnell et al., 2003). The 2007 FDS used an FFQ only as the data collection tool (National Research Bureau Ltd, 2008). Both these New Zealand studies reported frequency or drink intake, but did not report quantity of intakes. However, the international literature suggests that the quantity of drinks consumed increases somewhat with age (Guelinckx et al., 2015; Iglesia et al., 2015; Ozen et al., 2015; Popkin, 2010).

Worldwide, national surveys report that young children are not meeting the recommended fluid from drink intake each day (Edmonds & Burford, 2009; Iglesia et al., 2015; Kenney et al., 2015; Ozen et al., 2015; Senterre, Dramaix, & Thiebaut; Whitton et al., 2011).

### 2.6.2 Energy contribution from beverages

Reported energy contribution from beverages differs between countries. In the USA up to 21% of a child’s daily energy intake has been reported to come from beverages (Popkin et al., 2006). In 2010 it was reported that US children consumed 400 calories (1674 kJ) per day from drinks alone (Coppinger et al., 2013). In contrast, less than 10% of energy has been reported to come from beverages in the National Diet and Nutrition Survey UK (Whitton et al., 2011). The same UK survey found that beverages contributed one quarter to one third of all sugars consumed (Whitton et al., 2011). In New Zealand it has been reported that beverages and milk each contribute 6% respectively to total energy intake (New Zealand Ministry of Health, 2012).
2.6.3 Drink types

2.6.3.1 Water

Water is recommended to provide the majority of children’s beverage intake. Internationally this has been occurring with the contribution of water as a drink to total drink intake (TDI) ranging in international reviews from 42% (Guelinckx et al., 2015) to 58% (Ozen et al., 2015) for children. In New Zealand 96% of school children drink tap water (National Research Bureau Ltd, 2008). Although it is the most consumed beverage it has been internationally recognised that the amount of water consumed is low (Edmonds & Burford, 2009; Iglesia et al., 2015; Kenney et al., 2015; Ozen et al., 2015; Senterre et al.; Whitton et al., 2011).

2.6.3.2 Milk

There appears to be a decrease in milk intake internationally, which becomes more apparent with age (Coppinger et al., 2013; Guelinckx et al., 2015; Nielsen & Popkin, 2004; Popkin, 2010). In the US, total energy intake from milk dropped from 13.2% to 8.3% between 1977 and 2001 (Nielsen & Popkin, 2004). In New Zealand, children are drinking fruit juice more frequently than milk. Only 38% of NZ children drink milk daily, with a higher proportion of New Zealand European/Other (NZEO) than Māori or Pacific consuming milk (New Zealand Ministry of Health, 2012). When comparing milk types, New Zealand and the US report standard milk being most commonly consumed (Guelinckx et al., 2015; National Research Bureau Ltd, 2008; Popkin, 2010). In contrast, the UK reports a decrease in standard milk with semi-skimmed being the most often consumed by children aged 4-18 years of age (Whitton et al., 2011).
2.6.3.3 Sugar sweetened beverages

Most recent studies have shown that the intake of sugar-sweetened beverages (SSB) has been starting to decrease. However, the intake still remains relatively high. NHANES data show that SSB intakes have undoubtedly been increasing since the 1940s to late 1990s but since then average intake has fallen (Popkin, 2010). However, one report suggests that American five-year olds are meeting 50% of their fluid from drinks through SSB and fruit juice consumption (Fulgoni & Quann, 2012). Like NHANES, Australian data suggest a decreased proportion of children drinking sweet beverages in 2008 compared to 2003 (Jensen et al., 2012). Even though the proportion decreased, consumption still remained high with 71.4% of children and adolescents reporting drinking a sweet drink on the day of the survey in 2008 (Hafekost, Mitrou, Lawrence, & Zubrick, 2011). This study also identified that an increasing proportion of children and adolescents consumed fruit juice or fruit drinks, which seems to be an emerging trend worldwide (Fulgoni & Quann; Popkin, 2010; Whitton et al., 2011). In New Zealand, fruit drinks and fruit juices are drunk more regularly than soft drinks by (National Research Bureau Ltd, 2008) (Parnell et al., 2003). The 2002 CNS found powdered fruit drinks and food drinks such as Milo, to be the most frequently consumed SSB (Parnell et al., 2003).

2.6.3.4 Diet drinks

Diet drink consumption by children increases with age (Popkin, 2010) but diet drinks tend to be consumed by children in significantly lower amounts than regular sugar sweetened beverages (Popkin, 2010).
2.6.3.5 “Other” drinks

Although caffeinated beverages are not recommended for school-aged children, they are widely consumed by this age group. Data from the 2007 Australian Children’s Nutrition Survey found 20% of 4-8 year olds were consumers of caffeinated beverages (Beckford, Grimes, & Riddell, 2015). In the USA, approximately 73% of children consumed caffeine on a given day. The majority of caffeine came from tea in the 2-5 year age group (Branum, Rossen, & Schoendorf, 2013).

2.7 Conclusion

Data on drink intake is extremely hard to collect, and can be equally difficult to interpret. Overall more research investigating children’s and beverage consumption is warranted, including research on the long-term outcomes of drinking sugar sweetened beverages in children. New Zealand is lacking data on the amount and types of drinks consumed by children. Investigations in this area would allow for comparisons with other populations, identification of trends, and identification of health implications other countries are facing with similar intakes. With this information further research or public health campaigns could be initiated if undesirable drink intake is occurring in New Zealand children.
3. Objective Statement

Children’s drink intake has been assessed in a number of international studies, and frequency with which different drink types are consumed has been reported in two large New Zealand studies. However, a national study has not produced quantifiable results on the volume of child drink consumption. Drinks are an integral part of a child’s diet, providing hydration, nutrients and energy. The purpose of this study is to determine the types and amounts of drinks being consumed by 65 five-year old New Zealand children, and their contribution to energy and nutrient intake.

The specific objectives were to:

1. Determine the drink intake (type and amount) of the study sample,
2. Determine the daily energy contributed from drink intake,
3. Determine key nutrients contributed from drink intake,
4. Compare drink intake (types and amounts) to Ministry of Health recommendations for this age group,
5. Determine the percentage of the study sample consuming not recommended drinks.
4. Subjects and Methods

4.1 Study Design

The aim of the wider EAT5 study, to which this EAT5-Drinks project contributes, is to validate the EAT5 Food Frequency Questionnaire (FFQ) that has been developed for use with 5 year old New Zealand children. In total, four Master of Dietetic students will aim to contribute 25 children each to a combined pool of subjects for the validation study. The aim of the current project (EAT5-Drinks) was to investigate the drink intake of a subsample of these children. Diet records were used from two previous EAT5 studies (Chee, 2015; Yu, 2015), in addition to data that the candidate collected. In brief, participants, five-year old children and their primary caregiver, attended two appointments one month apart. Anthropometric measurements were taken at the first appointment. An FFQ was administered at both appointments. A three-day weighed diet record (WDR) was provided and instructions given at the first appointment, completed during the subsequent month, and then collected at the second appointment.

4.2 Recruitment and participants

The EAT5 study was approved by the Human Ethics Committee of the University of Otago, Dunedin in 2015 (APPENDIX A). Before taking part in the study, the caregiver and child signed separate consent forms (APPENDIX B) at the first appointment.

The candidate aimed to recruit 25 caregivers and five-year-old child pairs using fliers (APPENDIX C), posters (APPENDIX D), websites and word of mouth. Recruitment for this study was conducted in Auckland, New Zealand from February to March 2016.
following a recruitment protocol (APPENDIX E). Recruitment was primarily through local primary schools located in Glendowie (NZ Deprivation score 1) and Sandringham (NZ Deprivation score 5) (Statistics New Zealand, 2013). A total of 35 schools were contacted during recruitment. Ten schools distributed the EAT5 flier to their New Entrant and Year One pupils. Five community libraries displayed the EAT5 poster and one Internet site called ‘Neighbourly’.

After parents made initial contact, they were emailed further information sheets: a child-specific information sheet (APPENDIX F) and a parent-specific information sheet (APPENDIX G) detailing what participating in the study would entail.

The inclusion criteria for the study were:

- A caregiver and five-year old child pair,
- No diagnosed health conditions that would affect the child’s eating or growth.

Once inclusion in the study was confirmed the candidate scheduled the first appointment with the participant, at the participants own home (APPENDIX H).

Participants were reimbursed with a $25 petrol voucher at the second appointment and were given a nutrient analysis of their child’s diet after completion of the study (APPENDIX I).
4.3 Data collection

4.3.1 Demographics

The caregiver was given the demographic questionnaire to complete at the beginning of the first appointment (APPENDIX J). The questionnaire enquired about the age, sex and ethnicity of themselves and their child, how many children they had, as well as their relationship to the child participating in the study. It also enquired about tribal affiliations if the participant identified as Māori.

4.3.2 Food Frequency Questionnaire

The EAT5 Food Frequency Questionnaire (FFQ) was administered by the candidate at both appointments, approximately one month apart and aimed to assess the frequency and quantity of food eaten by the child over the past month. The FFQ contained 125 foods divided in order into the following food groups: ‘bread, crackers and breakfast cereals’; ‘rice and pasta’; ‘fruit’; ‘vegetables’; ‘meat, chicken, fish, eggs, beans’; ‘spreads’; ‘cakes, biscuits, snacks’; ‘milk and dairy products’; ‘puddings’; ‘drinks’; and ‘takeaways’ (APPENDIX K). The caregiver was asked to recall how frequently over the past month the listed food items were consumed by their child. The available frequency options 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’; ‘every day’; and ‘more than once a day’. Caregivers were also asked to estimate using measuring tools how many units their child usually ate of the food items in the FFQ. Measuring tools included: dried beans, dried rice, a measuring cup and measuring spoon. Information gained in the FFQ was not used in this study; data collected will be used at a later date for validation of the FFQ.
4.3.3 Anthropometry

Anthropometric measurements were made using standard procedures (APPENDIX L). Weight was measured using a Wedderburn Seca Alpha (Model 770; Birmingham, United Kingdom) set of scales, issued from the University of Otago, placed on a flat, even surface. The child was asked to stand in the centre of the scale, with their feet slightly apart, wearing light clothing with shoes removed. Two measurements were taken (to the nearest 0.1kg), with a third measurement taken if the first two differed by more than 0.1kg. The closest two measurements were then averaged.

The height of the child was measured using a Leicester wall stadiometer (Tanita, Illinois, USA) placed with the vertical board against a wall with the base on a hard flat surface. The child was measured without shoes or socks. The candidate asked the child to stand straight with their feet shoulder width apart, and with the back of their head, shoulder blades, buttocks, calves, and heels touching the vertical board. The candidate checked the child was in the correct position before taking measurements. The child's head was positioned in the Frankfurt Plane, and all measurements were recorded to the nearest 0.1cm. Two measurements were taken, with a third recorded if the first two differed by more than 0.7cm. The closest two measurements were then averaged.

4.3.4 Weighed diet records

Weighed diet record booklets were distributed and instructions given at the first appointment and then collected at the second appointment, approximately one month later (APPENDIX M). The candidate also provided a set of dietary scales (Salter Electronic
Model 2200; Victoria, Australia), and a spare set of batteries. The candidate demonstrated to the parents how to accurately weigh and record their child’s food following the written instructions in the food diary and using examples with plastic food to demonstrate. The candidate also gave specific instructions for accurately weighing drinks, such as weighing ‘Raro’ powder and water separately before mixing, and weighing a full drink bottle before school and then after school to gauge the amount of water drunk by their child. Parents were assigned three days (two week days and one weekend day) using a protocol (APPENDIX N) to attain an even spread of days in the study. Recorded days were required to be non-consecutive. Parents were asked to record one day a week, starting the day following the first appointment. On these days parents were asked to weigh and record all food and drink given to the child, including leftovers. Specific details such as brand, cooking methods, time of consumption and place of consumption were also recorded. Caregivers were asked to first weigh the empty plate or mug, record the weight, and then add and record items one by one without pressing the tare button between items. After the child had eaten their meal or snack or had a drink, caregivers were asked to weigh the bowl/mug and record the weight again. If there were leftovers, the caregiver was asked to describe the amount of each different item making up the leftovers.

At the top of each day’s food diary were the following questions; “Is your child unwell? – Yes/No”; “If unwell, did this influence your child’s appetite? – Yes/No” “If Yes: decreased appetite or increased appetite.”
At the end of every day there was also a page for recipes. Caregivers were asked to record the name of the recipe, amount of ingredients, amount of water added and the proportion of the whole recipe that the child was served in the diary.

At the back of the food diary, there was a supplementary page containing photographs of takeaway foods and drinks and their weights, along with a ruler and a set of circles for participants to estimate the weight or amount of food their child consumed when scales were not available to them.

Caregivers were contacted after their first day of recording to discuss any difficulties encountered. A reminder text was sent for future recording days. At the second appointment caregivers returned the scales and food diary. The candidate checked the food diary and asked questions about any unclear or uncommon food items and missing information.

4.4 Data entry

Demographic and anthropometric data were entered into a Microsoft Excel 2014 (Microsoft Corporation; Washington, United States of America) spreadsheet by the candidate. The candidate entered completed WDR into Kai-culator (Version 1.11s), a programme developed by the Department of Human Nutrition at the University of Otago. The amount consumed by the child, worked out as the recorded amount presented minus recorded leftovers, was entered in Kai-culator as a weight (g), volume (mL), or as a unit amount when items were estimated by size not weight. Homemade recipes were entered under the ‘Recipe’ tab, and the proportion given to the child was calculated. In Kai-culator each
liquid entered was assigned as either ‘drink’ or ‘not drink’ (these data were added by the candidate to the WDRs that had been collected by other MDiet students (Chee, 2015; Yu, 2015). For example milk with cereal was labeled as ‘not drink’ whereas a glass of milk was labeled ‘drink’. All diets were checked for accuracy, and participants were contacted for more information where required.

4.5. Statistical analysis

All statistical analyses were conducted using Microsoft Excel 2013, or Stata version 12.1. The mean and standard deviation were calculated, and the range where appropriate. Percentages were calculated for nutrients, as well as energy from food compared to energy from drinks. When determining whether children were following Ministry of Health recommendations, a tally was calculated, as some drinks, such as fruit juices had multiple recommendations for dilution, maximum daily amount and whether drinks were consumed with a meal or as a snack. A tally was also calculated for ‘age appropriate’ and ‘age inappropriate drinks’ (4.6.1). The dietary software programme Kai-calculator calculates all food and drink intakes in grams. The density of water is 1g/mL and therefore the number of grams is the same as the number of millilitres. For drinks such as milk, intakes will be slightly underestimated when comparing participant intake (in grams) to the Ministry of Health recommended intake (in millilitres).

4.6 Classification according to Ministry of Health recommendations

These recommendations are from the Ministry of Health document ‘Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2-18 years) A background paper’
Children aged 4-8 years should be consuming 1.2L per day as drinks. Water is recommended as an ‘every-day’ drink. Milk, preferably low-fat is also recommended as an ‘every-day’ drink. Five-year olds should not exceed 500mL of milk per day to avoid displacing solids. Flavoured milks are not recommended as the main source of milk for children. If they are consumed, have them occasionally, in small serving sizes. Fruit juice, if consumed, should be diluted to a 50:50 ratio, drunk at meal times, and to a daily maximum of one cup diluted (125mL). Sugar-sweetened drinks include: fruit drinks, fizzy/soft drinks, cordial, powdered drinks and sports drinks. These drinks are recommended as occasional drinks, and, if consumed, should not exceed one cup (250mL) per week. These drinks should also be consumed with meals. Diet drinks are also recommended as occasional drinks, and, if consumed, should not exceed one cup (250mL) per week. These drinks should also be consumed with meals. Caffeine containing drinks should not be consumed by children under the age of 13 years.

4.6.1 Classification of ‘Recommended’ and ‘Not Recommended’ Drinks

Drinks were classified into two categories; ‘Recommended’ and ‘Not Recommended’ based on two Ministry of Health publications: one being a background paper on the food and nutrition guidelines, and the other a public resource (New Zealand Government, 2012; New Zealand Ministry of Health, 2012). For a drink to be considered as ‘Recommended’ for five-year olds it had to meet the following criteria:

- Be listed as ‘Drink Most’ in the ‘Eating for Healthy Children (From 2-12 years) Ministry of Health public resource (New Zealand Government, 2012)
• Be recommended for daily consumption both in the public resource (New Zealand Government, 2012) and in the Food and Nutrition Guidelines for Healthy Children and Young People aged 2-18 years (A background paper) (New Zealand Ministry of Health, 2012).

The following drinks are advised for daily consumption and were in the ‘Recommended’ category:

• Water
• Milk (preferably low-fat)
  o Including milk-based smoothies

All drinks that were not advised as part of a five years old’s daily intake, for various nutritional and medical reasons, were in the ‘Not Recommended’ category:

• Fruit juice
  o Including fruit juice-based smoothies
• Flavoured milks
  o Including food drinks such as Milo, Nesquik and hot chocolate drinks
• Sugar-sweetened beverages
  o Including fruit drinks, fizzy drink, cordial, powdered drinks, sports drinks
• Diet drinks

The following drinks are advised to never be consumed by five year olds so were also in the ‘Not Recommended’ category:

• Energy/guarana containing drinks
• Coffee
• Tea
• Alcohol
5. Results

5.1 Sample characteristics

While 42 caregivers expressed interest in participating in the study, only 25 (60%) arranged a first appointment, with 24 participants (96%) completing the study. Three participants did not record drinks and therefore had to be excluded from the analysis. These 21 Auckland participants were pooled with 44 Dunedin participants from the ‘EAT5FV – Fruit and vegetable intake in five-year old children living in the Otago region’ (Yu, 2015) and ‘The role of “snacks” in the diets of 5-year old children in Dunedin, New Zealand’ (Chee, 2015) studies to give a total sample size of 65 children (see Figure 5.1).

Figure 5.1: Data pool for EAT5 Drinks study.

EAT5 Fruit and Vegetable (2015): 25 participants

EAT5 Snack (2015): 19 participants

EAT5 Drinks (2016): 24 participants

3 excluded (did not record drinks)

Total sample: 65 participants
Baseline demographic characteristics of the caregiver and 5 year-old child pairs are presented in Table 5.1.

Caregivers were predominately New Zealand European (87%), mothers (n=63, 97%), residing in Dunedin, and living in an area of low deprivation. The child participants were predominantly female, aged 5.5 years and mostly New Zealand European (77%). Average BMI was 15.9kg/m$^2$, with a wide range observed (13.7-18.2kg/m$^2$) corresponding to percentiles ranging from the 5$^{th}$ to <95$^{th}$ percentile (Centers for Disease Control and Prevention, 2001). Eight out of the eleven overweight or obese children were male, and no child in the Auckland region had an overweight or obese BMI. Children were recorded as sick on 20 out of the total of 195 days of diet records (10%). Caregivers reported that this sickness did not affect the appetite of the child on nine of these days (55%), but on 11 days it resulted in a decreased appetite (45%). All 195 days were included in this analysis as a reflection of usual life.

Energy contribution from the macronutrients (Table 5.2); protein, carbohydrate and fat was similar for both sexes with approximately one sixth from protein (mean total = 15%, Male = 16% Female = 15%), one third from fat (mean total = 33%, Male = 34%, Female = 33%) and just over half of kilojoules originating from carbohydrate (mean total = 53%, Male = 53%, Female = 54%).
Table 5.1 Participant demographic characteristics (n=65).

<table>
<thead>
<tr>
<th>Caregiver/parent</th>
<th>Mean (SD)</th>
<th>n (%)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>37.1 (5.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of children (total)</td>
<td>2.3 (0.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ European/Other</td>
<td>57 (87)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>3 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific</td>
<td>1 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>4 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dunedin</td>
<td>44 (68)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auckland</td>
<td>21 (32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ Deprivation Score</td>
<td>4.0 (2.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 (least deprived)</td>
<td>31 (48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-7</td>
<td>22 (34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-10 (most deprived)</td>
<td>12 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28 (43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>37 (57)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>5.5 (0.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ European/Other</td>
<td>50 (77)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>7 (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific</td>
<td>4 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>4 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anthropometry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>20.3 (2.0)</td>
<td></td>
<td>15.7-25</td>
</tr>
<tr>
<td>Height (m)</td>
<td>112.9 (4.5)</td>
<td></td>
<td>1.02-1.26</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>15.9 (1.1)</td>
<td></td>
<td>13.7-18.2</td>
</tr>
<tr>
<td>Obese¹</td>
<td>1 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>10 (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy weight</td>
<td>54 (83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Ethnicity prioritisation was used in the following descending order: Māori, Pacific, Asian, NZ European and other
² NZDep2013 Index of Deprivation allocated a deprivation score on a scale of 1-10 (1= least deprived and 10=most deprived) calculated by Statistics New Zealand (Statistics New Zealand, 2013).
³ Classified based on BMI-for-age weight status using the Centers for Disease Control and Prevention (CDC) Growth Charts (Centers for Disease Control and Prevention, 2001)
Table 5.2: Total energy and nutrient intakes calculated from three-day weighed diet records.

<table>
<thead>
<tr>
<th>Energy or nutrient</th>
<th>3-day diet record</th>
<th>Estimated Average Requirements (1)</th>
<th>Adequate Intake (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All (n=65)</td>
<td>Male (n=28)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female (n=37)</td>
<td></td>
</tr>
<tr>
<td>Energy (kJ)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5815 (1329)</td>
<td>6031 (1231)</td>
<td>5652 (1394)</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>51.4 (14.5)</td>
<td>55.9 (16.2)</td>
<td>48 (12.2)</td>
</tr>
<tr>
<td>% of Energy (%)</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>51.8 (15.5)</td>
<td>53.6 (15.3)</td>
<td>50.5 (15.7)</td>
</tr>
<tr>
<td>% of Energy (%)</td>
<td>33</td>
<td>34</td>
<td>33</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>182 (45.2)</td>
<td>186.5 (43.3)</td>
<td>178.6 (46.9)</td>
</tr>
<tr>
<td>% of Carbohydrate</td>
<td>53</td>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>Fibre (g)</td>
<td>17.7 (5)</td>
<td>19 (4.9)</td>
<td>16.7 (4.8)</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>627 (252.5)</td>
<td>679 (269)</td>
<td>588 (235.6)</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>74.2 (36.6)</td>
<td>80.2 (35.5)</td>
<td>69.6 (37.3)</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>1917 (484)</td>
<td>2077 (449)</td>
<td>1795 (479)</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>186 (114)</td>
<td>225 (147)</td>
<td>157 (69)</td>
</tr>
</tbody>
</table>

(1) From the Australian and New Zealand Nutrient Reference Values (The National Health and Medical Research Council, 2006)
5.2 Average daily intake of drinks

The average total daily fluid from drinks for the sample was 511g. Drinks were divided into five main categories: fruit and vegetable-based drinks, milk-based drinks, sugar-sweetened drinks, non-caloric drinks and caffeinated drinks. These five groups were then broken down into specific sub-groups. Many participants did not consume drinks from all five of these categories so data for consumers of each drink are reported separately alongside the sample mean. ‘Non-caloric drinks’ was the most consumed drink category, both in terms of the number of participants (94%) and the total amount (total mean = 373g, consumer mean = 398g) with water being the main non-caloric drink (total mean = 369g, consumer mean = 407g). The ‘caffeinated drinks’ category had the lowest daily amount (total mean = 0.5g). Only one child in the study consumed caffeinated drinks, in a small amount (33.3g). Milk-based drinks were the second highest consumed category, both in terms of number of participants (63%) and in terms of amount (total mean = 102g, consumer mean = 161g). Of the milk-based drinks, full fat milk was consumed by the most participants (35%), followed by flavoured milk (34%), low-fat milk (28%) and milk-based smoothies (11%). However, low-fat milk was consumed in the highest amount (total mean = 34.7g, consumers mean = 125g), followed by full-fat milk (total mean = 33.7g, consumers mean = 95.2g). Sugar-sweetened drinks were consumed by 25% of children, while fruit/vegetable based drinks were consumed by 20%. Other fruit juices, such as Keri and Just Juice, were reported by a higher percentage at 17% and consumed in larger amounts (total mean = 14.4g, consumer mean = 85.0g) than 100% fruit or vegetable juice at 3% (total mean = 2.1g, consumer mean = 68.8g). Fizzy drinks were consumed by 22% of the sample, compared to cordial drinks, which were consumed by just 6%. However, cordial was
consumed in an amount almost double that of fizzy drink (cordial consumer mean = 111g, fizzy drink consumer mean = 57.5g).
Table 5.3: Average daily amount and type of drink intakes calculated from three-day weighed diet records.

<table>
<thead>
<tr>
<th>Drink type</th>
<th>n (%) consuming drink&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Average daily amount (g)</th>
<th>Average daily intake in consumers (g)</th>
<th>Recommended daily intake (mL)&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Drink Intake (TDI)</strong></td>
<td>65 (100)</td>
<td>511 (282)</td>
<td>-</td>
<td>1200</td>
</tr>
<tr>
<td><strong>Fruit/Vegetable based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100% fruit or vegetable juice</td>
<td>2 (3)</td>
<td>2.1 (14.2)</td>
<td>68.8 (196)</td>
<td></td>
</tr>
<tr>
<td>Other fruit juice</td>
<td>11 (17)</td>
<td>14.4 (39.9)</td>
<td>85.7 (59.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Milk based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full fat milk</td>
<td>23 (35)</td>
<td>33.7 (61.6)</td>
<td>95.2 (70.1)</td>
<td></td>
</tr>
<tr>
<td>Low fat milk</td>
<td>18 (28)</td>
<td>34.7 (72.1)</td>
<td>125 (87)</td>
<td></td>
</tr>
<tr>
<td>Flavoured milks</td>
<td>22 (34)</td>
<td>27.0 (98.5)</td>
<td>79.6 (159)</td>
<td></td>
</tr>
<tr>
<td>Milk-based smoothies</td>
<td>7 (11)</td>
<td>6.2 (22.4)</td>
<td>57.5 (43.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Sugar-sweetened</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fizzy drinks</td>
<td>14 (22)</td>
<td>12.4 (27.6)</td>
<td>57.5 (31.1)</td>
<td></td>
</tr>
<tr>
<td>Cordial/sachet mixes</td>
<td>4 (6)</td>
<td>6.8 (39.6)</td>
<td>111 (135)</td>
<td></td>
</tr>
<tr>
<td><strong>Non-calorific drinks</strong></td>
<td>61 (94)</td>
<td>373 (268)</td>
<td>398 (258)</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>59 (91)</td>
<td>369 (273)</td>
<td>407 (258)</td>
<td>&gt;50% of TDI</td>
</tr>
<tr>
<td>Diet drinks</td>
<td>2 (3)</td>
<td>2.7 (21.6)</td>
<td>88.7 (120.7)</td>
<td></td>
</tr>
<tr>
<td>Herbal tea</td>
<td>1 (2)</td>
<td>1.2 (9.9)</td>
<td>80.0 (0)</td>
<td></td>
</tr>
<tr>
<td><strong>Caffeinated drinks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tea</td>
<td>1 (2)</td>
<td>0.5 (4.1)</td>
<td>33.3 (0)</td>
<td>0</td>
</tr>
<tr>
<td>Coffee</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Energy drinks</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<sup>1</sup> Participants were included if they consumed the specific drink at least once during the 3WDR

<sup>2</sup>New Zealand Ministry of Health recommendations (New Zealand Ministry of Health, 2012).
5.2.1 Drink intake in comparison to government recommendations

Water should make up the majority of daily drink intake, and Figure 5.2 demonstrates that water was indeed the main contributor to average daily drinks intake (providing 72% of daily volume). However, although 91% of the sample recorded drinking water intakes were low, with an overall sample mean of 369g (consumer mean = 407g). Just two children (3%) reached the AI of 1200mL.

Figure 5.2: Percentage contribution of drink types to total drink intake.

The New Zealand Ministry of Health recommends that flavoured milk should not be the main source of milk for children, a recommendation that was met by our group, with flavoured milk contributing 24% of average daily milk intake (Figure 5.3). Overall, children were drinking 102g of milk per day, which does not exceed the government recommended maximum of 500mL per day.
Figure 5.3: Percentage contributions of different milks types to overall daily milk intake.

As shown in Figure 5.4, 24 (37%) of children did not consume a ‘Not Recommended’ during the 3-day WDR. However, 41 (63%) of children did consume these ‘Not Recommended’ during the three days of recording. Flavoured milk was the most commonly consumed drink in this category, consumed by 22 children (34%), followed by 16 children (25%) drinking SSB, 13 (20%) drinking fruit and vegetable based juices and 2 children (3%) had diet drinks.
Figure 5.4: Combinations of ‘Not Recommended’ drinks consumed during the three-day weighed diet record.

- **Fruit/vegetable based juices n=7 (11%)**
  - Juice & sugar-sweetened n=3 (5%)
  - Flavoured milk n=14 (22%)
- **Sugar-sweetened beverages n=6 (9%)**
  - Juice & flavoured milk n=1 (2%)
  - Sugar-sweetened & flavoured milk n=5 (8%)
- **All n=2 (3%)**
- **Caffeinated drinks n=1 (2%)**
- **Diet drinks n=2 (3%)**

No Fruit/vegetable based juice, sugar-sweetened beverages, flavoured milk, diet drinks, or caffeinated drinks n=24 (37%)
These drinks all have individual recommendations involving frequency, timing and amount of consumption (New Zealand Ministry of Health, 2012). Juice should be consumed in a 50:50 ratio diluted with water, with meals, at a maximum of 125mL per day. Three children (23%) who consumed fruit juice followed these recommendations. Sugar-sweetened beverages, including fizzy drinks and cordial, are to be consumed less than once a week, with meals, at a maximum of 250mL. As our WDR only included three days we cannot accurately compare the ‘less than once per week’ recommendation to our results. Instead if a child consumed a SSB once in their WDR, with a meal and less than 250mL then it was considered that they met the recommendation. Six SSB consumers (38%) followed these recommendations. Diet drinks should be consumed less than once per week, with one of the two diet drink consumers following this recommendation. Caffeinated drinks are not recommended for children under the age of 13 years; one child in the study (2%) did not follow this recommendation as they consumed tea. It is recommended that flavoured milk to be consumed occasionally and in small amounts, but without quantifiable limits and amounts, we were unable to make comparisons between the recommendation and intake of flavoured milk in this sample. Nine children consumed two non-recommended drinks per day, and seven children consumed non-recommended drinks on more than one day in the WDR.

5.3 Contribution of drinks to energy and nutrient intake

When comparing food contribution and drink contribution separately, it is clear that food provides the majority of daily energy and selected nutrients as shown in Table 5.4. For example, food contributes 94% of total energy while drinks contribute only 6%. The largest contribution to a macronutrient from drinks is protein at 7%. When considering the nutrients investigated, drinks make useful contributions to the intake of
calcium (21%), vitamin C (13%), and potassium (10%). It should be noted that these figures refer to the percentage contribution from consumers and non-consumers, and thus reflects the population overall. It might be expected that comparable data from consumers only would represent larger contributions to nutrient intake. For example, a large proportion of children (37%) did not drink milk over the three days of recording, so the calcium contribution from drinks in children that drink milk is likely to be higher than 21%.
Table 5.4 Comparison of energy and nutrient contribution from food and drink to the overall diet.

<table>
<thead>
<tr>
<th>Energy or nutrient</th>
<th>Contribution from food</th>
<th>Contribution from drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>% of total nutrient intake</td>
</tr>
<tr>
<td>Energy (kJ)</td>
<td>5478 (1228)</td>
<td>94</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>47.6 (13.5)</td>
<td>93</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>49.5 (14.9)</td>
<td>97</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>171 (42.8)</td>
<td>94</td>
</tr>
<tr>
<td>Fibre (g)</td>
<td>17.5 (17.5)</td>
<td>99</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>4831 (201)</td>
<td>79</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>63.5 (33.1)</td>
<td>87</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>1711 (432)</td>
<td>90</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>182 (111)</td>
<td>97</td>
</tr>
</tbody>
</table>
6. Discussion

Only two participants in the EAT5 Drinks study met the Ministry of Health (New Zealand Ministry of Health, 2012) adequate intake of 1200mL of fluid from drinks per day, with the majority contributed by water (72%). Overall drinks contributed a small amount of energy (6%), but a substantial percentage of nutrients, in particular calcium. The majority of five-year olds (63%) were consuming drinks not recommended for their age. However, these drinks were only consumed in relatively low amounts, or not consumed daily, and thus contributed relatively little to overall energy intake.

Consistent with our findings, international literature demonstrates that water is the most commonly consumed drink (Ozen et al., 2015). Many parents commented that water was the hardest component of the WDR to measure and under-reporting most likely occurred. Multiple water bottles, drinking fountain intake and children helping themselves to water from the tap were reported reasons for this difficulty. However, even if water intake was under-reported it is likely that some children were not drinking 1.2L of fluid per day, as the average recorded intake was half that. Low fluid intake in children is not uncommon, as a number of international studies have reported children under the age of five not reaching the recommended adequate intake (Iglesia et al., 2015; Ozen et al., 2015; Senterre et al., 2014). Additional factors need to be considered when evaluating adequate intakes at population level such as health status, physical activity, temperature, humidity and dietary factors. Due to inter-individual variation it is hard to make a judgment on adequacy of intake especially considering the climate variation between Auckland participants and Dunedin participants, and the timing of the studies, February (Summer) and July (Winter). Urinary measures of colour and
osmolarity are relatively sensitive at detecting moderate dehydration and would assist in determining individual hydration states, however these tests have a relatively high respondent burden and many factors still have to be controlled for such as time of day and health status (Ozen et al., 2015; Shirreffs, 2003).

Water depletion is more likely to occur in children than adults for physiological reasons such as: a proportionally larger total body water content and heat intolerance (Meyer, 2016; Popkin et al., 2010). Five-year old children are also very reliant on their caregivers and often have inadequate spontaneous intake (Meyer, 2016). While individual hydration status cannot be determined from this study, and it is unlikely that all children were dehydrated, some are likely to have been given dehydrated given the low reported intakes. This is a concern as long-term insufficient fluid intake can have detrimental effects on cognitive function and memory (Edmonds & Burford, 2009; Edmonds & Jeffes, 2009).

In New Zealand five-year olds spend 30 hours per week at school, and, attend school for up to 41 weeks per year. School has proven to be an appropriate setting to encourage increased consumption. The ‘Grab a Cup, Fill it up!’ intervention trial in Boston proved that providing disposable plastic cups can increase water consumption (Kenney et al., 2015). Ten schools (6 primary, 4 high schools) were split into control and intervention arms, with the intervention schools providing disposable cups near water fountains. The percentage of students consuming water at lunchtime doubled in the intervention arm (Kenney et al., 2015). New Zealand does not have the same lunch cafeteria design as the U.S.A so it would be interesting to see if this model could be replicated here.
The 2002 CNS found that after milk, food drinks and powdered fruit drinks were the most commonly consumed drinks by children aged 5-6. Water was not measured (Parnell et al., 2003). This differed somewhat from the EAT5 study, which found that, after water, full fat milk and food drinks were the most commonly consumed by participants. There has been a noticeable trend of milk intake decreasing with age in national surveys in several countries (Ozen et al., 2015). The 2002 CNS identified the proportion of ‘Never or <monthly’ milk drinkers increasing with age. In females the proportion of daily milk drinkers decreased with age (Parnell et al., 2003). However, the 2002 CNS and NHANES data also found that full fat milk was the most commonly consumed milk (Drewnowski, Rehm, & Constant, 2013; Parnell et al., 2003). The Food and Nutrition Guidelines have identified two major barriers to changing to lower-fat milk: the perception that low-fat milks cost more and lack of acceptance from family members (New Zealand Ministry of Health, 2012). Interestingly, the current study identified a third barrier. Several parents indicated that they did not buy low-fat milk because they believed that low fat products resulted in added sugar. While this is may be true for some dairy products, such as yoghurts, it does not apply to low-fat milk.

A high proportion of the participants consumed flavoured milk and/or food drinks. This may be due to public confusion as to what flavoured milks are. In the FFQ parents often responded ‘Never consumed’ when queried about their child’s flavoured milk intake, even though they were prompted to include hot chocolates and similar drinks in this category, yet recorded milo and hot chocolate in the weighed diet record. Milo has a long-standing advertisement campaign as an ‘energy food drink’ and is often pictured with sporting children. This could influence parents to view it as a healthy choice, and separate it from the flavoured milk category, even though one 20g serve of Milo powder contains 9.2g of sugar. Although flavoured milk is not recommended, there is no
amount or limit specified in the guidelines, presumably because of the positives contributions to calcium and protein intakes.

Sugar-sweetened beverages were consumed by one quarter of the study participants and fruit juice by one fifth; with approximately double the amount of cordial being consumed as fizzy drink and fruit juice. Previous New Zealand surveys have reported considerably more children and young adults consuming sugar-sweetened fizzy drinks (51%) and fruit juice and fruit drinks (73%) at least once a week (National Research Bureau Ltd, 2008). This data includes children in the age bracket from 5 to 14 years, and sugar-sweetened drink intake tends to increase with age (Ozen et al., 2015). Health outcomes from sugar-sweetened beverage studies in the U.S.A cannot be applied directly to the EAT5 drink study due to the vast difference in intake amounts. NHANES data from 2001-2006 show that on average five-year-old children are consuming 296mL of fruit juice per day and 290mL of SSB per day (Fulgoni & Quann, 2012). The average intake of fruit juice (16.5g/day) and SSB (19.2g/day) is surprisingly low even in comparison to the international literature (Guelinckx et al., 2015). The EAT5 study had predominately NZEO participants from areas of low-medium (mean=4) household deprivation. This could account for the low frequency and intakes of powdered drinks and soft drinks as these are more commonly consumed by high deprivation households (Parnell et al., 2003) and by higher proportions of Pacific and Māori children than NZEO in the 2002 CNS (Parnell et al., 2003).

Overall, there is no national guideline that refers to the consumption of fruit juices, flavoured milk and sugar-sweetened beverages as a whole. Nine children consumed two non-recommended drinks per day, and seven children consumed non-recommended
drinks on more than one day in the WDR. Perhaps a weekly limit referring to a combination of these drinks should be considered.

The U.S.A has reported extremely large daily energy contributions from beverages, (21%), while less than 10% has been reported from the U.K., which is more comparable to our results. Liquid is proven to be less satiating than solid food, and large contributions of caloric drinks can lead to weight gain (Zheng et al., 2015). Drinks provided only a small energy contribution (6%), and an even lower fat contribution (4%) in the current study.

Drinks contributed one-fifth (144mg), of daily calcium intake. Similar median calcium intake were reported by the 2002 Child Food and Nutrition Survey for 5-6 year olds: 677mg (males) and 616mg (females) (Parnell et al., 2003). With calcium requirements increasing with age, and milk intake decreasing with age it is likely that inadequate intakes would increase when looking at older age ranges. The contribution of drinks to calcium intake is important as maintaining adequate intake reduces the risk of fractures and osteoporosis later in life (Greer & Krebs, 2006). This study was predominantly NZEO participants, which might have contributed to high calcium intakes as it has been reported that both male and female Pacific, and male Māori children have significantly lower calcium intakes than NZEO children (Parnell et al., 2003). Drinks contributed 13% (10.7mg) to total vitamin C intake. The 2002 CNS also identified that the main source of Vitamin C in 5-14 year olds diet was from beverages (37%) (Parnell et al., 2003). The lower contribution from the current study is likely explained by the low intake of fruit juice and the younger age group who consume less sweet drinks overall.
The current study had two main strengths, a strong study design, and gold standard dietary assessment. First, data were collected from two main centres in New Zealand: Auckland and Dunedin, which allowed for a better understanding of the average New Zealand five-year olds intake. Second, the source of food and drink data collection was through a WDR, which is considered the gold standard for dietary assessment (Bingham et al., 1994). The WDR was explained to participants in face-face meetings which allowed for interactive questions and learning to take place. Any problems with the completed WDR were queried and corrected in the second face-to-face meeting. Each participant in the study was allocated two weekdays and one weekend day to record dietary intake in order to account for differences in intakes on school and non-school day. In addition, participants were not informed that the objective of this study was to investigate drink intake and its contribution to the diet so the potential for biased drink reporting was reduced.

Our study also has some limitations: the likelihood of participation bias, inaccurate reporting in the WDR, and the limitations of dietary software ‘Kai-culator’. Participants were volunteers, with an average low-medium level of deprivation. In the Auckland sub-group alone, two parents had a degree in Dietetics or Nutrition. Although not formally assessed, it was clear from conversations with parents that many of them were highly educated and/or interested in nutrition. One participant commented that her sister did not want to join, as “her children do not eat the perfect diet”. This participant bias would likely influence the results to reflect a ‘healthier’ diet rather than the ‘average’ diet of a five-year old. In the Auckland sub-sample two extreme diets were observed – one family who purposely restricted carbohydrate containing foods, and another who followed a strict gluten-free, dairy-free, sugar-free organic diet. While a range of diets
should be expected within any population, these two participants represented a fairly large proportion of our study (3%) given the overall numbers were relatively small.

While WDRs are considered the gold standard for dietary assessment, they do have some limitations (Bingham et al., 1994). Under-reporting and under-estimating are common biases that occur. Participants may omit or reduce the amount of ‘bad’ food given to their children, in pursuit of the ‘perfect’ diet. However, in the EAT5 study sample the participants’ average daily energy intake was similar to the recommended Estimated Energy Requirement. This suggests that under-reporting may not have been a large problem in our study. Quantifiable data on drinks seemed to be difficult to collect with many parents expressing the difficulties they had experienced with accurately recording water intake. Also, the dietary programme Kai-culator was based on the Plant and FOODfiles 2010 and contained a range of food items but when recorded foods or drinks were not available, a substitution had to be made, potentially resulting in inaccurate data. Likewise, where WDR amounts were unclear, or an item was described but not measured, an estimation had to be made. Free sugars could not be analysed in Kai-culator, which would have been particularly useful when comparing free sugars from drinks in comparison to food. The 2002 CNS found that beverages were the main source of sucrose (26%) in 5-14 year olds (Parnell et al., 2003). Lastly, as mentioned earlier this study sample was relatively small, (n=65) therefore any outliers could have a greater influence on the sample mean.

In conclusion, the current study has shown that drinks are an integral component of a five-year olds’ diet, providing a small proportion of energy, but making a substantial contribution to calcium intake, even though only 63% of children consumed milk as a drink. In the study 63% of children were consuming ‘Not Recommended’ drinks. The
potential negative nutritional implications of flavoured milk need to be addressed as many children consume these drinks, but they are not currently mentioned in the public resource, only the background paper. Future investigation into the hydration status of New Zealand children may be warranted due to the low-recorded amounts of drinks consumed. To conclude, drinks, when consumed within the recommendations can make significant positive contributions to a five-year olds’ diet without contributing excessive energy.
7. Application to Practice

The EAT5 Drink study has highlighted the importance of milk as a drink in five-year olds diets, and suggests it should continue to be encouraged as a source of calcium for five-year olds. With national and international trends in literature suggesting that milk intake decreases with age these milk-drinking habits need to be promotion in order to be maintained. This is especially important as calcium requirements actually increase with age (The National Health and Medical Research Council, 2006) while milk intake decreases. Several campaigns overseas have targeted this trend such as the “Got Milk?” ad campaign (Goodby Silverstein & Partners, 1993-2014), but specific New Zealand advertisements could be beneficial. The annual cost of osteoporosis in New Zealand is 1.15 billion dollars, with an osteoporosis-related fracture occurring every 6 minutes (Brown, McNeill, Radwan, & Willingale, 2007). Therefore, dietitians should work to promote long-term milk drinking into adulthood to reduce future burden of osteoporosis injuries.

Education regarding the positive attributes of low-fat milk over full-fat milk requires reinforcing due to perceived barriers identified by the Ministry of Health (New Zealand Ministry of Health, 2012) but also due to the emergence of interest is ‘high-fat’ diets, and the parental belief that low-fat milk contains added sugar.

Without data on free sugars, it was not possible to determine whether sugar from flavoured milk, which was consumed by one third of the sample, made a significant contribution to sugar intakes, however they contain a large amount of sugar per serving. An assertive stance on flavoured milk, including food drinks such as Milo, should be
included in the public resource Eating for Healthy Children (From 2-12 years) (New Zealand Government, 2012) as they are currently it is not mentioned in this resource, these drinks are only briefly addressed in the Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2-18 years) A background paper (New Zealand Ministry of Health, 2012) – a document over 200 pages long and less likely to be read by parents. As sugar constitutes a large proportion of Milo powder, it is not appropriate to recommend it as an “every day” drink for children. Hot milk would be a more suitable daily hot beverage for five year old children.

Fruit juice, although consumed in low amounts on average, was usually consumed undiluted and between meals which does not follow Ministry of Health (New Zealand Government, 2012) recommendations to minimise the risk of developing dental caries. Awareness of proper dilution and timing of fruit juice consumption needs to be raised.

And finally, water intake should be encouraged with frequent reminders throughout the day. School based initiatives and education regarding the importance of water may be beneficial for this age group. A future study with urine osmolality samples would indicate whether the five-year old population is adequately hydrated.
8. References


consumption and nutrient intakes from the first year of the rolling programme and comparisons with previous surveys. *Br J Nutr, 106*(12), 1899-1914. doi:10.1017/S0007114511002340


9. Appendices

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
<td>Consent form</td>
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<td>D</td>
<td>EAT5 poster</td>
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<td>E</td>
<td>Advertising and recruitment protocol</td>
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<td>F</td>
<td>EAT5 information sheet for children</td>
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<tr>
<td>G</td>
<td>EAT5 information sheet for parents</td>
</tr>
<tr>
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<td>First and second visit protocol</td>
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<tr>
<td>I</td>
<td>Nutrient analysis letter to parent</td>
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<td>J</td>
<td>Demographic questionnaire</td>
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<td>Food frequency questionnaire (FFQ)</td>
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<td>L</td>
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<td>3-day weighed diet record (WDR)</td>
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<tr>
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<td>WDR day allocation pattern</td>
</tr>
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Appendix A

Dr A Heath
Department of Human Nutrition
Division of Sciences

16 February 2015

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
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
Appendix C

**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: Robyn Moore
Email: mooro526@student.otago.ac.nz
Phone: 021 2606653

This project has been reviewed and approved by the University of Otago Human Ethics Committee (Health).

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

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EAT5 – What are New Zealand 5 year olds eating?

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Phone: 021 2606653

This project has been reviewed and approved by the University of Otago Human Ethics Committee (Health).
Appendix A Advertising protocol

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 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
- Kidspot 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 B Recruitment protocol

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?

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

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
Appendix A Advertising protocol

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 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
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.
Appendix G

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 100 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 another 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

Name: Associate Professor Rachael Taylor
Position: Co-Principal Investigator
Department: Medicine
Contact phone number: 021 479 556
Email: rachael.taylor@otago.ac.nz

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.
Appendix O 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 participant’s 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 diary, 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 me 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

<table>
<thead>
<tr>
<th>Steps– After</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Filling FFQ, demographic questionnaire and consent forms</td>
</tr>
<tr>
<td>o Record reminder dates in dairy according to diet record plan</td>
</tr>
<tr>
<td>o Record next appointment date and reminder</td>
</tr>
</tbody>
</table>
Appendix P Second visit protocol

Study: EAT-5
Prepared by: Renee Yu
Protocol is based on The Validation Study Second Visit protocol, prepared by Emily Olivia Watson

PS. 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
Appendix I

Date:

Dear Name,

Thank you very much for participating in the EATS study. Please find enclosed [child]’s 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/n35.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 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 Zihan’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 Zihan’s help with the EATS 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,

Robyn Moore
Student Dietitian, Department of Human Nutrition
robynvmoore@hotmail.co.nz
Nutrient Analysis

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>“Estimated Average Requirement” (per day)</th>
<th>“Recommended Dietary Intake” (per day)</th>
<th>“Adequate Intake” (per day)</th>
<th>[child]’s average daily intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy $^1$ (kJ)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>16</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Fat $^1$</td>
<td></td>
<td>20-35% dietary energy intake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Carbohydrate $^3$</td>
<td></td>
<td>45-65% dietary energy intake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Fibre (g)</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>520</td>
<td>700</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td></td>
<td></td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>25</td>
<td>35</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>160</td>
<td>200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^1$ 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] energy intake is adequate for normal growth at this time.

$^3$ 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.

Potassium
Potassium is a mineral that helps nerves and muscles communicate, it also helps move nutrients into cells, and waste products out. Good source of potassium in the diet include: leafy green vegetables, tree fruits, vine fruits, and root vegetables. It is also moderately abundant in milks, yoghurts and meats.

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.

Folate
Folate is important in cell growth and reproduction. Folate deficiency can result in a type of anaemia. Food high in folate include: green leafy vegetables (such as spinach and broccoli), citrus fruits and juices, wholemeal bread, legumes and animal liver.
Appendix J

ID Number: _____________

**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)
5 Year Food Frequency Questionnaire

To be administered to the child’s main carer

You will need:

- 5 Food Frequency Questionnaire
- Interviewer
- Study number

Interviewer name

DD MM YY

To be continued...

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

1.7 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.
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).

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?

<table>
<thead>
<tr>
<th>Food</th>
<th>Units</th>
<th>How many [units] would they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chips from a takeaway shop or fast food restaurant (KFC, McDonalds, Burger King)</td>
<td>______ ml</td>
<td></td>
</tr>
<tr>
<td>Hotdog, fish, sausage from a takeaway shop</td>
<td>1 item</td>
<td></td>
</tr>
<tr>
<td>Burgers from a takeaway shop or fast food restaurant (KFC, McDonalds, Burger King)</td>
<td>1 burger</td>
<td></td>
</tr>
<tr>
<td>Other item from a takeaway shop or fast food restaurant (KFC, McDonalds, Burger King) (please describe)</td>
<td>1 item</td>
<td></td>
</tr>
<tr>
<td>Ready to eat pizza (takeaway shop or supermarket)</td>
<td>1 slice</td>
<td></td>
</tr>
<tr>
<td>KFC or other fried chicken</td>
<td>1 piece</td>
<td></td>
</tr>
<tr>
<td>Subway sandwich</td>
<td>1 6” roll</td>
<td></td>
</tr>
<tr>
<td>Kebabs or wraps (bought)</td>
<td>1 wrap</td>
<td></td>
</tr>
<tr>
<td>Sushi (bought)</td>
<td>1 piece</td>
<td></td>
</tr>
<tr>
<td>Chinese, Thai, or Indian meal or similar (bought)</td>
<td>______ ml</td>
<td></td>
</tr>
</tbody>
</table>

Comments?

86
How often have they eaten this food this month? Complete one frequency column only per food.

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

If more than once a day – how many times a day?

<table>
<thead>
<tr>
<th>Units</th>
<th>How many [units] would they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Drinks

1. Instant noodles
2. Cornflakes or rice bubbles
3. 100% orange juice (freshly squeezed or similar)
4. Other fruit juice (“Fresh up”, “Just Juice”)
5. Fruit drinks, Ribena, cordial, sachets
6. Regular fizzy drinks (lemonade, coke)
7. Diet fizzy drinks (lemonade, coke)
8. Tea (not herbal)
9. Coffee

Instructions for the participants:

- These questions ask how often and how much the 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?

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Units

How many ___[units]___ would they eat each time?

<table>
<thead>
<tr>
<th>1 White bread</th>
<th>1 toaster slice</th>
<th>2 White buns (not iced), crumpets</th>
<th>1 small bun or 1 crumpet</th>
<th>3 Wholemeal bread or bun</th>
<th>1 toaster slice or 1 small bun</th>
<th>4 Wholegrain bread or bun</th>
<th>1 toaster slice or 1 small bun</th>
<th>5 Crackers (wheat, rice or corn-based)</th>
<th>1 cracker</th>
<th>6 Rice cakes or rice wheels*</th>
<th>1 rice cake or 17 rice wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

**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?

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Units

How many ___[units]___ would they eat each time?

<table>
<thead>
<tr>
<th>106 Ice cream</th>
<th>107 Custard and other milk puddings</th>
<th>108 Puddings not yet described</th>
</tr>
</thead>
<tbody>
<tr>
<td>ml</td>
<td>ml</td>
<td>ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments?**

---

### Questions on the recording of individual episodes of food eaten

- How often have they eaten this food this month?
- How much did they eat each time?
- How many ___[units]___ would they eat each time?
- How often have you eaten this food this month?
- How much did they eat each time?
- How many ___[units]___ would they eat each time?

---

* Rice wheel = tiny kids' size rice cake (~ 50 cent coin in diameter)  * Rice cake = puffed rice crackers the size of a large cookie
### Food Frequency and Amount Table

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
<th>Units</th>
<th>How many (units) they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese (including in recipes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Yoghurt or dairy food</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White sauce or cheese sauce</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter (not in baking)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Margarine (not in baking)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cream or sour cream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Comments?</strong></td>
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</tbody>
</table>

### Additional Food Table

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
<th>Units</th>
<th>How many (units) they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weet-bix</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 weetbix</td>
</tr>
<tr>
<td>Fruity-bix or similar</td>
<td></td>
<td></td>
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<tr>
<td>Porridge</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cornflakes or ricebubbles</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cornflakes, honey puffs or puffed wheat cereal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nutrigain, Milo cereal or similar</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Muesli and &quot;Light&quot; muesli (e.g. &quot;Light and Tasty, Light and Right&quot;)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Other breakfast cereal (record name of main one)</td>
<td></td>
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<tr>
<td><strong>Comments?</strong></td>
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<td></td>
</tr>
</tbody>
</table>
### B. Rice and pasta

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
<th>If more than once a day – how many times a day</th>
<th>Units</th>
<th>How many [units] would they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>White rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Brown rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instant noodles</td>
<td></td>
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</tr>
<tr>
<td>Canned spaghetti</td>
<td>1 packet</td>
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</tr>
<tr>
<td>Other pasta (pasta only - not including sauce)</td>
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</tr>
<tr>
<td>Pizza (not takeaway) – base only</td>
<td>1 slice</td>
<td></td>
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</tr>
</tbody>
</table>

### H. Milk and dairy products

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
<th>If more than once a day – how many times a day</th>
<th>Units</th>
<th>How many [units] would they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavoured milk (including Milo, Quick, Drinking chocolate, Up-and-Go)</td>
<td></td>
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</tr>
<tr>
<td>Low-fat cows milk (green, lite blue, yellow-top) as a drink</td>
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<tr>
<td>Low-fat cows milk on cereal or other food (not custard or sauces)</td>
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<tr>
<td>Cows milk (blue, silver-top) as a drink</td>
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<tr>
<td>Cows milk on cereal or other food (not custard or sauces)</td>
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</tr>
<tr>
<td>Soy milk as a drink</td>
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</tr>
<tr>
<td>Soy milk on cereal or other food (including custard or sauces)</td>
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</tr>
<tr>
<td>Other milk (goat, rice) as a drink</td>
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</tr>
<tr>
<td>Other milk (goat, rice) on cereal or other food</td>
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</tr>
</tbody>
</table>

### Comments

1. Please make an entry in the tables when a child has eaten a food item.
2. Entries can be made in any of the frequency columns. For any item that children have eaten, please fill in the frequency column to indicate how often they have eaten this food this month.
3. Complete one frequency column only per food.
4. How much did they eat each time? Please enter the number of units they would eat each time for each food item.
### G. Cakes, biscuits, snacks

How often have they eaten this food this month?

Complete one frequency column only per food

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 Biscuits – chocolate coated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81 Biscuits – other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82 Cakes or slices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83 Muffins or scones</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84 Croissant, sweet buns, iced buns, pastries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85 Fruit bread, currant buns</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>86 Chocolate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87 Lollies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88 Crisps, corn chips, corn snacks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>89 Muesli, nut, cereal or puffed rice bars</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 Fruit leather, fruit strings, fruit roll-ups</td>
<td></td>
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<tr>
<td><strong>Comments?</strong></td>
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<td></td>
</tr>
</tbody>
</table>

### C. Fruit

How often have they eaten fruit this month?

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 Banana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Apples (fresh or canned)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 Apricots, plums or peaches (fresh or canned)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Pears (fresh or canned)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 Raisins or sultanas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Dried apricots or prunes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 Oranges, mandarins</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Comments?

---

*2 bobby bananas = 1 medium banana*
How often have they eaten this food this month? Complete one frequency column only per food.

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Kiwifruit</td>
<td>1 kiwifruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 Green grapes</td>
<td>1 grape</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 Black or red grapes</td>
<td>______ ml</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 Berries or cherries (fresh or frozen)</td>
<td>______ ml</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 Avocado</td>
<td>1 avocado</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>35 Rhubarb</td>
<td>______ ml</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 Other fruit</td>
<td>______ ml</td>
<td></td>
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</tr>
</tbody>
</table>

Comments?

F. Spreads

How much did they eat each time?

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 |
## D. Vegetables

<table>
<thead>
<tr>
<th>Food</th>
<th>Units</th>
<th>How many [units] would they eat each time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato salad or other potato eaten cold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato or kumara (boiled, baked, microwaved, mashed) eaten warm or hot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot chips, potato shapes, roast potato or kumara cooked at home eaten warm or hot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green peas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green beans</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments?
How often have they eaten this food this month?
Complete one frequency column only per food

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>46 Sweet corn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47 Broccoli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>48 Cauliflower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>49 Capsicum (peppers)</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>50 Red cabbage</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>51 Green cabbage</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>52 Spinach or silverbeet</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>53 Lettuce or salad leaves</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>54 Cucumber</td>
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<td></td>
<td></td>
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<tr>
<td>55 Raw tomato</td>
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<tr>
<td>56 Cooked tomato (pasta sauce, canned tomatoes, tomato sauce)</td>
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<tr>
<td>57 Leeks</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>58 Other vegetables</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>59 Chicken nuggets or shapes</td>
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<tr>
<td>60 Fish fingers or shapes</td>
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</tr>
<tr>
<td>61 Battered or crumbed fish</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>62 Other chicken (eg. roast, stir-fry, BBQ)</td>
<td></td>
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<td></td>
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<tr>
<td>63 Other fish (eg. canned, pan-fried)</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>64 Sausages, saveloys (including vegetarian)</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>65 Ham, bacon, luncheon, salami</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>66 Meat pies</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>67 Sausage rolls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68 Mince &amp; patties (from beef or lamb)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Comments?</strong></td>
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<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Food</th>
<th>Not eaten this month</th>
<th>Less than once a week</th>
<th>Once a week</th>
<th>2 times a week</th>
<th>3 times a week</th>
<th>4 times a week</th>
<th>5 times a week</th>
<th>6 times a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 Chicken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86 Fish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87 Battered or crumbed fish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88 Other fish (eg. canned, pan-fried)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>89 Sausages, saveloys (including vegetarian)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 Ham, bacon, luncheon, salami</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91 Meat pies</td>
<td></td>
<td></td>
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<tr>
<td>92 Sausage rolls</td>
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<td>93 Mince &amp; patties (from beef or lamb)</td>
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Appendix T Measurement protocol

<table>
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<th>P3b. Measurement Protocol</th>
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<tr>
<td><strong>Objectives:</strong></td>
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<tr>
<td>1. To undertake anthropometric measurements (weight, and height) of five-year old children</td>
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<tr>
<td>2. Record measurements immediately in the anthropometry data sheet.</td>
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<tr>
<td>3. Enter the measurements into Excel.</td>
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<table>
<thead>
<tr>
<th><strong>Equipment requirement</strong></th>
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<tbody>
<tr>
<td><strong>Measurement Protocol</strong></td>
</tr>
<tr>
<td><strong>Anthropometric data sheet</strong></td>
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<tr>
<td><strong>Tracking sheet containing child’s name parents’ names and their addresses</strong></td>
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<tr>
<td><strong>Stadiometer</strong></td>
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<tr>
<td><strong>Equipment Bag:</strong></td>
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<tr>
<td><strong>Scale</strong></td>
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<tr>
<td><strong>Hand sanitizer</strong></td>
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<tr>
<td><strong>Pencil (for recording results on data sheet) Eraser</strong></td>
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<tr>
<td><strong>Wipes</strong></td>
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<tr>
<td><strong>A measurement Card (to copy child measurements to mother).</strong></td>
</tr>
</tbody>
</table>

**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:
   a) 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.


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

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Maximum allowable difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.1kg</td>
</tr>
<tr>
<td>Length</td>
<td>0.7cm</td>
</tr>
</tbody>
</table>
**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**

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).
Protocol is based on the EAT-3 Advertising protocol, prepared by Jia Yun Fam
Thank you! 

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

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

Thank you very much for your help.

Appendix M

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.

• Where do any ingredients you give your child come from?

Please don't rely on your memory at the end.

On these days:

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

We would like you to please read through these pages before starting your food diary.
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 each column

<table>
<thead>
<tr>
<th>Office use</th>
<th>Where Time of day</th>
<th>Name, brand and cooking method</th>
<th>Weight of plate or mug</th>
<th>Weight of food or drink + plate or mug</th>
<th>Weight of leftover + plate or mug</th>
<th>Description of leftovers</th>
<th>Amount eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFFICE USE</td>
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</tbody>
</table>

1) Weigh an empty plate or mug using the scales provided.
   2) Write down the weight.
   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.
   2) Estimate how much of each food was left over (for example, half the potato).
   "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.

How to fill out your Diet Record:
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

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Name, brand and cooking method</th>
<th>Weight of plate or mug</th>
<th>Weight of food or drink + plate or mug</th>
<th>Weight of leftover + plate or mug</th>
<th>Description of leftovers</th>
<th>Amount eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home 7:30am</td>
<td>2 slices white bread toast slice, Tip Top, toasted Butter, Mainland salted Marmite, Sanitarium</td>
<td>115g</td>
<td>165g</td>
<td>170g</td>
<td>1/3 leftover</td>
<td>179g</td>
</tr>
<tr>
<td>At Café with Gran</td>
<td>Fruit cake Bobby banana Water</td>
<td>4 match boxes</td>
<td>medium</td>
<td>1 medium glass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>McDonald’s</td>
<td>Cheeseburger Medium fries (from supplementary page) McDonald’s lemonade</td>
<td>1</td>
<td>45g</td>
<td>small</td>
<td>1/8 leftover</td>
<td></td>
</tr>
<tr>
<td>Home 3pm</td>
<td>Tasti milkies muffin bar - choc vanilla</td>
<td>20g</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Home 6pm</td>
<td>Home-made mince (see recipe) Potato, boiled Butter Peas, frozen, boiled Just Juice, Orange and mango fruit juice</td>
<td>175g</td>
<td>42g</td>
<td>414g</td>
<td>419g</td>
<td>459g</td>
</tr>
</tbody>
</table>

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.
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

Ingredients:
- 300g standard beef mince (browned in 1 tablespoon olive oil)
- 50g onion, diced
- 60g carrot, diced
- 1 clove garlic, minced
- 60g beef stock (Campbells)
- 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).

Supplementary Pages – Takeaway Foods Estimation Guide

Example:

1. Name of recipe: Hawaiian Pizza
2. Any water added?
3. Amount of each ingredient (for example, 3 medium carrots, 500g lean beef mince etc)
4. The proportion of the whole recipe that your child was served in the diary (for example, "one quarter (1/4)"

Example:

Hawaiian Pizza

Ingredients:
- 50g onion
- 60g tomato sauce
- 60g cheese

Cooking method:
Pizza was baked in the oven.

One quarter (1/4) of the pizza was served to my child.

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).
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).

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:
- Households measures like cups, tablespoons and teaspoons can be useful. Please tell us whether it was a heaped or level amount.
- Weights marked on packages – 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 lunchtime sausage 8cm x 4cm x 1cm.
- Bread – Tell us the number and size of the slices e.g., sandwich, medium, or toast slice.
- Fruit – Tell us whether the piece of fruit is small, medium or large.

TAXEWAY FOODS

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

Takeaway foods

Please record the amount 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 3

**Supplement Use**

- Did your child take any supplements today? Include anything you consider to be a supplement to your child's diet (e.g., multivitamin, etc.).
  - **No** (please go to page 20)
  - **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., 6 x 2 mls x 5 drops x 2 tablets):
      - **Date of administration** (a.m./p.m./dose):

- Does the supplement contain iron or zinc? (check the label)
  - **No**
  - **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):

If you have any questions or need assistance, please let us know. Thank you for your cooperation.
<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Brand and Cooking Method</th>
<th>Weight of Plate or Mug</th>
<th>Weight of Food or Drink + Plate or Mug</th>
<th>Weight of Leftover + Plate or Mug</th>
<th>Description of Leftover</th>
<th>Amount Eaten</th>
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<tr>
<td>Day</td>
<td>Time of Day</td>
<td>Name, Brand and Cooking Method</td>
<td>Weight of Plate or Mug</td>
<td>Weight of Food or Drink + Plate or Mug</td>
<td>Weight of Leftover + Plate or Mug</td>
<td>Description of Leftovers</td>
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</tbody>
</table>
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:
- Description of tablet (e.g., 2 x 10mg, x 30 tablets):
- 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):

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

- No
- Yes

Describe your child’s eating habits while taking the supplement:

- Are your child’s eating habits actually worsened by taking supplements?
- Yes
- No

If your child is unwell:

- Does this influence your child’s appetite?
- Yes
- No

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Name, brand and cooking method of food or drink</th>
<th>Amount of food or drink + plate or mug</th>
<th>Weight of leftovers + plate or mug</th>
<th>Weight of plate or mug</th>
<th>Description of leftovers</th>
</tr>
</thead>
</table>

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

Date:  
Day of week:  
Is your child unwell?  
Did this influence your child’s appetite?
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 (e.g. 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).

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 (e.g. 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).
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., multivitamin, etc.).

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.

Is your child unwell?
- Yes
- No

If unwell, did this influence your child’s appetite?
- No
- Yes – decreased appetite
- Yes – increased appetite

Date:

Day of week:

Is your child unwell?

Supplement Use – Day 2
<table>
<thead>
<tr>
<th>Time of day</th>
<th>Name, brand and cooking method</th>
<th>Weight of plate or mug</th>
<th>Weight of food or drink + plate or mug</th>
<th>Weight of leftover + plate or mug</th>
<th>Description of leftovers</th>
<th>Amount eaten</th>
</tr>
</thead>
<tbody>
<tr>
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Day 2 continued
WDR patterns for EATS

ALH24Feb15

Criteria:
3 non-consecutive days (i.e. need to use one of these days each week over 3 weeks)
1 weekend day and 2 weekdays
Start on the day after the interview
Approximately equal numbers of each day of the week

To use:
Find the "WDR Handout" day that applies to the day the 1st interview is completed
Use the next unused pattern for that "handout" day

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<th>T</th>
<th>W</th>
<th>Th</th>
<th>F</th>
<th>Sat</th>
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