

The association between parent and child dietary patterns

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A thesis submitted for the degree of
Master of Science
at the University of Otago, Dunedin, New Zealand

February 2016

Abstract

Previous research investigating the relationship between parents' and children's diets has focused on single foods or nutrients. Dietary patterns are a tool that allows the whole diet to be assessed, and may therefore be used as a measure of diet quality. Two types of methods are commonly used to determine diet quality: empirical and theoretical. Empirical patterns are derived using statistical techniques, such as principal component analysis, whereas, theoretical patterns measure how closely people adhere to certain diets. The aim of this thesis is to determine if parent diet quality (theoretical) is associated with children's dietary patterns (empirical), and if these relationships differ between boys and girls.

Food consumption, demographic and lifestyle information was collected from 338 children aged 9-11 and their parents. The children's dietary intake was measured using a validated food frequency questionnaire. This information was then used in principal component analysis to derive dietary patterns. The parents completed a Dietary Habits Questionnaire to assess their dietary intake; this was then used to calculate diet quality using a Diet Quality Index. Regression models were used to examine associations.

Principal component analysis produced three children's dietary patterns: 'Processed Foods', 'Low Fibre Foods' and 'Basic Foods'. Boys had a significantly higher score for the 'Processed Foods' pattern compared to girls (mean difference=0.22, $P=0.039$). Parent diet quality was negatively associated with the children's 'Low Fibre Foods' pattern ($P<0.001$). No associations were found between parent diet quality and the other children's dietary patterns. Non-significant interaction terms showed that the relationship between parent diet quality and children's dietary patterns were not different between boys and girls, and was unaffected by which parent completed the questionnaire.

These results indicate that boys have a more frequent intake of processed foods compared to girls, and that parents with a lower quality diet have children with a more frequent consumption of low fibre foods, such as white bread, sugary drinks, crisps and hot chips.

Preface

This MSc project was part of the Physical Activity, Exercise, Diet and Lifestyle Study (PEDALS), which was run out of the Department of Human Nutrition at the University of Otago. PEDALS ran from April to November 2015, however only data entered and cleaned before the 6th of November 2015 were included in this thesis. The main aims of PEDALS were to collect information about children's (aged 9-10 years) food choice, physical activity, cardiovascular health and fitness levels, as well as information about their primary caregivers' food choice and physical activity. In addition to this, the study aimed to determine psychological, social, and environmental factors associated with all of these. The focus of this thesis was to investigate the relationship between parent and child dietary patterns, and to determine if this relationship differs between girls and boys.

As part of this thesis, the MSc candidate:

- Contributed to drafting the ethics application
- Participated in training for data collection, including anthropometric and Sphygmocor training
- Taught new team members the skills required for data collection, including anthropometric measurements, running the fitness test and administering the children's questionnaires
- Responsible for the initial contacting of school principals via phone and email to recruit schools into the PEDALS Study
- Led meetings with school principals and staff to discuss the PEDALS Study and confirm enrollment
- Worked with the research team to assemble the information and consent packs
- Presented the PEDALS Study to eligible school students and distributed information and consent packs
- In charge of collecting mail consent forms and organised online consents; entered all information from these into school databases on Excel
- Coordinated and updated the PEDALS Study calendar
- Responsible for organising school visits this included ensuring enough research assistants were available for each school visit, assigning roles to research assistants

as well as briefing researchers prior to each school visit to ensure the smooth running of data collection.

- Coordinated school visits and liaised with school principals and staff during data collection
- Collected anthropometric, Sphygmocor, questionnaire and physical fitness data with research team during all school visits
- Responsible for sending text message reminders to parents three times per week to complete questionnaires, and return questionnaires and activity monitors to school; required to be available at all times during school term for parents and teachers to call with any questions or concerns
- Also responsible for the study email for parents and schools to contact with questions and online consents, and to send reminders to schools about upcoming visits
- Accountable for following up missing consent information, and worked with others to chase up missing questionnaires and activity monitors
- In charge of designing and preparing participation certificates, and organising movie vouchers for children
- Reported back to the Primary Investigator about how the study was progressing
- Entered data from Parent Questionnaire One into an Excel spreadsheet
- Interpreted and reported results from the principal component analysis that was run to identify the children's dietary patterns
- Calculated the Diet Quality Index scores for the parents' dietary patterns

The Primary Investigator Dr. Paula Skidmore cleaned the data and performed the principal component analysis. Dr. Jillian Haszard (Biostatistician, Department of Human Nutrition, University of Otago) performed statistical analyses, including t-tests, interaction terms, linear regressions and mixed regressions. The candidate was responsible for re-running the statistical analyses, and interpreting and tabling the data. Dr. Haszard also provided guidance on how to correctly write up the Statistical Analysis section in the Methods.

Acknowledgements

The biggest thank you to everyone in the PEDALS team. You persevered through rain and snow; without your tireless work this project would have never been possible. Harriet and Pouya, I could not have asked for more hard working and supportive colleagues. Thank you to all the children, parents and school staff for giving up their time and taking part in our study.

Thank you Dr. Paula Skidmore, Associate Professor Sheila Skeaff and Dr. Katherine Black for guiding me through the tough times. Thank you for your wisdom and support, and for believing in me when I doubted myself. A further thank you to Dr. Jillian Haszard for all of your statistical help and thesis guidance.

To the University of Otago and the Department of Human Nutrition for my Master's scholarships. You provided me with opportunities I will be forever grateful for. Also a big thank you to Anne Morrison and Madeline Sim. You always pointed me in the right direction and helped with my endless requests.

To the postgrad students in my office. Thank you for the good times and the endless laughs. You taught me many things and always gave me the pick me up I needed.

To my Dunedin flatmates Alissa, Bridget and Nani. You were my family away from home. I will never forget our adventures together and the smiles we shared. Thank you William for always answering the phone. I could not have survived these last two years without you.

Thank you to Louise, Aunty Sue and Uncle Jacques. Your guidance and encouragement throughout my university years were a blessing.

Finally, thank you to Mum and Dad for showing me the importance of hard work, perseverance and remembering to have fun. You taught me well in the time you had and I hope I have made you proud.

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List of Abbreviations

AHEI	Alternative Healthy Eating Index
ALSPAC	Avon Longitudinal Study of Parents and Children
ANS	2008/09 New Zealand Adult Nutrition Survey
β	Regression coefficient
BIA	Bioelectrical impedance analysis
BMI	Body mass index
CCLaS	Cork Children's Lifestyle Survey
CEHQ	Children's Eating Habits Questionnaire
DASH	Dietary Approaches to Stop Hypertension
DHQ	Dietary Habits Questionnaire
DQI	Dietary Quality Index
FFQ	Food Frequency Questionnaire
GIS	Geographic Information Systems
HBSC	Health Behaviour in School-Aged Children Study
HEI	Healthy Eating Index
IDEFICS	Identification and Prevention of Dietary- and Lifestyle-Induced Health Effects in Children and Infants Survey
NHANES	National Health and Nutrition Examination Survey
NZDep13	New Zealand Deprivation Index 2013
OSSLS	Otago School Students Lifestyle Survey
OSSLS2	Otago School Students Lifestyle Survey Two
PARQ	Physical Activity Readiness Questionnaire
PCA	Principal Component Analysis
PEDALS	Physical Activity, Exercise, Diet and Lifestyle Study
r	Correlation coefficient
R^2	Coefficient of determination
RPAQ	Recent Physical Activity Questionnaire
SPEEDY	Sport, Physical Activity and Eating Behaviour: Environmental Determinants in Young People Study
UK	United Kingdom
US	United States of America
YPAQ	Youth Physical Activity Questionnaire

1. Introduction

The prevalence of childhood obesity is rapidly growing worldwide (1). This trend is of concern due to the negative health effects associated with increased body mass. Cardiovascular disease, type 2 diabetes, hypertension and some cancers have been linked to childhood obesity (2). Overweight and obesity, and the associated health outcomes, are now recognised as major contributors to the global burden of disease (2). Increased energy consumption and decreased levels of physical activity are major risk factors for overweight and obesity. The energy equation is unbalanced when more energy is consumed than is being expended, resulting in weight gain over time. Improving diet is a crucial part of rebalancing this equation. Focusing on diet quality is particularly important, as low quality diets are associated with high intakes of unhealthy, energy dense foods (i.e. foods high in saturated fat, sugar and salt) (3). Improving diet quality reduces the consumption of these foods and replaces them with nutrient dense, lower energy foods. Attending to this problem in childhood is particularly important as dietary habits developed early in life continue into adulthood (4).

Many studies have investigated children's dietary intakes. However, this research typically focuses on individual foods or nutrients. This is a significant limitation as it is unrealistic to assume that people consume foods in isolation. Instead it is important to recognise that people consume meals and that there are synergistic relationships between food and nutrients (5). To consider the diet as a whole, dietary patterns can be used. These take into account the combinations of foods consumed and have been increasingly used alongside individual dietary intakes. Dietary patterns can be derived theoretically or empirically (6). Theoretical dietary patterns are often used to determine how closely people adhere to a certain diet, whereas empirical dietary patterns use statistical techniques to derive specific patterns for a population of interest.

Social and environmental factors have been associated with children's dietary intakes (7, 8). More specifically, the influence of parents on children's consumption has been heavily researched. Several studies show that for some food groups there is a relationship between parent and child intakes (9-11). However, there has been little

investigation into the relationship between parent and child dietary patterns. The use of empirical dietary patterns to examine this association is lacking in the published research.

The aim of this thesis was to use cross-sectional data from the Physical Activity, Exercise, Diet and Lifestyle Study (PEDALS) to derive parent and child dietary patterns, and to determine if a relationship exists between them.

2. Literature Review

This literature review explores the current published research to describe and discuss: 1) how dietary patterns are derived and used in adults and children; 2) the influences on children's food choices; and 3) the types of dietary assessment used in children including the importance of accurate, validated tools.

2.1 Literature Search Methodology

The article databases PubMed, Scopus, Science Direct and Google Scholar were searched. The reference lists of relevant articles and reviews identified from the database searches were also used to identify relevant papers.

Search terms used to identify papers about dietary pattern derivation were: dietary patterns, food patterns, eating patterns, empirical*, theoretical*, principal component analysis, PCA. To identify papers investigating the use of dietary patterns in adults and children the additional terms were used: children, adults, determinants, association.

Search terms used to identify the influences of children's food choices were: dietary intake, food choice, child*, determinants, influences, child dietary consumption. To find papers specifically looking at the influence of parents' dietary intake and dietary patterns on children's food choices, the additional terms were used: parent*, family correlates, diet quality. The term diet quality was added after the initial search as no papers were identified for children aged 8-12 years without the inclusion of this term. For the influence of parents' dietary intake on children's dietary intake, papers from 2013 onwards were originally included (excluding review articles), however there was limited research from that time frame so the period was extended to 2010. Seventeen studies met the additional inclusion criteria for this section.

Search terms used to identify types of dietary assessment used in children were: dietary assessment methods/tools, child*, validated. A separate search was completed after this focusing on food frequency questionnaires (FFQ), as this was the dietary assessment method used in this thesis project. Additional terms used in this search were: food frequency questionnaires, FFQ, school-aged.

Papers for each section were only included if the study samples had children between the ages of 8-12. However, this age range was extended for the dietary patterns section as little research has been undertaken in this age group, with most of the literature focusing on younger children and adolescents.

2.2 Dietary Patterns

2.2.1 What are dietary patterns?

Previous research in nutrition epidemiology has typically focused on single nutrients or foods, however, this method can be unrealistic as people consume meals, not single nutrients or foods in isolation. It is important to consider food interactions that occur when foods are eaten together. This has led to the development of dietary patterns (12). Dietary patterns, also known as eating or food patterns, are defined as “foods as they are consumed in various characteristic combinations” (6). These patterns are shaped by environmental, religious and cultural factors (13). In recent decades dietary patterns have been used increasingly to investigate the role of nutrient and food intake in relation to disease risk. They have become particularly helpful as populations move away from nutrient deficiency diseases to more complex chronic conditions (14). Dietary patterns have an advantage over measuring single food intakes because they allow the whole diet to be examined, taking into account synergistic relationships between food and nutrients (5). For example, examining single nutrients alone cannot account for changes in bioavailability or absorption of nutrients seen when foods are consumed together. Dietary patterns also consider the changes that occur in people’s diets when the consumption of one food group alters. For example, people who consume less meat and meat products, tend to consume more fruit and vegetables (13). This is important to note because it is this combination of food that will impact a person’s health, not just the low meat intake or the high fruit and vegetable intake. Based on these qualities, it has been acknowledged by many experts that dietary patterns are highly representative of real world conditions and should be used in disease prevention research (13). Dietary patterns are now used as an alternative or complementary method for analysing dietary data (13).

2.2.2 Analysing dietary patterns

Two main methods are currently used to examine dietary patterns in the literature: the theoretical or *a priori* approach, and the empirical or *a posteriori* approach (6, 15). The

a priori approach was the original method used in nutritional epidemiology to analyse dietary patterns. This method is based on dietary guidelines, which themselves are centered around existing knowledge of diet and disease risk (15). Dietary indices and scores are used to measure how well a person or population is adhering to dietary guidelines. When used as a measure of adherence, risk of disease can be estimated. In theory, a higher adherence equates to a healthier or higher quality diet, and therefore a lower risk of disease (15). For example, the Healthy Eating Index (HEI) is used to measure how well an individual's diet conforms to the food pyramid developed by the US Department of Agriculture (16). Points are given for the consumption of a variety of fruit, vegetables and grains, as well as meat, milk, legumes, oils and saturated fats. The closer an individual's diet is to 100, the higher their adherence to the dietary guidelines (15). The HEI has been widely used throughout the United States and the rest of the Western world. This index was first developed in 1995 and has since been revised twice (15). Schwingshackl and Hoffmann published a systematic review and meta-analysis examining studies measuring diet quality via the HEI (all revisions) (17). When the highest and lowest diet quality categories were compared, a higher score for the HEI was associated with a significantly decreased risk of all-cause mortality, cardiovascular mortality and incidence, cancer mortality and incidence, and type 2 diabetes ($P < 0.001$ for all outcomes). The reduction in all-cause mortality risk was the largest of all the outcomes with a risk reduction of 22%. Despite these positive results, the HEI was not associated with a reduction of neurodegenerative disease risk (17). Further examples of commonly used indices are the Alternative Healthy Eating Index (AHEI), the Mediterranean Diet and the Dietary Approaches to Stop Hypertension (DASH) diet (14). Dietary indices are useful because they are comparable and easy to interpret. However, they are limited to current knowledge which is incomplete, and do not provide new information on diet and disease risk. There has also been debate over which dietary guidelines and indices to use for each disease state. For example, the AHEI was found to be more strongly associated with reduced risk of heart disease compared to the HEI (16, 18). Experts believe this is because the HEI was developed to maintain general good health, whereas the AHEI was based on findings from diet and disease studies (18). This highlights the importance of selecting the appropriate guideline for specific situations.

In contrast to the *a priori* approach, the *a posteriori* method uses statistical techniques such as principal component (PCA), factor or cluster analysis (13). These patterns are data driven, unlike theoretically derived patterns. PCA is the most commonly used empirical method to derive dietary patterns in nutritional epidemiology (18). The first step is to collect the dietary data from the population of interest. Commonly used methods are diet records, 24-hour recalls and FFQs (18). Food items from the original dietary data can be entered directly into a statistical program, or they can be pre-grouped if the data set is very large or if there are foods of similar nutritional quality. For example whole milk, cream, sour cream, ice cream and cream cheese may be grouped as “high fat dairy products” (19). During statistical analysis the original data set is condensed. An advantage of this type of analysis is that it reduces a large number of variables into a smaller set while retaining much of the variance from the original data (13). From the smaller number of variables, patterns are derived. These patterns are based upon intercorrelations between dietary items (6). Orthogonal rotation can also be used to produce uncorrelated factors and therefore improve the interpretability of the results (18, 20). Empirical methods of deriving dietary patterns are advantageous because they allow for specific patterns to be produced for the population of interest (15). However, there is the opportunity for bias to arise throughout the derivation process. Arbitrary decisions need to be made at several steps (13). For example, grouping of food items, number of components to extract and naming of patterns (6). To avoid this subjectivity, the use of standardised practices should be employed. Questions have also been raised about how comparable empirically derived dietary patterns are across different studies (18). Each study that uses data driven techniques has different food combinations and makes decisions that are potentially subjective. However, Hu *et al.* found that despite these considerations, empirically derived patterns were valid and reproducible (19). In this study, 127 males were recruited to complete a 131-item FFQ twice, and two 1-week diet records over 12 months. Factor analysis was used to derive two dietary patterns: the Western diet and the Prudent diet. The reliability correlations between the two FFQs for the Western pattern were 0.67, and for the Prudent pattern 0.70 (19). Correlations were also found between the diet records and FFQs. Though there were some differences in the factor loadings for the food items between the food diaries and FFQs, this was most likely due to the differences in dietary assessment methods (19). Two further studies in Sweden and Japan have also found empirically derived dietary patterns (Western and Prudent/healthy) to be valid

and reproducible when compared to diet record data (21, 22). The Western diet and the Prudent diet are patterns that are commonly derived in nutrition epidemiology (15). Foods characteristic of the Western diet are red and processed meats, butter, potatoes, refined grains and high fat dairy. This is considered a less healthful dietary pattern. The Prudent diet is a contrast to the Western pattern. The Prudent dietary pattern is high in vegetables, fruits, legumes, fish, seafood and whole grains. When compared to the Western diet, the Prudent diet has been associated with reduced incidence of cardiovascular disease and slower progression of atherosclerosis (15).

Table 2.1 Strengths and limitations of theoretical dietary patterns¹

Theoretical Dietary Patterns - <i>a priori</i>	
Strengths	Limitations
Based on scientific evidence.	Based on current knowledge of diet-disease risk – this knowledge may not be complete and it is unknown if guidelines lead to “optimal” health.
Easy to compute and are therefore reproducible and comparable.	Lack of consensus on what is the “healthiest” diet.
Good for measuring adherence to guidelines and diet quality of population.	Does not provide new information about diet and disease.
Results are easy to understand and interpretable by health professionals and public.	Only focus on selected aspects of the diet therefore do not describe overall dietary pattern. Bias can be introduced when interpreting guidelines and during the construction of the scores through the choice of foods to include, defining cut-offs and setting scores for food components.

¹ Reference from Michels and Schulze, 2005 (16); Moller *et al.*, 2007 (18); Ocké, 2013 (15); Tucker, 2010 (14).

Table 2.2 Strengths and limitations of empirically derived dietary patterns¹

Empirically Derived Dietary Patterns - <i>a posteriori</i>	
Strengths	Limitations
Reduces a large set of dietary variables into a smaller number of factors while retaining much of the variance from the original data.	Relies on arbitrary decisions that can lead to bias: how to group food items, number of components to extract, rotation method, naming of patterns.
Allows relationships to be detected that may have been undiscovered by current research.	Difficult to compare patterns across populations as differences may be due to how patterns were developed rather than real differences.
Allows specific patterns to be derived for population of interest.	Extracted patterns can be difficult to interpret or may not be meaningful.

¹ Reference from Hu, 2002 (23); Moller *et al.*, 2007 (18); Newby and Tucker, 2004 (6); Panagiotakos, 2008 (13).

2.2.3 Application of dietary patterns in adults

In recent years dietary patterns, both theoretical and data driven, have been increasingly used in adult populations. Several reviews have been published analysing the use of dietary patterns and diet-disease relationships (24-26). Liese *et al.* investigated four commonly used dietary patterns in large-scale cohort studies, including the NIH-AARP Diet and Health Study, the Multiethnic Cohort, and the Women's Health Initiative Observational Study (24). The DASH, HEI, AHEI and alternate Mediterranean diet scores were found to be associated with decreased all cause mortality, CVD mortality and cancer mortality. Participants were categorised into quintiles; those in quintile five had the highest scores and therefore adhered more closely to the dietary pattern. When quintiles one versus five of dietary intake were compared, female individuals in quintile five had a 18-26% decreased risk of all cause mortality, a 19-28% decreased risk of CVD mortality and a 11-23% decreased risk of cancer mortality (24). Similar risk reductions were also found in male participants. The only exception to these results was that the AHEI was not associated with cancer mortality in the Women's Health Initiative Observational Study. Important food groups in the DASH, HEI, AHEI and alternate Mediterranean scores that are likely to be responsible for these improved health outcomes are whole grains, vegetables, fruit and plant based protein. Significant intakes of poly- and monounsaturated fats, which are part of all the scores except the DASH score, may be contributing to the positive results seen in this study. Low sodium intakes that are part of HEI, AHEI and DASH scores might also be playing a role in this change in disease risk.

Carlton *et al.* also found positive associations between "healthy" dietary patterns and reduced disease risk over 15 prospective and intervention studies (25). The aim of this review was to assess the protective effects of empirical and theoretical dietary patterns, and their components, on Metabolic Syndrome. The constituents of Metabolic Syndrome included in this review were waist circumference, blood pressure, blood glucose, high-density lipoprotein cholesterol and triglycerides. Calton *et al.* found that higher adherence to the Mediterranean, DASH and Nordic diets reduced the risk of developing the components of Metabolic Syndrome. Important food combinations that are common between these three dietary patterns are fruits, vegetables, whole grains and dairy. Evidence from descriptive and intervention studies support the intake of these food groups to attenuate disease risk (25). The food groups identified in this

review as being “health giving” are similar to the ones identified in the Liese *et al.* study discussed previously. Carlton *et al.* also found that the incidence of Metabolic Syndrome increased with adherence to the Western diet. The consumption of meats and processed convenience foods that were high in salt, sugar and saturated fat, as well as the decreased intake of fruits and vegetables, were suggested to be responsible for this increased disease risk (25). Results from North American and Asia-Pacific studies highlight that the typical Western diet not only leads to increased weight gain but also negatively impacts other health outcomes.

Data-driven dietary patterns are being increasingly used in diet-disease research, as demonstrated by a review published in 2014 focusing on associations between *a posteriori* dietary patterns and risk of type 2 diabetes (26). This meta-analysis included nine cohort studies with a total of over 300,000 participants. The two main dietary patterns influencing the development of type 2 diabetes were Western and prudent. Those in the highest adherence category of the prudent diet had a 15% decrease in risk of developing type 2 diabetes compared to those in the lowest adherence category (26). When the same categories were compared with a Western dietary pattern there was a 41% increased risk of developing type 2 diabetes for those with the highest adherence. (26). This combined body of evidence suggests that moving towards a more prudent diet could reduce the burden of type 2 diabetes on global health.

2.2.4 Application of dietary patterns in children

Theoretical and data driven dietary patterns have been used extensively with adults and are a valid measure of diet quality in this group. Evidence that dietary indices and scores are valid in children is more limited (15). However, a recent systematic review of diet quality indices and their associations with health-related outcomes in children shows that significant work is being undertaken in the area (27). Eighty dietary indices were identified in this review, many of which were associated with environmental, behavioural and maternal factors. The authors suggest that further cohort, intervention and validation studies are needed to be able to use these indices to assess disease risk (27). Therefore, this thesis will focus only on data driven dietary patterns in children.

2.2.5 Influences on children's dietary patterns

Research using PCA to derive dietary patterns in children is a relatively new field of interest. Studies are being conducted around the world looking at a variety of factors. For example, a study examining the associations between food involvement, frequency of family dinner meals and dietary patterns in children aged 10-12 was undertaken in Australia (28). This study of 155 children derived two dietary patterns using PCA: energy-dense and healthful. The energy-dense pattern was characterised by savoury flavoured biscuits, potato chips, energy-dense drinks, biscuits, cakes and pastries. In contrast to this, the healthful pattern was characterised by water, reduced fat milk, dried and fresh fruit, and vegetables. After adjustment for potential confounders, it was found that having daily family dinners was positively associated with the healthful dietary pattern in boys. No association was found for girls. Socioeconomic factors have also been shown to be associated with dietary patterns in children. A Scottish study involving 5-11 year olds (n=721) found that a fruits and vegetables dietary pattern was positively associated with the education level of the main food provider (P for trend 0.001 boys and 0.013 girls) (29). This pattern was characterised by frequent intakes of fruits, vegetables and rice. The snacks dietary pattern (frequent intakes of white bread, processed meat, fast foods and sweet treats) was inversely associated with household income in boys and positively associated with level of deprivation in girls ($P=0.025$ and $P=0.012$, respectively). A Spanish study reported similar results (30). A snack dietary pattern was inversely associated with the education level of the mother, whereas, a healthy pattern was positively associated with mother's education level. The snack dietary pattern was characterised by a higher consumption of bakery products, sweets, salted snacks and soft drinks. Conversely the healthy pattern was characterised by the intake of fruits, vegetables and fish.

A key group that has extensively used PCA to derive children's dietary patterns is the Avon Longitudinal Study of Parents and Children (ALSPAC). This study is a longitudinal birth cohort study, which recruited pregnant women from southwest England in the early 1990s (31). A cohort of 14,500 women was established, with nearly 14,000 children participating from 12 months of age (32). Over the past two decades participants from this cohort have been involved in medical, psychological, education and lifestyle choice research.

ALSPAC has published several papers investigating factors that have a relationship with children's dietary patterns. For example, some interesting associations have been found between children's dietary patterns and their mothers' history of eating disorders (31). Before the children were born, pregnant mothers completed a questionnaire about disordered eating. Mothers with the help of their children (when they were old enough) also completed FFQs when the children were three, four, seven and nine years of age. This information was used to derive the children's dietary patterns. Dietary patterns that were associated with past eating disorders in mothers were health conscious and traditional. The health conscious pattern had high loadings of vegetarian foods, nuts, pasta, salad and fruit. In contrast, the traditional pattern was characterised by meat, poultry, potato and vegetables. Children in the exposed group (a mother with a history of anorexia nervosa or bulimia nervosa) scored significantly lower on the traditional dietary pattern at all four ages measured, compared to children in the unexposed group (mothers with no history of eating disorder). The opposite was true for the health conscious dietary pattern. Children in the exposed group scored higher on the health conscious dietary pattern compared to unexposed children ($P < 0.001$ and $P = 0.013$ for anorexic and bulimic mothers, respectively). Authors from this paper concluded that mothers with a history of disordered eating were more conscious of feeding their children healthy foods (31). Such a focus on health may also influence children's eating habits later in life, however further research is needed to determine the direction of this influence.

ALSPAC have also found associations between children's dietary patterns and the physical location of their home (32). Morris *et al.* compared dietary patterns between 10 year-old children living in rural and urban areas, based on data from three-day diet records. Data from approximately 6,500 children was used to derive three dietary patterns: health conscious, traditional and packed lunch/snack. Health conscious and traditional dietary patterns were characterised as discussed in the previous paragraph. The packed lunch/snack pattern loaded highly for foods often found in children's packed lunches, such as white bread, sandwich fillings, potato chips and chocolate. Results found that children that lived in the most rural areas had the highest scores for the health conscious pattern and the lowest scores for the packed lunch/snack pattern (32). The traditional dietary pattern was not associated with rural or urban living. This

evidence suggests that children living in rural areas are consuming healthier diets than children from urban households.

To date there is no current data detailing the influences of primary school-aged children's dietary patterns in New Zealand. There is one study investigating younger children and two studies working with adolescents (33-35).

The Auckland Birthweight Collaborative Study recruited mothers of newborns between 1995 and 1997 (33). The children were classified as small for gestational age (SGA) or of normal weight, based on the national birthweight percentile. The study recruited 1,714 mother-child pairs. The children were followed up between the ages of three and half, and four, and then between seven and a half, and eight years of age. At both follow up interviews the mothers completed a semi-quantitative FFQ for their child. The first questionnaire included 71 food items and the second questionnaire had 77 food items. The final sample used for the dietary pattern analysis was restricted to a European population due to the low response rates of other ethnic groups (n=550 at three year follow up; n=591 at seven year follow up). Using PCA, the researchers derived three dietary patterns at both follow up points: junk food, traditional and healthy. The junk food pattern was characterised by candy bars, hamburgers, soft drinks, chips, chocolate and lollies (in New Zealand lollies are sweets). The healthy dietary pattern included a variety of vegetables and mixed grain bread, and loaded negatively for white bread. Finally, the traditional pattern loaded highly for potatoes, mixed vegetables, cauliflower, pumpkin and beef. At the age of three and a half, the junk food diet was associated with maternal smoking in pregnancy, maternal BMI, no attendance of antenatal classes and younger maternal age at pregnancy. At the same age, the healthy diet was associated with the mother being married when pregnant. The traditional diet had no significant associations with the mother's characteristics at age three and a half. However, at age seven, this dietary pattern was positively associated with being born SGA, being male, maternal smoking and younger maternal age at pregnancy. This study highlights that dietary patterns stay relatively consistent throughout early childhood, and that they are influenced by a variety of factors that occur during the pregnancy period, as have been discussed. However, due to the limited years of follow up it cannot be known if these factors persist into the preadolescent years.

Two studies based in Otago have investigated the influences of dietary patterns in adolescents. The first was the Otago School Students Lifestyle Survey (OSSLS), conducted at the end of 2009 (35). All students in years nine and ten (mean age 14.1 years) at schools in the Otago area were eligible to participate. One of the objectives for this study was to identify correlates of ‘dieting’ in New Zealand adolescents. Students completed an online survey, this included questions on diet, physical activity and lifestyle. An FFQ was used to collect dietary information. Data from 1,329 students was available for the final analysis. PCA was used to derive three dietary patterns: treats, fruit and vegetables, and breakfast foods. The treats pattern loaded highly for chocolate, sugar-sweetened drinks, sweets, potato chips and hot chips. Conversely, the fruit and vegetable pattern was characterised by fruits, vegetables and brown bread. Lastly, the breakfast foods pattern loaded highly for full-fat milk, breakfast cereal and white bread. After further statistical analysis no associations were found between any of the dietary patterns and dieting status. However, attitudes towards foods did differ between dieters and non-dieters.

The second Otago based survey investigating adolescent dietary patterns was the Otago School Students Lifestyle Survey Two (OSSLS2) (34). This survey was similar to the first OSSLS but this time focused on year 11-13 students (age 14 to 18 years). An important objective of this study was to examine associations between dietary patterns and several body composition measurements. Researchers also wanted to determine if this differed between boys and girls, and if any associations were moderated by dieting status. The students completed an online survey, similar to the one in the previous study. PCA was again used to derive the dietary patterns. Three patterns similar to those found in OSSLS were derived: treat foods, fruits and vegetables and basic foods. The treat foods, and fruit and vegetable patterns consisted of the food items discussed in the previous study. The basic foods pattern was also very similar to the breakfast foods pattern but given a different name in this study. After further statistical analysis basic foods was the only dietary pattern to be significantly associated with body composition. One standard deviation increase in the basic foods score was associated with a 3.6% decrease in fat mass index. When separate sex analysis was undertaken significant associations between dietary patterns and body composition were found for boys only, and only with the basic foods pattern. When the basic foods score increased,

waist circumference, waist-to-height ratio, fat mass index and fat-free mass index decreased. These results are interesting as they indicate dietary patterns are not associated with girl's body composition or with BMI in this age group.

From the studies discussed above it is clear that there needs to be further New Zealand and international research looking at what factors influence the dietary patterns of preadolescents. It is also important to note that several of the studies investigated the influence of various maternal factors, however none have examined the relationship between parent and child dietary patterns derived via PCA.

2.3 Food Choice in Children

2.3.1 Peer influence on food choice in children

The foundation of peer modeling research was laid in 1938 when Duncker discovered that pre-school children would change their food preferences to match those of the children around them (36). It was only in the last ten years that similar associations were found with older children (children aged 8-12). Romero *et al.* tested the hypothesis that modeling influences eating in overweight and non-overweight girls aged 8-12 (37). Children attended the clinic and were told they would be completing a task that involved sorting pictograms. During this exercise they were allowed to snack on as many cookies as they liked and were to watch the video being played. Twenty-two girls were randomly assigned to watch a video of a girl eating a small serving of cookies and the other 22 girls watched a video with the same girl eating a larger serving of cookies. The results showed that the children who saw the video with more cookies being consumed ate significantly more cookies than the children in the other group. Overweight girls also consumed significantly more cookies than the girls of normal weight.

The majority of work in this area focuses on preschoolers and adolescents, however, in 2014, Houldcroft *et al.* compiled the available evidence in a review investigating peer and friend influence on older children's eating (38). The review highlights the potential importance of peers and friends on children's eating behaviours due to the large amount of time spent together. From preschool or kindergarten, through primary school and on to intermediate and high school, children are surrounded by their peer group. As

children age, they spend more time with their friends and peers, and activities outside of school also become part of their routine. Houldcroft *et al.* found that there was substantial evidence suggesting peer modeling is a significant factor in children's food choice. This has been found for both everyday and novel foods (37, 39).

In their review, Houldcroft *et al.* also identified that children's characteristics determine the way they are influenced by their peers (38). Aspects such as weight status, age, gender, siblings and familiarity have all been researched with regard to how children respond to other children around them.

Salvy *et al.* investigated how a child's weight status influenced their food intake around peers (40). The aim of the study was to determine whether or not overweight and lean girls ate differently around overweight and lean peers. Twenty-three lean and 23 overweight girls were recruited and were put into lean, overweight or lean-overweight pairs. The girls were told to snack on cookies as much as they wished while completing another task. This was so that the girls were not aware that their food intakes were being monitored. Data from this study suggested that weight status does influence how much children consume around peers. The overweight girls who were partnered with other overweight girls consumed significantly more cookies than overweight girls paired with lean girls. Although this study provides some evidence that weight status can affect peer influence on food choice in children, additional research in an everyday setting is needed.

Further research by Salvy *et al.* suggests that the familiarity of the peers also influences children's food choice (41, 42). In an experimental trial 31 boys and 41 girls between the ages of 9-15 were recruited to test whether the presence of a friend influences children's food choice differently compared to the presence of an unknown peer (42). Participants were taken to a room with either their friend or an unfamiliar peer where they could eat as much as they liked while playing for 45 minutes. At the end of the time each child's set of pre-weighed food was re-weighed to calculate energy intakes. Children who were with their friends had a greater energy intake ($P < 0.01$), as well as larger intakes of energy and nutrient dense foods ($P < 0.01$; $P < 0.03$, respectively), compared to children with an unfamiliar peer.

In addition, Salvy *et al.* also found that the presence of a sibling influences children's food choice differently compared to the presence of an unfamiliar peer (41). In a set up similar to the previous Salvy study, 44 children aged 5-11 were invited to the lab and were to complete a task with either a sibling, an unfamiliar peer or alone. The children were given a bowl of cookies to snack on while completing the task. At the end of 20 minutes the pre-weighed cookie bowls were re-weighed to calculate energy intakes. Children who were paired with their sibling consumed more cookies than children with an unknown peer and more than those completing the task alone ($P < 0.05$ for both comparisons).

Results from the Salvy studies are consistent with research in adults that shows people eat less with strangers (43). The current theory behind this behaviour is that people want to make a favourable impression in social situations. It appears that children may also be influenced by social desirability. From this research it can be concluded that children are aware of how their peers perceive them and have a desire to be accepted by these peers, resulting in altered food choices. An important point to note about the evidence supporting peering modeling in older children is that much of the work was undertaken in experimental settings. To date there is a lack of research based in a habitual setting. Further work needs to be done in this area to determine if children in their everyday environment choose to eat foods based on what those around them are consuming.

As previously mentioned there is a considerable amount of research focusing on the influence of peers on younger children's food choice, as well as adolescents' food choice. There are several major findings for these two age groups. For preschoolers role modeling is a strong influence on food choice (4). If a young child sees someone else consume a food that increases the likelihood that they will also eat that food. This occurs even when the child says they do not like or have a preference for a particular food. Research exploring adolescent food choice shows that peers influence others through the shaping of attitudes towards foods and peer pressure (4). Foods often consumed differently due to peer influence in adolescence are drinks and snacks. From the evidence currently available it appears that peers may have a stronger influence on food choice in young children and adolescents compared to children aged 8-12.

Research suggests that parents have a stronger influence over older children's food choices compared to their peers, as will be discussed in sub-sections 2.3.5 and 2.3.6.

2.3.2 How food preference influences food choice in children

Food preferences play an important role in children's food choice and can be shaped by both genetic and environmental influences (8). These preferences are developed early in life and continue to influence food choice through to adulthood (4). Children are less likely to choose foods they do not like the taste of and are more likely to choose foods they have a preference for, as shown by the Pro Children Study (44). Children aged 8-13 years from nine European countries were approximately twice as likely to consume fruit daily if they liked the taste of fruit or had a preference for many different fruits (44). Children that liked vegetables or had a preference for many vegetables were also more likely to have vegetables daily. These findings support earlier research highlighting the importance of liking and preference on fruit and vegetable intake (45).

Innately humans enjoy high-energy, sweet and fatty foods, and dislike bitter and sour tastes (45). Even amongst fruit and vegetables children tend to choose bananas and potatoes over less energy dense alternatives. It is possible these choices may be the result of experiences very early in life (45). There is individual variability in how much someone likes or dislikes bitter flavours. Researchers have used the compound 6-*n*-propylthiouracil (PROP) to measure how innate preferences influence food choice in children. Children with a high sensitivity to PROP have a lower acceptance to bitter tasting vegetables, such as raw broccoli and spinach, in laboratory taste tests (46). However, acceptance for such foods in an everyday setting does not appear to be affected by this sensitivity, according to parental reports (47).

Despite all people having an innate preference for certain tastes, research strongly suggests that environmental factors can overcome genetic predisposition. Exposure studies have consistently demonstrated that the more a child experiences a food the more likely they will develop a preference for it. Much of this research has been conducted with infants and pre-school children (48). However, there is a growing body of evidence that innate preferences can be altered in older children through repeated food exposure (49-51).

Early research conducted by Sullivan and Birch laid the foundation for further food exposure work in children (52). This study aimed to increase the acceptance of vegetables in 4-6 month old children. Over 26 days, 36 infants were exposed to vegetables ten times; acceptance was measured pre and post test. At the end of the study the infants ate significantly more vegetables than they did at the beginning of the study ($P < 0.001$). Since then many more studies have found that introducing foods early in life increases acceptance of foods in later childhood and adulthood (8).

Further research has discovered that food preferences can be altered in primary school aged children through exposure techniques. Originally it was thought that children had to be exposed to foods within the first few years of life to increase chances of acceptance. However, Wardle *et al.* found that exposing children 5-7 years to new foods can increase their preference and intake of those foods (49). In this randomised controlled trial (RCT), 49 children were assigned to either the exposed, reward or control group. Children in the exposed group were presented with pieces of red pepper and given the opportunity to consume as much as they wished on ten occasions over two weeks. Children in the reward group were also exposed, as well as receiving a “reward” when they ate the pepper. Children in the control group were not given any red pepper or reward during the two week period. Level of liking was measured before and after the intervention. Children in the exposed group had a greater change in liking of red pepper compared to children in the control group ($P < 0.01$). There were no significant differences between the reward and exposed groups, and the reward and control groups. This study is important as it suggests that children’s food preferences can be influenced after their preschool years.

An interesting finding from exposure research in children is that it appears older children may need to be exposed to a novel food more often than younger children to improve their preference for the food. Lowen and Pliner found that to increase liking of a novel food in 10-12 year olds, the children needed to be exposed to the food up to 20 times (50). However, research in this area is conflicting. Liem and de Graaf worked with 8-11 year olds to increase preference for sweet tastes, and found that eight exposures was sufficient to increase preference for this flavour (51). It is possible a change was seen so quickly due to humans’ innate liking of sweet foods. Despite these

differing results, both studies support the theory that children's food preferences can be changed during later childhood.

2.3.3 How the media influences children's food choice

Children's food choice is strongly influenced by what they are exposed to in their everyday environment. Food advertisements and the media are becoming an increasingly strong force acting on these choices. There has been much debate about the impact of food advertisements on children, and the majority of the literature now suggests that children are easily influenced by what they see on television and in magazines (7, 53).

Halford *et al.* published one of the first studies investigating the effect of food advertisements on children's food consumption (54). In this study, 42 children aged 9-11 years were recruited to watch cartoons on television with food advertisements or non-food advertisements. Each participant completed both sessions over a two-week period. After each session the children were given a plate of food to eat as much or as little as they liked. The amount eaten by each child was recorded. The results showed that children ate more after watching the food advertisements compared to when they watched the non-food advertisements ($P < 0.001$ for lean children, $P < 0.05$ for overweight children, and $P < 0.001$ for obese children). The children also ate more high fat and high sugar foods after watching the food advertisements. Though it is concerning that the media can so easily influence children's food choices, further research has found that this could be beneficial. Data from the Pro Children's Study suggested that watching television advertisements for healthy foods was positively associated with children's consumption of fruit and vegetables (55). However, it is important to note that this relationship is mediated by attitudes towards, and liking of, fruit and vegetables.

Over the last two decades children's exposure to food advertisements has increased dramatically. The two main factors contributing to this are the increased level of food advertising by the media and the increased exposure children have to the media. It is reported that children and adolescents see between 4,500 and 6,000 food advertisements on television each year (56). This does not include all the other advertisements children see in magazines or on the internet. In the UK, 95% of food

advertisements were for foods high in fat, salt or sugar (55). Similar statistics have also been found in the US, Portugal, Iran, New Zealand and Australia (53). These findings are of concern due to the strong influence the media has on children's food choice.

Though television is still the media activity of choice for children and adolescents, there is an increased use of the internet and social media by children (57). Australian data shows that 65% of 5-14 year olds are now using the internet (58). This provides food and beverage companies with another avenue to promote their products; child-targeted food marketing can be found on many websites, online videos and online games. Facebook in particular is heavily embedded with food and beverage advertisements, many directed at children (57). As with television marketing, internet advertisements on non-food websites aimed at children, are heavily skewed towards energy dense foods (58). In addition to this, companies use strategies such as 'advergames' (games that have branded products incorporated into them), downloads (such as wallpapers) and website memberships to encourage children to stay on their websites (58). The more children have access to digital devices such as computers, phones and tablets, as well as television, the greater their risk of being persuaded to choose high fat, salt or sugar foods (57).

One area that has been relatively understudied is the influence of print media on children's food choice. Over the past decade children have become increasingly exposed to magazines due to the growing amount of print targeted at children (53). From the limited research available it appears that print media influences children's food choices in a similar way to television and internet advertisements. If children see a food advertisement in a magazine they are more likely to choose that food over a non-advertised food, even if both choices are unhealthy (53). New Zealand research also found that the percent of unhealthy branded foods advertised in children's and adolescents' magazines was significantly higher than the percent of healthy foods advertised (72% of advertisements were for unhealthy foods) (59). Advertisements for snacks such as ice cream and chocolate were most frequent (36%), while fruits and vegetables were the foods with the least marketing (3% of food ads) (59). Overall, the literature suggests that children's food choices are influenced by the media via a variety of outlets, many of which are not strongly regulated.

2.3.4 Influence of the physical environment on children's food choice

The physical environment in which children live may have an important influence on their food choices. As countries become more urbanised, access to food outlets increases. In urban areas, there is a high density of food outlets, with longer open hours, resulting in a constant supply of food. In 2014, a systematic review was published by Engler-Stringer *et al.* to better understand the evidence looking at the influence of physical environments on children's diet (60). This review included 26 studies, 24 cross-sectional and two longitudinal. The majority of studies used Geographic Information Systems (GIS) to map the participants' homes or schools, and food outlets in the neighbourhood. The most common measures of dietary outcomes were fruit and vegetable consumption, fast food intake, sugar-sweetened beverage consumption and measures of diet quality (for example, the HEI). Of the 16 studies that used GIS, 11 found a significant association between the food environment and dietary intake. For example, Skidmore *et al.* found that children aged 9-10 that lived closer to a convenience store had a significantly increased consumption of potato chips, white bread and chocolate (61).

Longitudinal results were similar to the majority of those found in cross-sectional studies. Khan *et al.* studied 10-13 year old children to see if the density of fast food outlets influences fast food consumption patterns (62). Self-reported fast food consumption over the past seven days suggested that fast food outlet density was significantly associated with fast food consumption patterns ($P < 0.05$). The second longitudinal study by Smith *et al.* focused on children around the age of 12 years and followed them up over four years (63). The aim of the study was to determine how the density of food outlets close to children's schools influenced the quality of children's diets. Data from this investigation found that there was a positive association between distances travelled to grocers and healthy diet scores. This means that children that had to travel further to the grocers had a healthier overall diet.

Twenty-two of the 26 studies in the Engler-Stringer review showed at least one positive association between exposure to the food environment and dietary outcomes in children. However, several of these studies found inconsistent relationships. For example, Timperio *et al.* investigated how the availability of different types of food near the home influences fruit and vegetable consumption in children aged 5-6 and 10-

12 years (64). Self-reported data suggested that the likelihood of children consuming greater than three servings of vegetables daily was higher when they lived further from the supermarket (OR = 1.27, 95% CI 1.07-1.51), as well as further from a fast food outlet (OR = 1.19, 95% CI 1.06-1.35). It was unexpected to see vegetable consumption associated with a greater distance from supermarkets and fast food shops (60). Such evidence is contributing to the debate over how the physical environment influences children's food choice. Some experts say measuring techniques are the cause of such inconsistencies, however this has not been proven (60). Further research is needed in this field to determine if intervention in this area could improve children's food choices and overall diet.

2.3.5 Parental influence on food choice in children

Throughout the literature social and environmental factors are repeatedly shown to influence children's food choice. Parents themselves are an important predictor of food consumption through a variety of avenues. An early study by Klesges *et al.* (65) demonstrated that children will alter their food choices based on whether their parent is present or not. In this study, children were asked to select what they would like for lunch from a variety of foods; they were also told that their parents would not see their choices. After this exercise the children were again asked to select what they would like for lunch but this time their parents would be inspecting their choices. When children thought their parents would not know what they ate they chose energy dense foods and foods of lower nutritional quality, particularly foods high in added sugar. When the children believed they were being monitored they reduced the amount of sugary foods but did not increase nutrient dense foods. The decrease in sweet foods may be due to parents restricting sugar intake in the home so children know they should not choose such foods. It is interesting that children did not increase foods of high nutritional quality, such as fruit and vegetables, when they thought their parents were going to inspect their choices. In addition to this, mothers did not add in fruit and vegetables to their children's lunches when given the opportunity. Data from this study suggests that the presence of parents does influence children's food choice. Though this study is a useful foundation for further research investigating the influence of parents on children's food choice, it has an important limitation. This study only provides acute data; it does not provide insight on how a child's overall diet is impacted by the presence of parents over a sustained period of time.

Further research in this area is limited, possibly due to the difficulty in measuring the influence of a parent on children's food choice over an extended period. However, Holesten *et al.* trialed a qualitative approach to determine home influences on children's food choice (66). This study is particularly interesting as it looks at the child's overall diet, not only fruit and vegetable intake. From 47 children and adolescents aged 11-14 years old it was determined that the presence of parents does influence food choice for a variety of meals and snacks. Breakfast and afterschool snacks tended to be the meals where children had the most autonomy. It was apparent that when there was no parental supervision children had a higher consumption of easy-to-prepare foods that they enjoyed the taste of. Though this study had a small sample size and focused on slightly older children, it clearly suggests that parents can impact their children's eating habits by simply observing what is being prepared and eaten. These findings support the research conducted by Klesges *et al.* (65).

Parents can also influence food choice in primary school age children through home availability. Most children have little autonomy over what food they can eat because their parents or caregivers provide food on a day-to-day basis. If parents choose to not have a certain food in the home then it is unlikely children will have access to that food, and therefore will not be part of their diet. The opposite of this is also true. Research suggests having fruit and vegetables available in the home results in children having a higher consumption of fruit and vegetables. A cross sectional study investigating fruit and vegetable intake in Greek children is one of several studies to demonstrate this association (67). Primary school children (n=167) completed questionnaires about their fruit and vegetable intake, and the amount of fruit and vegetables available at home. Fruit intake was significantly associated with fruit availability at home ($r=0.7$; $P<0.001$) and vegetable intake was significantly associated with vegetable availability at home ($r=0.5$; $P<0.001$). Results from this study support similar evidence from the US and Northern Europe (68-71).

Despite agreement that fruit and vegetable accessibility at home is associated with intake in children, there are still some inconsistencies in the literature. Data from the Pro Children Study found that Spanish 11 year olds had large amounts of fruit and vegetables available at home but had low levels of consumption when compared to

children in Scandinavia (72, 73). It is discussed in the literature that these conflicting results may be due to cultural differences across Europe (67). Factors such as general lifestyle and household routines may be important in determining fruit and vegetable intakes for children. It is also possible that home availability may need to be used in conjunction with other parental roles, such as parenting style or actively encouraging a healthy diet.

Parents can influence children's food choice by shaping their attitudes towards food. This is largely done through parents' beliefs, nutritional knowledge and parenting style. If parents believe diet is important for positive health outcomes they will ensure healthy food is available for their children to eat (74). As previously discussed, home availability can be an important determinant of children's food choice. Data from Gibson *et al.* (75) indicates that mothers who believe fruits and vegetables reduce disease risk have children with higher fruit and vegetable consumption. In this cross sectional study, 92 mothers and their children (aged 9-11) completed questionnaires and three-day food diaries, respectively, to determine food intakes and factors associated with these intakes. Mothers that agreed with the statement 'increasing fruit and vegetable consumption would decrease cancer risk' had children with significantly higher fruit intakes than mothers who did not agree with this statement ($P<0.001$). Children's vegetable consumption was also explained by their mother's belief in reducing their child's disease risk through food selection ($P<0.001$).

Parental nutritional knowledge is also important, for similar reasons, to parental beliefs. If parents, in particular mothers, know the importance of consuming fruits and vegetables, and limiting high saturated fat, sugar and salt foods, there will be more healthy foods in the home and less unhealthy foods (74). There is also evidence to suggest that parents with a strong knowledge of nutrition are more likely to prepare smaller portion sizes. This is important as there is increasing evidence supporting the theory that greater portion sizes are associated with larger food intakes in some age groups. Rolls *et al.* (76) worked with 3-5 year old children to determine if the size of their preschool or school lunches would influence how much they ate. Food intakes were measured on three different occasions. Older children consumed more when they were given more to eat ($P<0.002$), however portion size did not influence the younger children's intakes. There is further evidence suggesting that food intake in children

around the age of five is influenced by the size of the portion put in front of them; it is hard to determine if this can be generalised to older children and adolescents (77). Due to the developmental changes that occur throughout childhood further research is needed to know how these changes impact how much children eat in different environments. For example, from the research available it is difficult to determine how much a ten-year-old child will eat if their parents give them larger meals compared to smaller ones.

Research surrounding parenting style and children's diets is growing rapidly. A large body of evidence suggests that how parents "feed" their children is associated with children's attitudes towards food (45, 74, 78). Many different feeding styles have been identified, for example, restriction, food as reward and child control. Some evidence suggests that children who have "restricted diets" tend to have an increased liking for energy dense foods as they are very rarely allowed such foods (45, 74). When restrictions are lifted they are more likely to consume these foods, compared to children under different feeding styles. However, there is conflicting research in the literature. Some evidence suggests that children from homes where high fat foods are restricted make healthier food choices than children with different parenting styles (45). From the available evidence it appears that parenting style may need to be modified with age. A child control method may work in the early years, but a more restricted style may be needed once children start school. Parents need to be careful in how they choose to guide their children's eating as good intentions may develop unhealthy attitudes towards food.

2.3.6 The influence of parents' diet on children's diet

Many studies have investigated the relationship between parental dietary intake and the dietary intake of 8-12 year old children, including three reviews, which are summarised in **Table 2.3**. Rasmussen *et al.* published the first in 2006 (9), with the aim of comprehensively reviewing the potential determinants of fruit and vegetable intake in children and adolescents. The age range for this review was 6-18 year olds. Ninety-eight papers were included, of which 48 were from the US and eight used longitudinal data. Factors associated with fruit and vegetable consumption included socio-demographic, personal, family-related, friend-related and school-related factors. Nine studies investigated the relationship between parent and child fruit and/or vegetable

intake. Eight of these found a positive association and for two of these papers, the effect of parental intake was modified by home availability. This was the first review of its kind to include socio-economic factors as well as such a wide age range (9).

The next review was published by van der Horst *et al.* in 2007 (10). The aim of this paper was to determine which environmental factors potentially influence obesity-related behaviours in children and adolescents. The dietary components included energy, fat (total and percent energy), fruit, vegetables, snacks/fast food and soft drink. This review explored a much greater proportion of the diet compared to the first review, as well as dividing children and adolescents into two groups (4-12 and 13-18 years, respectively). Some of the papers looking at fruit and vegetables were included in both the Rasmussen and van der Horst reviews, however the majority were used exclusively in one review or the other (9, 10). For papers to be included in the van der Horst review, the outcome measure had to be assessed for at least one day. For example, studies assessing fruit intakes at one meal were not included. Fifty-eight articles were selected, 29 of these had child populations and 27 involved adolescents. One paper had both children and adolescents in their sample. A positive association was found between parent and child fat intakes in three out of three studies. A positive association was also found between parent and child fruit and vegetable intakes in all six studies. For example, Vereecken *et al.* found that the Spearman's correlation between mother and children's fruit consumption was 0.49, and for vegetable consumption was 0.44 ($P < 0.001$ for both), in a sample of 316 participants (79). Additionally, parental soft drink consumption was positively associated with children's soft drink consumption in two out of two studies. No papers investigated parent and child intakes of energy or snack/fast food intakes. In the adolescent group, only fat intake was found to be associated between parents and children. There were no papers looking at the other food and nutrient groups and parent-child dietary intakes. The Rasmussen and van der Horst reviews demonstrated consistent evidence supporting the relationship between parent and child dietary intakes, particularly for fruit and vegetables. However, they both agreed that there is a need for longitudinal studies with valid measurement tools to solidify the evidence (9, 10).

Pearson *et al.* published a third review investigating the relationship between parent-child dietary intakes in 2009. This review aimed to develop and add to the findings of

the Rasmussen and van der Horst reviews by updating the evidence on family correlates of fruit and vegetable consumption. Additionally, this review reported results for fruit and vegetables separately, differing from the previous reviews. Studies with children and adolescents aged 6-18 were eligible for inclusion. Sixty-six papers were included in the final analysis, 25 papers with children (age range 6-11) and 38 papers with adolescents (age range 12-18). The three outcome variables identified were fruit and fruit juice consumption, vegetable consumption, and fruit, fruit juice and vegetable consumption. Correlations between these variables and physical, sociocultural and demographic factors were investigated. Child fruit consumption was positively associated with parent intake in all three relevant studies. However, child vegetable consumption was only related to parent intake in one of three studies. No association was found in the other two samples. The combination of fruit, juice and vegetable intake was examined in three studies. A positive relationship between parent and child intakes were found in two of these. Positive associations were also found between parent and adolescent intakes of fruit and vegetables, but no studies looked at fruit, juice and vegetables combined.

The findings from these three reviews indicate that there is a positive relationship between parent and child dietary intakes of fruit and vegetables. Further evidence from 2010 to 2015 largely supports this argument (**Table 2.4**). Of 12 studies that examined the association between parent and child fruit and vegetable intakes all but one study found a positive association for the relationship (80-90). The remaining study found a relationship between parent and child fruit intake but not vegetable consumption (91). One study examined fruit intake exclusively, with another study investigating vegetable intake exclusively (92, 93). Both of these studies found a positive association between parent and child fruit and vegetable intakes, respectively.

Researchers have continued to explore the relationship between parent and child fruit and vegetable intakes, to determine additional factors associated with the relationship. For example, Yung *et al.* investigated the influence of mothers' fruit and vegetable consumption on children's intake in Hong Kong because most of the previous research was from the US and Europe (83). Yung *et al.* argued that the relationships between parents and children in Western society are different to those in Chinese culture. Harris *et al.* and Reed *et al.* explored the dietary intake relationship between African

American parents and children again for ethnic and cultural reasons (89, 91). Researchers have also been interested in the impact of childhood overweight and obesity on the relationship between parent-child fruit and vegetable intakes (80, 86). Furthermore, the influence of only fathers on child fruit and vegetable intakes has been explored (85, 89). Nearly all of these studies have found similar results to each other, and to the Rasmussen, van der Horst and Pearson reviews (9-11).

Since the van der Horst review in 2007, many researchers have further explored the relationship between parent and child soft drink intake. From 2010 onwards, seven studies have examined this relationship (**Table 2.4**). Six of the studies found that parental sugar sweetened beverage consumption was significantly associated with child intake (10, 80, 89, 90, 94-96). One of these studies estimated that if parents consumed one litre of sugar sweetened beverage per week, children consumed 0.46 litres more sugar sweetened beverage per week (96). The remaining study found no association between parental and child soft drink consumption (86). Research continues in this area, despite the relative consistency of the evidence, to determine if additional factors alter the relationship. For example, the influence of fathers, childhood overweight and obesity, and different ethnic groups have all been explored (80, 86, 89).

The relationship between parent and child snack intake is inconsistent. Two studies have found a positive association between parent and child consumption, however a further study found no association (80, 86, 96). This difference may have been seen because the latter study only examined unhealthy snack foods, not all snack foods (96). In addition to this, the two studies that found an association involved overweight and obese children, whereas the third study did not. This may also explain the contrasting findings. The relationship between parents' and children's dairy consumption has also been inconsistent, with two studies finding a positive association but the third finding differing intakes (81, 86, 91). The inconsistency in these results may be due to the third study using an African American sample of girls aged 10-12, whereas the two studies that found a positive association included boys and girls that were predominantly Caucasian, and included children as young as four years of age (81, 86, 91).

Several other food groups have also been investigated to determine if intakes between parents and children are correlated. Deroma *et al.* examined seafood consumption in 8-

11 year olds (97). This study found that mothers and children consumed similar amounts of fish, molluscs, fish in oil and other canned fish, however mothers consumed more crustaceans. Hall *et al.* explored the influence of fathers' intake of energy dense foods of their 5-12 year old children's consumption of these foods (85). Using FFQs, it was concluded that fathers' intakes of potato chips and cookies influenced the consumption of these foods in children. However, there was no relationship between the intakes of french fries, chocolate or ice cream. A Canadian study also found that the intake of desserts in 11-16 year olds was not associated with parental intakes (80). Redd *et al.* investigated the association between mother-daughter intakes of carbohydrate and protein sources (91). Examples of carbohydrate foods included were rice, pasta and bread, and examples of protein sources were meat, fish and eggs. Both carbohydrate and protein intakes were correlated between mothers and daughters. Robinson *et al.* looked at similar food groups in Australian children aged 8-12 (81). The aim of this study was to determine if parent and child intakes of vegetarian protein sources, meat and grains were correlated. Grain intake was associated between mother-child and father-child dyads. However, child meat intake was only associated with the mother's intake. Neither dyad had correlated vegetarian protein intakes. The final group of foods that have been studied to determine if parent and child intakes are correlated is core foods and non-core foods (98). Johnson *et al.* worked with UK parents and their 11-year-old children to assess the relationship between intakes of core (bread, meat, fruit, vegetables, eggs) and non-core (cakes, biscuits, chips, processed meats) foods. After adjusting for potential confounders it was determined that intakes of both core and non-core foods were associated between parents and children ($r=0.5$ and 0.25 for core and non-core foods, respectively).

There is considerably less literature on food groups other than fruit and vegetables in the area of parent and child dietary intakes. As can be seen from the previous paragraph, although many other food groups have been investigated, there are only one or two studies exploring the interrelationship with parent-child dietary intakes. The influence of parental dietary patterns on children's dietary patterns is also not well researched. There is limited literature investigating this topic, particularly in school-aged children. Only two studies have looked into the associations between parent and child diet quality, both of which used theoretical methods to determine dietary patterns (81, 99).

The first study investigating the relationship between parent and child diet used data from the Continuing Survey of Food Intake by Individuals 1994-96 (99). This survey was undertaken by the US Department of Agriculture and included 4,244 parent-child dyads. The age of the children ranged from 2-18 years. Dietary data was collected via two 24-hour recalls, although the majority of 2-9 year old children had proxy responses. Diet quality for parents and children was assessed using the 2005 HEI. Scores for adherence to the HEI could range from 0-100. The results showed that the odds of a child having a healthier diet (HEI score range 61-81) increased by nearly three-fold when their parents also had a healthy diet (HEI score range 62-86). When the children were divided into groups by age, it was found that the relationship was stronger for children aged 2-10, compared to children over ten years of age (OR=4.05 and 1.55, respectively). All of these results were statistically significant and adjusted for potential confounders. The results from this study suggest that there is an association between parent and child diet quality.

The second study looking at the associations between parent and child diet quality was the Family Diet Quality Study in Australia (81). This was a cross-sectional study involving 66 parent-child dyads. Dietary intake was measured using the Australian Eating Survey for adults, and the Australian Child and Adolescent Eating Survey for children and adolescents. Both of these surveys are validated FFQs with 120 items. The Australian Recommended Food Score was used to measure diet quality in the adults, and the Australian Child and Adolescent Recommended Food Score was used for the children. The possible scores to be obtained ranged from 0-73, with a higher score indicating a closer adherence to the Australian Dietary Guidelines and a superior diet quality. The results from this study showed that diet quality was associated in both father-child and mother-child dyads, with Pearson's correlation coefficients of 0.50 and 0.55, respectively. These results suggest that there is an association between parent and child diet quality, agreeing with the findings from the US study.

Both of the discussed studies provide a good indication that diet quality is associated between parents and children, however both studies relied on adherence to dietary guidelines as their measurement tool. There is no research in the literature that has

investigated the relationship between parent and child diets using empirically derived dietary patterns.

Table 2.3 Reviews examining the relationship between parents' and children's dietary intakes

First author (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Rasmussen <i>et al.</i> (2006) (9)	Review, worldwide; 98 quantitative papers, children and adolescents aged 6-18	To provide a comprehensive review of potential determinants of fruit and vegetable intake in children and adolescents	Fruit and vegetables	FFQ, diet records and 24-hr recalls all used	FFQ, diet records and 24-hr recalls all used	Eight of the 9 studies looking at the association between parental and child fruit and vegetable intakes found positive associations, ($\beta=0.1-0.37$). One paper found no association
van der Horst <i>et al.</i> (2007) (10)	Review; worldwide; 58 papers; children aged 4-12	To determine which environmental factors are consistently associated with obesity-related behaviours	Fruit, vegetables, snack, fast food and soft drink	FFQ, diet records, 24-hr recalls and other questionnaires all used	FFQ, diet records, 24-hr recalls and other questionnaires all used	Child fruit and vegetable intake was associated with parent intake in 6 of 6 relevant studies (r values ranging from 0.35-0.49). A relationship between parents' and children's soft drink intake was also found in 2 of 2 relevant studies (OR=2.88 for children to drink soft drinks 5 times/week if their parents consumed it 3 or more times/week). No association found for snack intake
Pearson <i>et al.</i> (2009) (11)	Review, worldwide; 60 papers, children aged 6-11, adolescents aged 12-18	To review associations between the family environment and young people's fruit and vegetable consumption	Fruit and vegetables	FFQ and food diaries both used	FFQ and food diaries both used	An association between parent and child and adolescent fruit intake was found in 6 of the 7 relevant studies (r values ranging from 0.35-0.74). An association for vegetable intake was found in 4 of the 7 relevant studies (eg. t for trend=3.72)

Table 2.4 Papers examining the relationship between parents' and children's dietary intakes from 2010 to 2015

First author, (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Gross <i>et al.</i> (2010) (82)	Cross-sectional, USA; 93 children (average age 9.6) and their parents	To assess social and familial environmental influences on fruit and vegetable consumption of fourth and fifth graders	Fruit and vegetables		FFQ covering fruit and vegetable consumption over the past 7 days (did not include consumption of fruit juice)	Children whose parents had reported consuming fruit and vegetables the day before had a higher daily fruit and vegetable intake than those who did not, 1.8 vs 1.3 servings of fruit and vegetables per day ($P = 0.02$)
Yung <i>et al.</i> (2010) (83)	Cross-sectional, Hong Kong; 1,779 children aged 9-11 and their mothers	To determine if Chinese children in Hong Kong follow their mother's fruit and vegetable consumption patterns	Fruit and vegetable; adequate intakes were used (adequate fruit = 2 servings/day; vegetable = 3 servings/day)	Questionnaire assessing daily fruit and vegetable consumption	Questionnaire assessing daily fruit and vegetable consumption (same as parent questionnaire)	For mothers with adequate fruit intake, the proportion of their children having adequate fruit intakes was significantly higher (28.4% vs. 16.8%, $P < 0.001$). The same was seen for vegetables (34.8% vs. 25%, $P < 0.001$)
Hall <i>et al.</i> (2011) (85)	Cross-sectional, Australia, 50 father-child pairs, children aged 5-12	To determine whether an association exists between dietary intakes in overweight fathers and their children	Fruits, vegetables, energy dense foods (french fries, chocolate, potato chips, cookies, ice cream)	74-item FFQ of commonly consumed foods in the population, covering the previous year	135-item semi-quantitative FFQ of commonly consumed foods in the population, covering the previous 6 months (completed by mother)	A positive linear association was found between father-child intakes of fruit ($r=0.4$), potato chips ($r=0.33$) and cookies ($r=0.54$). No relationship was found for vegetables, french fries, chocolate or ice cream

First author, (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Johnson <i>et al.</i> (2011) (98)	Cross-sectional, UK; 324 children aged 11 and their parents	To take a multidimensional approach in assessing the independent correlates of core and non-core food intake in children	Core fruits (eg. bread, meat, eggs, fruit, vegetables), non-core foods (eg. cakes, biscuits, chips, processed meats)	FFQ with 73 core foods and 57 non-core foods	45-item FFQ covering core and non-core foods (completed by parent)	Maternal intake of core and non-core foods were associated with child intakes of core and non-core foods, respectively, after adjustment for potential confounders ($r=0.5$ and 0.25 for core and non-core food, respectively)
Raynor <i>et al.</i> (2011) (86)	Controlled trial, US; 135 child-parent pairs, overweight/obese children aged 4-9	To examine to relationship between parent liking and intake, and child liking and intake of a variety of foods	Fruits, vegetables, low-fat dairy, snack foods, and sweetened beverages	3-day food diary at baseline	3-day food diary at baseline (parents completed records for children under 8 years of age)	Parent intakes were positively correlated with child fruit, vegetable, low-fat dairy and snack intake (R^2 values ranging from 0.03-0.17), but not significantly correlated with sweetened beverage intake
Rodenburg <i>et al.</i> (2012) (92)	Cross-sectional, Netherlands; 1,762 children aged 9-12 and their parents	To examine the association between parental and child fruit consumption in the context of general parenting	Fruit	8 item semi-quantitative FFQ covering fruit and vegetable consumption over the past month	8 item semi-quantitative FFQ covering fruit and vegetable consumption over the past month (same as parent FFQ)	After adjustment for confounders parental and child fruit consumption were positively associated. Parents with double the average fruit intake had children with 17% higher fruit intake

First author, (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Christian <i>et al.</i> (2013) (84)	Cross-sectional, UK; 1,516 parent-child pairs, mean age of children was 8.3	To further explore and identify characteristics of the home food environment associated with children's fruit and vegetable intake	Fruit and vegetables; parental intake every day vs. never was used when determining associations	Questionnaire assessing home food environment and attitudes towards fruit and vegetables	Two food diary questionnaires (home and school) with 115 foods and drinks commonly consumed in the population	Children with parents who consumed fruit and vegetables every day had on average 88g more fruit and vegetables compared to children whose parents never/rarely ate fruit and vegetables every day
Deroma <i>et al.</i> (2013) (97)	Cross-sectional, Italy; 37 children aged 8-11 and their mothers	To evaluate whether children's seafood consumption is associated with their mothers	Fish, crustaceans, molluscs, fish in oil and other canned fish	Interview with 7 questions relating to types and amounts of seafood consumed	Mother asked the same questions about their child as they were asked about themselves	Children consumed similar amounts of all seafood groups as mothers, except for crustaceans. Mothers consumed more of this seafood group (0.24 vs 0.14 servings/week)
Reed <i>et al.</i> (2013) (91)	Cross-sectional, US; 43 African American mother-daughter pairs, daughters aged 10-12	To examine the agreement in nutritional intake between African American girls and their mothers	Fruit (and juices), vegetables, carbohydrates (rice, pasta, bread); protein sources (meat, fish, eggs); dairy	72-item FFQ, covering total nutritional intake over a 1 week period	72-item FFQ, covering total nutritional intake over a 1 week period (same as parent FFQ)	Significant agreement was found between mother-daughter intakes of fruit, protein sources, and carbohydrates (Pearson correlations ranging from 0.5-0.65). Mothers and daughters had differing intakes of dairy and vegetables

First author, (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Van Lippevale <i>et al.</i> (2013) (90)	Cross-sectional, 8 European countries; 7,915 children aged 10-12 and 6,512 parents	To investigate associations of family-related factors with children's fruit drink/juice and soft drink consumption	Fruit drink/juice and soft drink	Questionnaire covering fruit juice/drink and soft drink intake in a general week	Two FFQs covering soft drinks and fruit juice/drink, the first asking frequency per week and the second asking amount	Parents fruit drink/juice and soft drink intake was positively associated with children's intake of fruit drink/juice and soft drink intake, respectively (Pearson correlation 0.06 for both relationships)
van Ansem <i>et al.</i> (2014) (87)	Cross-sectional, Holland; 1,318 parent-child dyads, children aged 8-12	To examine whether parental fruit, vegetable and breakfast intake mediate the association between mothers education level and children's healthy eating behaviours	Fruit, vegetables and breakfast	FFQ covering fruit, vegetable and breakfast consumption	FFQ covering fruit, vegetable and breakfast consumption (same as parent FFQ; completed by parent)	Parents that consumed more fruits and vegetables had children that consumed 0.34 and 0.46 more pieces of fruit and vegetables per day, respectively. The OR of children eating breakfast daily was 15.75 if their parents ate breakfast daily, compared to not daily.
van Ansem <i>et al.</i> (2014) (96)	Cross-sectional, Holland; 1,318 parent-child dyads, children aged 8-12	To explore the extent to which various types of environmental factors explain socio-economic inequalities in 10-to-12-year-olds' sugar-sweetened beverage and energy-dense snack consumption	Unhealthy snacks (savory and sweet) and sugar-sweetened beverages	Questionnaire based on FFQ, covering snack and sugar-sweetened beverage consumption over the past week	Questionnaire based on FFQ, covering snack and sugar-sweetened beverage consumption over the past week. Child answered snack questions, parents answered beverage questions	Parental intake of sugar-sweetened beverages was associated with child intake; if parents consumed 1 litre per week, children consumed 0.46 litres more per week. No associations were found for snack intake

First author, (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Watts <i>et al.</i> (2014) (80)	Cross-sectional, Canada; 165 overweight/obese children and adolescents aged 11-16 and their parents	To examine the relationship between parent and child/adolescent intake of healthy and unhealthy foods and nutrients	Fruit, vegetables, total and saturated fat, sugar, desserts/treats, sugar-sweetened beverages and snacking	24-hr recall	24-hr recall	Parental intake of fruit, vegetables, sugar-sweetened beverages and snacks were associated with child intake. An additional serving of fruits and vegetables consumed by parents, resulted in an increase of consumption by 0.23 servings in children. No relationship was found for dessert/treat intake
Harris <i>et al.</i> (2015) (100)	Cross-sectional, USA; 102 African American father-child pairs, children aged 3-13	To investigate how African American fathers' food and beverage intake and feeding practices predict their child's food and beverage intake	Fruit, vegetables and sugar sweetened beverages	Questionnaire including frequency and quantity of fruits, vegetables and sugar sweetened beverages	Questionnaire including frequency and quantity of fruits, vegetables and sugar sweetened beverages	Child intake of fruit, vegetables and sugar sweetened beverages was predicted by father's intake of fruit, vegetables and sugar sweetened beverages, respectively ($\beta=0.46-0.65$)
Robinson <i>et al.</i> (2015) (81)	Cross-sectional, Australia; 66 parent-child dyads, children age 8-12	To evaluate which parents' dietary intake had the strongest relationship with their child's dietary intake	Fruit, vegetables, meat, vegetarian protein sources, grains, dairy, condiments and water	120-item semi-quantitative FFQ covering all aspects of dietary intake over the previous 6 months	120-item semi-quantitative FFQ covering all aspects of dietary intake over the previous 6 months	Mother-child dyads were significantly correlated for intakes of fruit, vegetables, meat, grains and dairy ($r=0.27-0.47$). Father-child dyads were significantly correlated for fruit and gains only ($r=0.01-0.52$)

First author, (year)	Study design and sample	Aim	Foods studied and levels of categorisation	Method of dietary assessment - parents	Method of dietary assessment - children	Key findings of relevance
Tada <i>et al.</i> (2015) (93)	Cross-sectional Japan; 332 parent-child pairs, children aged 10-12	To investigate the correlation between mothers' and children's vegetable intake	Vegetables	58-item questionnaire covering foods and beverages commonly consumed in the Japanese population	Questionnaire covering foods and beverages commonly consumed in 10 to 12 year olds, over the previous month. Parent assistance available on request	A positive linear relationship was found between mothers' and children's vegetables consumption, after adjustment for confounders ($R^2=0.18$)
Wolnicka <i>et al.</i> (2015) (88)	Cross-sectional, Poland; 1,255 children aged 9	To identify the determinants of consuming fruit and vegetables among school-aged children in Poland	Fruit and vegetables	Questionnaire (no details provided)	6-item qualitative FFQ covering fruit and vegetable consumption	The children's fruit and vegetable consumption was correlated with their parents consumption ($r=0.33$ and $r=0.27$, respectively; $P=0.001$)

2.4 Dietary Assessment Methods in Children

An important step when using or developing dietary patterns is collecting accurate dietary data. Without a valid and reproducible dietary assessment method, derived dietary patterns or indices measuring adherence to dietary guidelines cannot be presumed to be accurate. Four commonly used dietary assessment methods are 24-hour recalls, diet histories, food records and FFQs. All of these methods have been widely used and validated in different populations, including vulnerable groups such as children, the elderly and people with cognitive issues. An emerging method of dietary assessment is food photography. This method has had limited use but is becoming increasingly popular as varying techniques continue to be validated. When measuring diet in children there are added challenges not seen when assessing the diets of adults. The following section will discuss these challenges and how their effects can be minimised where possible.

2.4.1 24-hour recall

The 24-hour recall method involves people being asked by an interviewer to recall everything they ate and drank in the previous 24 hours. This method has been used in large-scale surveys, such as the 2008/09 New Zealand Adult Nutrition Survey (ANS) (101). A requirement of 24-hour recalls is that trained interviewers are used. This is essential to avoid interviewer bias, which is when the interviewer influences the results through, for example, the incorrect use of probing questions, incorrect recording and intentional omissions. Such actions would impact the validity of the final results (102). An important limitation of 24-hour recalls is recall bias, where people cannot remember everything they consumed accurately. This scenario can lead to underreporting (103). Using 24-hour recalls is especially difficult in children as several people may need to be interviewed to ensure all the food consumed by the child is accurately reported (102). For example parents, teachers and friends' parents may need to be consulted depending on where the child was on the specified day, adding time and complexity to the 24-hour recall method. Research suggests that children as old as ten require assistance from their parents to ensure details of their diet are recalled accurately (104). For example, parents can provide information about the types and quantities of foods consumed. The National Health and Nutrition Examination Survey (NHANES) have repeatedly used 24-hour recalls in children (105). This study has been running since the

1960's and now includes 5,000 participants each year from counties around the US (106). To ensure the reliability of data from 24-hour recalls, parents assist children below the age of 11. The New Zealand Children's Survey also used 24-hour recalls to collect dietary data from a sample children and adolescents aged 5-14 (107). As with NHANES, parents attended the interviews of children aged ten and under. Having both parents and children present reduces the risk of food or beverages being forgotten, and thus improves the accuracy of the results.

2.4.2 Diet history

The diet history method is used to estimate food intakes over a relatively long period of time (102). Diet histories are labour intensive and expensive as they require highly trained interviewers. Furthermore, they are usually qualitative not quantitative (100). For these reasons diet histories are rarely used in research and are better suited to clinical settings (103). When used in children often only one caregiver would be present. This increases the risk of missing important information if multiple people have looked after the child the previous day, for example, if they go to school or day care.

2.4.3 Estimated and weighed food records

A further method of measuring dietary intake is a food record or diary. These records can be weighed or estimated. Weighed food diaries are considered the gold standard as people measure everything they eat and drink at the time of consumption. Brands and cooking methods also need to be recorded. Prospective weighing and recording removes the problem of recall bias and inaccurate portion size estimation. However, this method is time-consuming and places a high burden on the participant (103). People also feel uncomfortable weighing food when they eat in public so will estimate portion size, despite not following protocol. A further limitation of weighed diet records, is that people change their eating patterns during the recording period to make their diets "healthier" or to make weighing easier (102). This problem results in an inaccurate reflection of usual dietary consumption. It is often not feasible to obtain weighed records from children themselves. In such situations, records must be completed by caregivers, who may not be aware of all food consumed by the child when they are not under their supervision (108). Estimated food diaries are an alternative method but estimating portion size accurately becomes an issue. Estimating

portion size is difficult for the general public, in particular for children (102). A way to improve the accuracy of estimated diet records is to provide people with photographs of foods with the portion size written next to it. Household measures, such as measuring spoons and cups, can also be used to reduce the risk of errors when estimating portion size (102). Estimated food diaries were recently used in the Cork Children's Lifestyle Study (CCLaS) (109). The aim of this study was to estimate the prevalence of childhood obesity in Ireland and to determine factors associated with childhood obesity. Children aged 8-11 years (n=1,075) completed three day estimated food diaries. Children were given a template to follow, a demonstration of how to fill in the diary and their first entry checked to ensure they were completing the diary correctly. The children were also given a food atlas for portion size estimation and were told to ask for help from teachers and parents if they needed it. All of these measures were needed to keep the estimated food diaries as accurate as possible. CCLaS shows that estimated food records could be used in children however, they place a greater burden on the participants and their parents compared to other dietary assessment methods, such as FFQs.

2.4.4 Food photography

A more recently developed method of collecting dietary data is food photography. This method is a development of the direct observation technique, which is very accurate but requires the presence of a trained observer during meal times (110). Food photography involves participants taking photographs of the food and drink they are going to consume, then another photograph when they are finished (111). A description of the photograph can also be added to provide extra information. The image can be used to determine what the person is eating and how much of it they ate. A benefit of this method is that portion size does not need to be estimated by participants and there is a low burden on the participants, compared to written food diaries (111). Trained researchers or clinicians use reference photographs to estimate portion size, which is then entered into a computer program. The program is able to calculate the weight, energy and micro- and macro-nutrient content of the food (111). This method has been found to be reliable and accurate to estimate energy intake in both adults and children (111). Research suggests that younger people are more compliant with electronic methods of nutrient data collection compared to paper based methods (75% compared to 50% compliance) (112). An important point to note when considering the use of food

photography is the cost of equipment. In the past photograph capable phones or iPods, and digital cameras could be very expensive, reducing the feasibility of this method. However, photograph capable technology is becoming more affordable and many people now have smartphones, including children. Such advances are helping this dietary assessment method to become a more viable option in the future. To date food photography has only been validated in small-scale studies and the feasibility of using this technology in large-scale studies is still to be investigated (111).

2.4.5 Food frequency questionnaires (FFQ)

The final method of dietary assessment is a FFQ, which aims to determine the frequency of consumption of different food items or groups (102). This method is commonly used in large-scale studies to determine long-term dietary intake (103). Over time FFQs have developed from a qualitative measure, which was used to provide descriptive information on food consumption patterns, to a semi-quantitative dietary assessment method. This development has occurred through the inclusion of portion sizes. FFQs place a relatively low burden on participants, as they are not time consuming, with most questionnaires taking 15-30 minutes to complete. However, to complete the questionnaire, participants are required to be literate and need to remember what they have consumed in the past. FFQs are therefore susceptible to recall bias, as people often cannot remember what they ate and drank over an extended period of time (102). Both of these components reduce the usability of FFQs in children. Nevertheless, research shows that from the age of eight years children begin to remember dietary intake more accurately. If FFQs are written appropriately for the population of interest, they can be a valid measure of dietary assessment in children 8-12 years (113). It has also been reported that frequency of consumption has a greater impact on dietary intake than portion sizes, therefore, qualitative FFQs are an acceptable tool to measure habitual dietary intake in this age group (114).

The Health Behaviour in School-Aged Children (HBSC) Study used a qualitative FFQ to determine habitual food and drink consumption in children and adolescents aged 10-16 years (115). The HBSC FFQ was previously validated among 7,000 Belgian children and adolescents aged 11-18. When the FFQ was tested against a 24-hour food behaviour checklist there was agreement for all foods except for other dairy, cereals and diet soft drinks (116). The HBSC Study is a cross-sectional study involving 34

countries, with over 130,000 participants taking part. The HBSC Study collects data on health and well-being, social environments and health behaviours (117). The FFQ used in this study was useful because it was age-appropriate allowing children as young as 10 years to answer accurately and only included 15 items. This short FFQ covered important food sources of fibre and calcium, as well as less healthy foods regularly consumed by children and adolescents (116). The response categories for each food item were 'never', 'less than once a week', '2-4 times per week', '5-6 times per week', 'once a day, every day' and 'every day, more than once'. The items included in the HBSC FFQ were piloted and validated at the national and international level before each cycle of the HBSC study (118).

Another qualitative FFQ that has been validated and used in children is part of the Children's Eating Habits questionnaire (CEHQ) (119). The CEHQ was validated in over 2,000 European children aged 2-9 years (119). Two non-consecutive 24-hour recalls were used as the comparison method. When the FFQ was compared to the 24-hour recalls Pearson correlation coefficients ranged from 0.01 (sweetened fruit) to 0.48 (sweetened milk) for children aged 2-6 years (119). For the children aged 6-9 years coefficients ranged from 0.01 (milled cereal) to 0.44 (water) (119). The CEHQ FFQ was used in the Identification and Prevention of Dietary- and Lifestyle-Induced Health Effects in Children and Infants Study (IDEFICS), which included children aged 2-9 years, from eight European countries (120). IDEFICS was a prospective cohort study that aimed to investigate the causes of diet and lifestyle-related diseases in European children. The CEHQ-FFQ consisted of 43 food groups, which were clustered into 36 food groups based on their nutritional profile. The categories of consumption were 'never/less than once per week', '1-3 times a week', '4-6 times a week', '1 time per day', '2 times per day', '3 times per day', '4 or more times per day' and 'I have no idea'. An important difference between this FFQ and the HBSC FFQ, is the IDEFICS FFQ was completed by the children's parents. This was possibly because the IDEFICS study included younger children who could not complete it themselves. A limitation of using a proxy like this was that parents were often not aware of what the child ate out of the home, for example, when they were at daycare or school (119). There is much debate in the literature about whether FFQ's should be administered to parents or the child (121). Some experts suggest that children younger than 12 do not have the ability to complete FFQ's correctly, whereas other research indicates that parent

administration is inappropriate as parents are not with the child at all eating occasions, as seen in the IDEFICS study (122). A review of validation studies of child FFQ's also found that validity correlations were lower when the FFQ was completed by parents, compared to when they were administered by children (121).

Despite these differing opinions, many FFQ's have been validated in children and are used by researchers around the world, including in North and South American, European, Asian and Australasian countries (**Table 2.5**). Commonly the consumption of fruit and vegetables is measured, as is the overall diet. The time span covered by FFQs can also vary from one week to one year, while still maintaining an acceptable accuracy of consumption. Over the past decade using FFQ's with children has become increasingly popular because of their practicality and versatility in a variety of settings, particularly in large population studies (115, 119, 123, 124).

Table 2.5 Characteristics of food frequency questionnaires used in children aged eight to twelve

First author, year (name of FFQ)	Study design and sample	Type	No. items	Foods and /or food groups	Category frequency	Time span	Method of administration
Andersen <i>et al.</i> , 2004 ¹ (125)	Validation; Norway; n=144	Qualitative	16	Fruit and vegetables	‘Never’ to ‘several times a day’, with 10 categories	3 months	Written, by child
Janssen <i>et al.</i> , 2005 (Health Behaviour in School-Aged Children Survey) (115)	Cross-sectional; 34 European countries; n=137,593	Qualitative	15	Sources of fibre and calcium, and unhealthy foods relevant to population	‘Never’ to ‘every day more than once’, with 7 categories	Typical week	Written, by child
Burrows <i>et al.</i> , 2009 (The Australian Child and Adolescent Eating Survey) (126)	Validation; Australia; n=125	Semi- quantitative	137	Fruit and vegetables		6 months	Written, by parent
Lazarou <i>et al.</i> , 2009 (127)	Cross-sectional; Cyprus; n=1,140	Semi- quantitative	154	Dairy, meat and alternatives, cereals and grains, fruits, vegetables and other		Not stated	Written, by child
Cribb <i>et al.</i> , 2012 (123)	Cohort; UK; n=10,133	Qualitative	41	All aspects of diet	‘Never or rarely’ to ‘more than once a day’, with 5 categories	“Now- adays”	Written, by parent

First author, year (name of FFQ)	Study design and sample	Type	No. items	Foods and /or food groups	Category frequency	Time span	Method of administration
Lillegaard <i>et al.</i> , 2012 (128)	Validation; Norway; n=1,637	Semi-quantitative	23	Foods high in fat and sugar; fruit and vegetables	‘Never-seldom’ to ‘4 or more times per day, with 8 categories	1 year	Written, by child and parent
Bel-Serrat <i>et al.</i> , 2014 (Children’s Eating Habits Questionnaire FFQ) (119)	Prospective cohort; 8 European countries; n=16,224	Qualitative	36	All aspects of diet	‘Never/less than once a week’ to ‘4 or more times per day’, with 8 categories	1 month	Written, by parent
Bontrager Yoder <i>et al.</i> , 2014 (Block Kid’s FFQ 2004) (129)	Cross-sectional; USA; n=1,117	Semi-quantitative	77	All aspects of diet		1 week	Online, by child
Kehoe <i>et al.</i> , 2014 (130)	Cohort; India; n=538	Qualitative	136	All aspects of diet	‘Daily’, ‘weekly’ or ‘monthly’ and how many occasions during the chosen period	Typical month	Written, child and parent
Farajian <i>et al.</i> , 2015 (131)	Cross-sectional; Greece; n=2,024	Semi-quantitative	48	Items commonly used in Greek cuisine	‘Seldom/never’ to ‘every day’, with 6 categories	Not stated	Written, by child
Ferland <i>et al.</i> , 2015 (Harvard Youth-Adolescent FFQ) (124)	Cross-sectional; Canada; n=2,328	Semi-quantitative	131	All aspects of diet	Varies depending on food	Not stated	Written, by child

First author, year (name of FFQ)	Study design and sample	Type	No. items	Foods and /or food groups	Category frequency	Time span	Method of administration
Griffin <i>et al.</i> , 2015 (Scottish Collaborative Group FFQ) (132)	RCT; Scotland; n=268	Qualitative	140	All aspects of diet	'Never or rarely' to '7 or more times per day', with 8 categories	2-3 months	Written, by parent (with child assistance)
Perry <i>et al.</i> , 2015 (133)	Cross-sectional; Ireland; n=8,568	Qualitative	20	All aspects of diet	"Did not eat/drink items at all' to 'ate food/ drink more than once', with 4 categories	1 day	Written, by parents
Rice <i>et al.</i> , 2015 (134)	Case-control; Peru; n=383	Qualitative	170	All aspects of diet	'Never' to '14 or more times in the last 2 weeks', with 6 categories	2 weeks	Written, by field staff
Yang <i>et al.</i> , 2015 (135)	Case-control; China; n=11,473	Qualitative	33	Fruit, vegetables, cereals and high risk allergy foods	'Less than once a month' to 'every day', with 5 categories	Not stated	Written, by child and parent

¹Dietary questionnaire includes 24-hour recall as well as FFQ.

2.5 Conclusion

This comprehensive literature review demonstrates that children's food choices are influenced by a variety of factors, including peers, the media, the physical environment, food preferences and parental factors, particularly parental dietary intake. However, the current research largely focuses on one or two food groups, and not the diet in its entirety. There is increasing evidence showing that dietary patterns are a valid tool to examine overall diet. To date there is little research investigating the relationship between parent and child dietary patterns. The two studies that have looked at this relationship have only used theoretically derived dietary patterns, using adherence to dietary guidelines as a measure of overall diet quality. No research investigating the relationship between parent and child dietary patterns has used PCA to derive dietary patterns. Using this technique would allow for the derivation of patterns that are not limited by current knowledge, but reflect the dietary intake for the population of interest.

Many dietary assessment methods have been used in children, all with their own strengths and limitations. Though weighed diet records are the gold standard method, they are impractical in a community setting for large numbers of children. FFQs are a more practical dietary assessment method for children aged 8-12.

The aim of this thesis was to address some of the gaps in the dietary pattern literature by addressing the following questions:

- 1) Are higher parental dietary quality scores associated with more healthful dietary patterns in New Zealand children aged 8-12?
- 2) Are these relationships different between boys and girls?

3. Methods

This chapter outlines the data collection methods relevant to this thesis.

3.1 Study Design

This thesis uses data collected as part of the Physical Activity, Exercise, Diet and Lifestyle Study (PEDALS). The project was conducted in the Otago province of New Zealand between April and December 2015. However, this thesis only includes data entered and cleaned by the 6th of November 2015. Data were collected on food choice, eating behaviours, body composition, physical activity and physical fitness, as well as social and environmental correlates of these in children aged 9-11 years. All of these factors, excluding physical fitness, were also measured in the children's parents. The study was approved by the University of Otago Human Ethics Committee (reference number 14/277) and the Ngāi Tahu Research Committee.

3.1.1 Participants and recruitment

Invitations to participate in the study were sent via email to 30 out of 55 primary schools in Dunedin City. For logistical reasons the remaining 25 schools were not invited, as there were ≤ 15 Year 5 and Year 6 pupils on the school roll. Year 5 and 6 students in New Zealand are usually 9-11 years old, however can be as young as 8 years. Once a school showed interest in the study a meeting was held with the school principal or interested teacher. Dates for a class presentation and data collection were set at this time and any questions from the principal or teacher answered. Members of the PEDALS team returned to the school to present the study to the Year 5 and 6 children, and to answer questions. Students were given information sheets and consent forms for themselves and their parents. Consent forms could be sent back via the freepost envelopes provided or completed by email. Both parent and child consent forms were needed in order for children to participate.

3.1.2 Power calculations

Power calculations were based on two main outcome variables. Taking into account clustering of data by schools, a total of 300 students was needed to detect a difference of 10% in the proportion of boys and girls consuming fruit and vegetables daily or to

detect a difference of 90 minutes of moderate/vigorous physical activity per week between boys and girls, given a power of 0.90 and the level of significance set at 0.05. For the fitness testing data, sample size calculations indicated that a sample of 278 participants would provide prevalence estimates for which the maximum confidence intervals would be within $\pm 6\%$. This sample size provides a statistical power of 0.80 at a *P*-level of less than 0.05 to detect a 0.5 stage (around 5 laps) difference in the 20 metre shuttle run between (a) overweight/obese participants and those of normal weight, (b) those of high and low socio-economic status and (c) boys and girls, where a difference of one stage in this population equates to a difference in predicted VO_2max of approximately 2.7 l/min. Based on an estimated complete data set being available from 75% of participants, 400 participants were recruited to meet the target of 300 participants. Participants had to meet separate criteria to complete the fitness test, primarily no medical conditions that would affect them completing this aspect of the study, therefore a 70% completion rate was estimated for this. Taking this into account 400 students would also need to be recruited to reach the target of 278.

3.2 Data Collection

On the first day of data collection, a team of research assistants, including the candidate, visited the school between the hours of 9am and 3pm. Data was collected in the school hall or library. The children completed two paper-based questionnaires and throughout the day the following measurements were collected from each child: handgrip strength (Zhongshan Camry Electronic Co. Ltd., Guangdong, China), waist circumference, height (Model no. WSHRP, Wedderburn, Dunedin), bioelectrical impedance (BIA) (Tanita Corporation, Japan), a taste test and pulse wave analysis with the Sphygmocor (AtCor Medical Pty Ltd, Itasca, IL). All measurements were taken according to standard protocols. Children received their activity monitors (Actigraph GT3X+, Pensacola, FL), activity logs and two parent questionnaires to take home, once they had completed all of the measurements. Children were also given their parents' activity monitors and activity logs if the parent had agreed to wear a monitor. Once the measurements and questionnaires were complete the children undertook a 20-metre shuttle run test as a measure of cardiorespiratory fitness (136). When there was not a 20-metre indoor space available at the school, the fitness test was run outside on a court or field. If the weather was not appropriate, the test was run on the return visit to the school one week later.

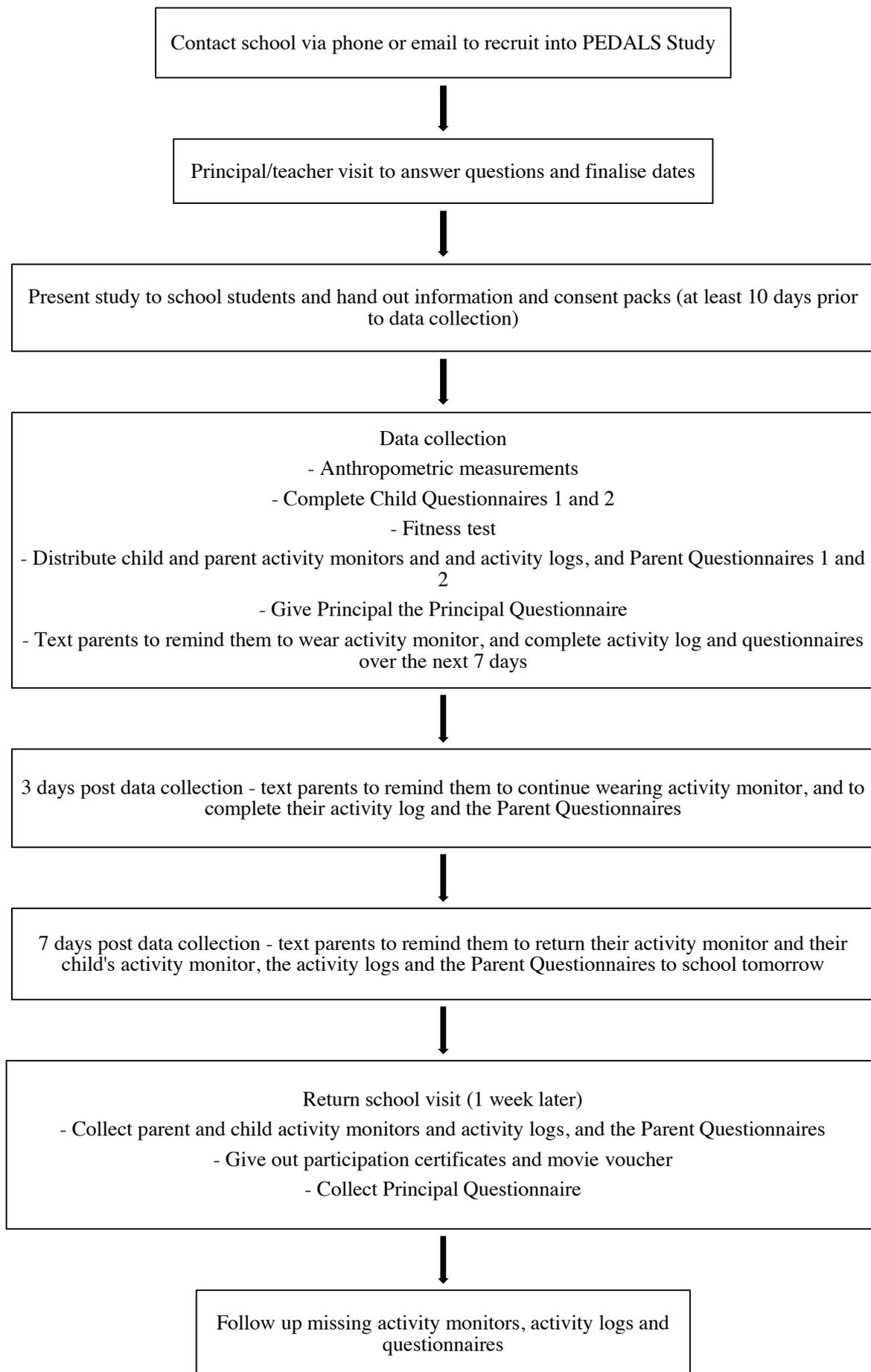


Figure 3.1. Process of data collection

The following paragraphs in this method section will describe extra details that were not used in this thesis. This is to provide a full picture of the study and because the candidate was involved in all aspects of data collection. Due to the aims and the time constraints of this thesis, in conjunction with the logistics of data entry and data cleaning, this thesis will only contain information from the sources stated in **Table 3.1**.

Table 3.1 Sources of information used in thesis

Source	Information used
Parent Questionnaire 1	Demographics
Parent Questionnaire 2	Dietary Habits Questionnaire
Child Questionnaire 1	Sex, age, school year, FFQ
Anthropometric measurements	Height, weight

3.2.1 Children’s questionnaires

The children were given two questionnaires to complete on the first day of data collection. Members of the research team clearly explained how to fill out the questionnaires correctly and were available at all times to help children if problems or queries arose. When the children thought they had finished each of their questionnaires they took them to a member of the research team to be checked for completeness. If there were missing or implausible answers, the questionnaire was given back to the child to answer or correct these questions. Under special circumstances, such as the child having reading difficulties or having to leave school early, children took the questionnaires home to complete and returned this the following week. Questions from the PEDALS questionnaires were collated from large epidemiological studies undertaken in Europe, Australia and the US (44, 118, 137). The questionnaires themselves are also based on questionnaires from previous studies in similar populations, including the Sport, Physical Activity and Eating Behaviour: Environmental Determinants in Young People Study (SPEEDY) and OSSLS 1 and 2 (34, 61).

The first questionnaire the children completed obtained information about the child (i.e. date of birth, age, sex, and year at school), and their food and drink consumption (Appendix F), including their perceptions of and attitude towards certain foods. A FFQ

was also included with 28 foods and food groups. In the final section, children were asked about body image and how they deal with different personal and social situations.

The second questionnaire assessed the children's physical activity (Appendix G). This questionnaire was the Youth Physical Activity Questionnaire (YPAQ), which has been previously validated in 12-17 year olds (138). The first section assessed how long the children had taken part in physical activity in the past week. This was split up into sports and physical activity at school and outside of school. For example, the children were asked how much time was spent walking to school in the "at school" section, and were asked how much time they spent playing basketball in the "outside school" section. Time spent doing non-physical activities was also assessed. For example, listening to music, doing homework and watching television. Children had the option to record how long each activity was undertaken for, as well as how many times per week they did that activity. For television and computer use, responses were broken down into weekdays and weekend days. Part two asked questions about the child's preference for different activities and what barriers (personal and environmental) they perceived to them undertaking these activities. The children were also asked about physical activity in a family setting. The third section assessed how children get to and from places such as school and friend's houses. The final section asked children if they participate in any sports and if so, what they were. This was followed by questions on why the children chose to participate in sports (or not) and why they chose to do physical activity.

3.2.2 Children's food frequency questionnaire

As previously mentioned the first child questionnaire included at 28-item qualitative FFQ (the PEDALS FFQ) to assess usual dietary intake (Appendix F). This FFQ is a modified version of the previously validated New Zealand Adolescent FFQ, which itself was based on the Health Behaviour in School-Age Children Questionnaire (118, 139). Major changes made from the Adolescent FFQ were simplifying the wording, removing items such as tea and coffee, and adding new food items such as jam and honey. The PEDALS FFQ was shown to valid and reproducible prior to the study in a group of 9-10 old children from Dunedin (140). The 28-items included commonly consumed single food items, groups of foods that were nutritionally similar (e.g. processed meat, meat pies, sausages) and foods that were important sources of fibre, calcium, fat and sugar (118). Foods were checked against the 2002 New Zealand

Children's National Survey to ensure that the included foods contributed to the diets of New Zealand children (107). The choice of responses for each food were 'never', 'less than once a week', 'once a week', '2-4 times a week', '5-6 times a week', 'every day once a day' and 'ever day more than once a day'.

3.2.3 Height

Height was measured with a calibrated portable stadiometer (Model no. WSHRP, Wedderburn, Dunedin). Participants were asked to remove their shoes and socks, and to stand up straight. A research assistant positioned their head on the Frankfort plane. The reading for height was taken to the nearest 0.1cm and recorded on the participant's measurement sheet. The participant stepped away from the stadiometer and the process was repeated. If the two measurements differed by more than 0.5cm a third measurement was take. The average was then taken between the two closest measurements.

3.2.4 Bioelectrical impedance analysis

A calibrated Body Composition Foot-to-Foot Analyser TBF-300 (Tanita Corporation, Japan) was used to measure weight (kg). Participants were measured in light indoor clothing with bare feet. Participants removed all metal objects from their pockets and any jewelry that may have interfered with the measurement. Participants with a pacemaker or metal pins were unable to complete the BIA. The weight entered for clothing was 0.5kg and either 'male standard' or 'female standard' was selected if the child was a boy or girl, respectively. Age was entered as a cut off to the full year (for example, 9 years and 3 months was entered as 9). Height was rounded to the nearest centimetre. The screen then indicated for the participant to step on; the participant placed their feet on the metal plates and the measurement was taken.

3.2.5 Activity monitors

The children were given an activity monitor (Actigraph GT3X+, Pensacola, FL) to wear on their wrist for eight days. It was worn on their non-dominant hand at all times during the eight day period, except when in water (for example, showering, bathing or swimming). The children were also asked to complete an activity log whenever the monitor was removed. Information they needed to include was the time the monitor was removed, the time it was put back on and why it was removed. If there were any

issues, such as the light on the monitor flashing red, parents could contact the study at any time.

3.2.6 Parent questionnaires

On the day of data collection each child received two paper-based parent/guardian questionnaires to take home for their parent or caregiver to complete. The first questionnaire asked about the family unit and the parents' physical activity (Appendix H). In section one, the parent completing the questionnaire self reported income, education, ethnicity, height and weight. Education was measured as years since finished full time study and highest level of qualification. Parents were also asked if they smoked and how often they consumed alcohol. Home residential address was used to assign a neighbourhood area-based New Zealand Deprivation Index (NZDep13) score for each participant. NZDep13 is a measure of socio-economic status that combines nine variables from the 2013 census, which reflect eight dimensions of deprivation, including owning a house and access to a car (141). The NZDep13 provides a deprivation score for each meshblock in New Zealand. A meshblock is a geographical unit defined by Statistics New Zealand, containing approximately 81 people (141). Section two of the questionnaire focused on health and well-being. For example, sleeping habits and ability to carry out certain activities such as climbing stairs. Questions in this section were sourced from the validated SF-36 survey (142). In section three, parents were asked about the physical environment around where they live. Section four assessed both parents' sedentary behaviour and level of physical activity. These questions are from the Recent Physical Activity Questionnaire (RPAQ), which assesses physical activity in four domains (leisure time, occupation, commuting and domestic life) (143). For this thesis only occupational physical activity levels were used, as the full RPAQ data were not ready at the time of analysis.

The second parent questionnaire assessed both parental and child dietary consumption (Appendix I). Firstly, parents were asked about their food choices and what foods they perceived as healthy and unhealthy. In the second section, parents completed a Dietary Habits Questionnaire (DHQ). Section three covered food security in the household. Parents responded to how much each statement related to them. For example "I/we can afford to eat properly". Both the DHQ and the food security questions were previously used in the ANS (101). The fourth section examined parents' attitudes toward foods

and drinks. Parents were asked about their diets and the importance of healthy eating. These questions have been previously used and validated in European and other Western countries (75, 144). Following this was a short section assessing body image. The final sections 6-10, asked parents questions about their child. This included how they perceived their child's weight and physical activity levels, how their child travelled to various destinations, rules around screen time and physical activity at home, and their child's sleeping patterns (145).

3.2.7 Parent Dietary Habits Questionnaire (DHQ)

Parent dietary intake and eating habits were assessed using a DHQ. This DHQ focused on dietary consumption over the previous four weeks. Nineteen questions were included in the DHQ, beginning with 10 questions assessing intake of red and processed meat, chicken, fish and shellfish, hot chips, soft drinks and energy drinks, fruit juice and confectionary. The range of options to choose from were 'none', 'less than once per week', '1-2 times per week', '3-4 times per week', '5-6 times per week', '7 or more times per week' and 'do not know'. There were five questions on dietary practices, such as removing fat from meat and chicken, adding salt to food and choosing low fat and salt varieties over standard varieties. Participants could select 'never', 'rarely', 'sometimes', 'regularly', 'always' and 'do not know'. Lastly, there were four questions on the type of milk, butter or margarine, bread and cooking fat used most often. Further details of the DHQ can be found in Appendix I. This questionnaire has been previously validated and was used in the 2008/09 ANS (101).

3.2.8 Principal Questionnaire

Each school principal was also given a questionnaire to complete (Appendix J). This questionnaire was adapted from surveys used in the SPEEDY Study and OSSLS2, and is based on previously validated questions where possible (35, 61). The questionnaire obtained information on food preparation, cooking, and physical activity opportunities at school. It also asked about the school's attitude towards physical activity, modes of transport to and from school, and regulation around catering and food provision at school.

3.2.9 One week post data collection

Throughout the following week parents were sent three text message reminders to complete the questionnaires, and to return them to school at the end of the seven days. The first reminder was on the day of the school visit, the second reminder sent on the third day after the school visit, and the final reminder sent the day before the second school visit. The research team returned to the school seven days post data collection (second school visit) to collect the parent questionnaires, the parent and child activity monitors and activity logs, and the principal's questionnaire. Each child received a certificate of participation and movie vouchers were given out to one or two children per school who won the prize draw, depending on the size of the school. If a child had forgotten to return any of the items mentioned, it was arranged for these to be picked up from school on another day or the items were collected from the participant's house.

3.3 Data Entry

Data from the two children's questionnaires, the second parent questionnaire (About Your Food and Drink, and Your Child) and the measurement sheets were entered into the survey application LimeSurvey (version 2.05+, LimeSurvey Project, Hamburg, Germany) by a team of research assistants. Specific questions relating to this thesis from the first parent questionnaire (About Your Family and Your Physical Activity) were entered into an Excel spreadsheet. The candidate and another Master's student completed this data entry.

3.4 Data Cleaning

The data was downloaded from the online server and each questionnaire was cleaned separately: Child Questionnaire 1 and 2, Parent Questionnaire 1 and 2, Principal Questionnaire, anthropometry and Sphygmocor data from the measurement sheet, 20-metre shuttle run data and Physical Activity Readiness Questionnaire (PARQ). Imputation was done for missing responses as follows: 75% of the questionnaire had to have been completed, and imputation of worst-case scenario was only done if the question had at least 4 sub-sections. For example, if a response for the question "How often do you eat lollies, sweets, chocolate or confectionary per week" was imputed, the worst case scenario response would be "7 or more times per week". This was to ensure imputed responses would at worst attenuate the results.

3.5 Children's Dietary Pattern Development

Data on 28 food items was collected in the children's FFQ. Nine of these food items were entered into the PCA individually (fruit, vegetables, standard milk, light or trim milk, processed meat, diet drinks, sugar-sweetened beverages, breakfast cereals, white bread and brown/wholegrain bread). The remaining 19 foods were collapsed into seven groups based on their nutritional similarity (all items except fish) or a lack of sufficient variation in the frequency distribution (fish):

- 'Confectionery': ice cream, cake/biscuits/muffins/doughnuts, snack bars, lollies and chocolate (lollies is the New Zealand name for sweets).
- 'Other dairy': yogurt and cheese.
- 'Meat and fish: non-processed meat and fish.
- 'Sugary drinks': fruit juice and sugar-sweetened beverages.
- 'Basic carbohydrates': potatoes (not including hot chips or crisps), rice and pasta.
- 'Crisps and chips': hot chips and crisps/potato chips.
- 'Sandwich spreads and tomato sauce: tomato sauce/ketchup, peanut butter/nutella and jam/honey.

3.6 Parents' Dietary Pattern Development

A dietary quality score for parents was calculated from the DHQ data, using a dietary quality index (DQI). This index was slightly modified from that developed and validated by Wong *et al.*, which used ANS data from adolescents aged 16-18 (146). The only modifications made to the adult index, compared to the published adolescent index, were a slight regrouping of frequency categories for two items. This modified index had good validity in the adult participants from the ANS (unpublished data). To produce the index, 17 items from the DHQ were grouped into five clusters: 1) fat from meat, poultry and fish, 2) other fats, 3) fruits, vegetables and breads, 4) sugar sources and 5) meal habits. A response that matched a more positive dietary habit was assigned a higher score (see Appendix K for details). A 5-point scoring system was used, with scores ranging from 0-4. The total diet quality score was a summation of scores from 17 items and ranged from 0-68.

3.7 Statistical Analysis

Demographic statistics for parent and children participants, including age, ethnicity, NZDep13 score, BMI category and school decile, were calculated using Stata version 13.1 (StatCorp, College Station, TX, USA). Ethnicity was categorised into three groups, as has been done in previous New Zealand surveys (101). 'Māori', 'Pacific Island' or 'New Zealand European and Other' (NZEO) were prioritised in that order. NZEO included those who identified as New Zealand European, as well as other groups that were too small for individual analysis, such as Indian and Korean. For statistical analysis, ethnicity was condensed into two groups, 'Māori and Pacific', and 'NZEO'. This was due to the small number of Māori and Pacific participants in the sample. Child BMI was categorised according to the Centres of Disease Control and Prevention guidelines (147). Children in the 85th to 95th percentiles were categorised as overweight and those above the 95th percentile were classed as obese. Self reported weight and height were used to calculate parent BMI. A BMI <25 was considered normal, 25-29.9 was overweight and ≥ 30 was obese. Demographics for children were reported for the total sample, and boys and girls separately. The parent dietary pattern scores were calculated on Microsoft Excel (version 14.1.0, Microsoft, Seattle, USA).

To identify the child dietary patterns PCA was conducted on the 28-item FFQ using Stata (version 12.1). Dietary data from 416 children who completed the FFQ were included in the analysis. At least 10 participants were in each of the 16 food groups entered into the PCA, which is important to provide robust results (148). Unrotated pattern scores were used when deciding which patterns to retain. Two methods were used to determine which patterns to retain. Firstly, patterns were considered for retention if they had an eigenvalue greater than one. This cut off is used to separate the meaningful results from the rest of the results (16). Secondly, a scree plot was visually examined. The points after the 'elbow' or 'bend' of the curve were discarded as the 'scree' and the remaining number represents the number of patterns (16). Both methods were used as examination of the scree plot improved the reliability of which patterns to retain, compared to relying on eigenvalues alone (20). Variables (food groups) with factor loadings ≥ 0.25 and ≤ -0.25 were considered significant when naming patterns (28). PCA was repeated with standardised variables to remove the skew from the data,

however, this did not change the factor loadings so results of the PCA using unstandardised data will be presented.

Mean (SD) scores were calculated separately for boys and girls for each dietary pattern. Two-tailed, unpaired t-tests were used to determine the unadjusted difference between boys' and girls' dietary pattern scores (Model 1). Mixed regression was used to calculate the adjusted difference between boys' and girls' dietary pattern scores (Model 2), and the adjusted association between parent and child dietary patterns. The regression model for the adjusted difference between boys' and girls' dietary pattern scores adjusted for child age and BMI, and school cluster. Mean differences (95% CI) and *P* values are presented. Linear regression was used to calculate the unadjusted association between parent and child dietary patterns. The mixed regression model for the adjusted association between parent and child dietary patterns adjusted for parent and child age and BMI, parent who completed the DQI (mother or father), level of deprivation (NZDep13), parent ethnicity and school cluster. An interaction term was included into the model between DQI score and who completed the DQI (mother or father) to assess whether the relationship between parent and child dietary patterns was moderated by which parent completed the DQI. An interaction term was also used between the DQI score (centered) and the sex of the child to determine if the relationship differed between boys and girls. Regression coefficients (95% CI) and *P* values are presented. Two sided *P* values of <0.05 were considered statistically significant.

4. Results

4.1 Participants and Recruitment

Thirty Dunedin primary schools were invited to take part in the PEDALS Study, of which eight schools declined to participate and five schools could not accommodate the study timeframe (**Figure 4.1**). Overall, 1,014 students were eligible to participate. Parent and child consent was received from 503 participants, of which 33 were away on data collection day. From the 470 available on data collection day, two refused to participate, resulting in 468 children participating in the study. All but two parents agreed to take part in PEDALS along with their child, and there were 12 sets of twins, resulting in 460 parent participants.

As of the 6th of November 2015 (the cut off point for this thesis), data from 398 child participants had been entered and cleaned. Data from three of the 17 participating schools were not included in the data set for this thesis as they were visited after the cut off date. Of the 398 child participants included in the data set for this thesis, 390 had complete questionnaire and anthropometric data, however 52 were excluded from the analysis, as their parents' questionnaires were incomplete. At the cut off date data from 405 parents had been entered for Parent Questionnaire One and data from 405 parents had been entered for Parent Questionnaire Two (**Figure 4.2**). Data from 67 parent participants were excluded due to incomplete data. Overall, 338 children and 338 parents were included in the analysis.

The average age of both the boys and the girls in this sample was 10.2 years (**Table 4.1**). The majority of child participants were New Zealand European or Other ethnicity (90.0%), with 8.6% identifying as Māori and 1.8% as Pacific Islander. When compared to the New Zealand population, this sample had a lower proportion of Māori and Pacific Islanders (14.9% and 7.4%, respectively) (149). According to the BMI z-scores, 18.9% of the sample was overweight or obese, with 21.2% of boys and 16.8% of girls falling into these categories. The school deciles of the 14 schools included in this analysis ranged from 6-10. In New Zealand school deciles range from 1-10. Decile one schools are the most deprived and receive the greatest amount of government funding.

Parent participants were on average 41.5 years old, ranging from 26-59 years (**Table 4.2**). Fifty-one fathers took part in the study compared to 287 mothers. Overall, 51.5% of parents were overweight or obese (74.5% of fathers and 47.4% of mothers). The majority of the sample had low levels of deprivation, with 49.1% of the total sample in the low NZDep13 category (levels 1-3). NZDep13 categories range from 1-10. One is the level of least deprivation, whereas ten is the highest level of deprivation. In a representative sample it would be expected that 30% of the sample would be from categories 1-3 as NZDep13 divides the New Zealand population into tenths (141).

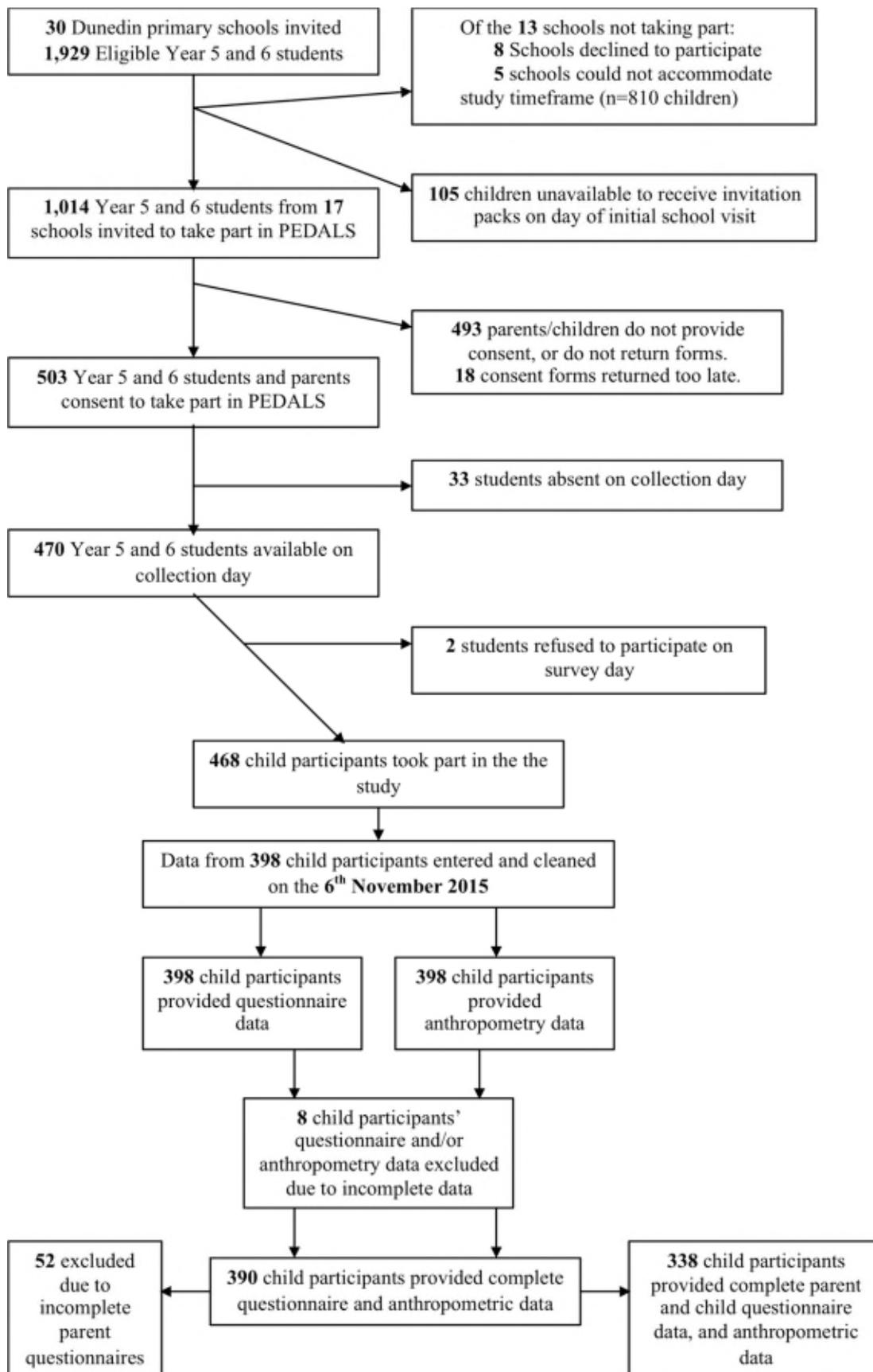


Figure 4.1 Recruitment of schools and children into the PEDALS Study

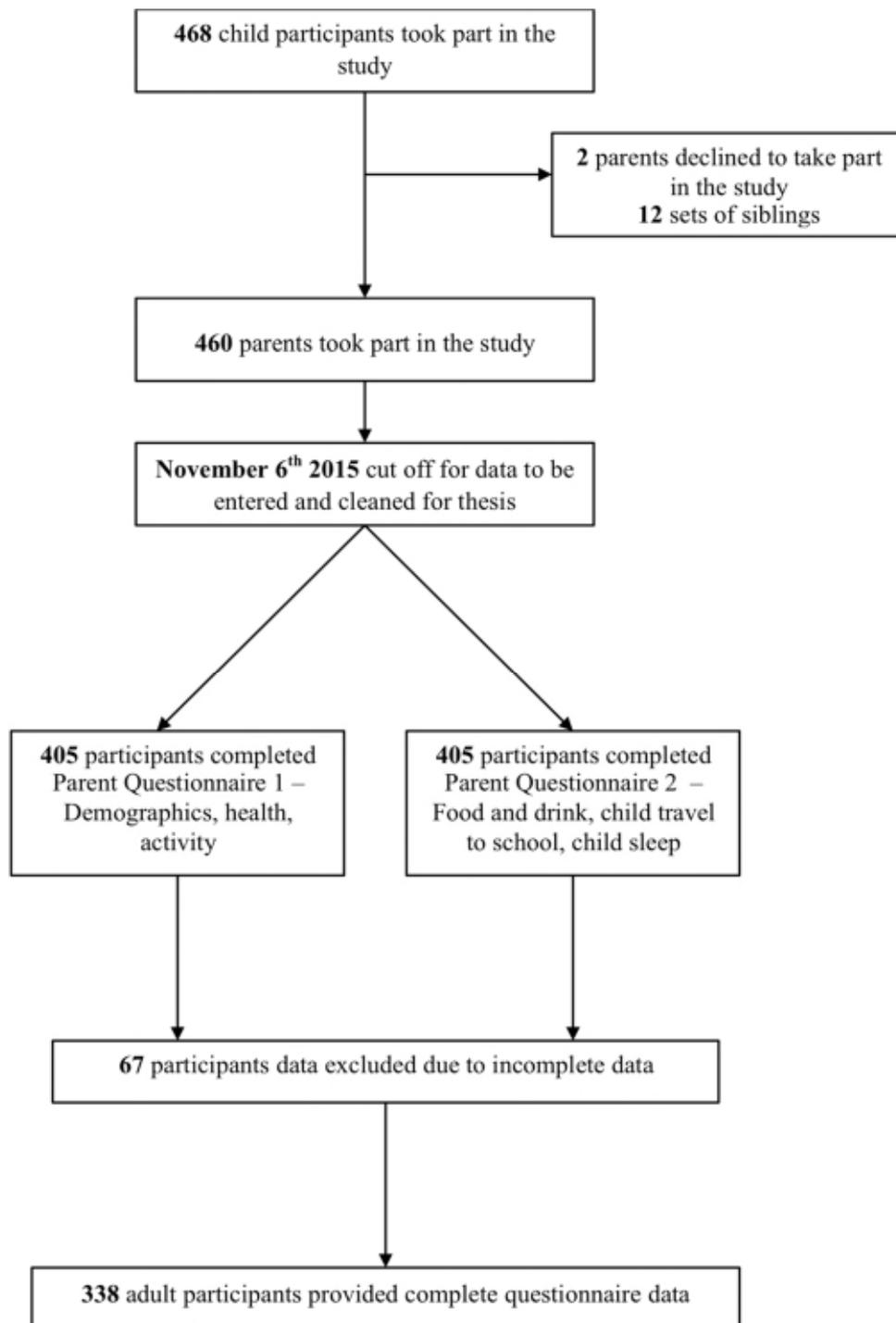


Figure 4.2. Recruitment of parents into the PEDALS Study

Table 4.1. Characteristics of child participants

Characteristic	Total (n=338)		Boys (n=165)		Girls (n=173)	
Age (years) ¹	10.2	(0.63)	10.2	(0.59)	10.2	(0.68)
Ethnicity ²						
Māori	29	(8.6)	17	(10.3)	12	(6.9)
Pacific	6	(1.8)	3	(1.8)	3	(1.7)
NZEO	303	(89.6)	145	(87.9)	158	(91.3)
BMI ^{2,3}						
Underweight/normal	274	(81.1)	130	(78.8)	144	(83.2)
Overweight/obese	64	(18.9)	35	(21.2)	29	(16.8)
School year ²						
Year 5	191	(56.5)	88	(53.3)	103	(59.5)
Year 6	147	(43.5)	77	(46.7)	70	(40.5)
School decile ^{2,4}						
Medium (4-7)	115	(34.0)	51	(30.9)	64	(37.0)
High (8-10)	223	(66.0)	114	(69.1)	119	(63.0)

¹ Presented as mean and standard deviation.

² Presented as number and percentage (%).

³ CDC criteria used to derive and allocate BMI categories.

⁴ Ratings given to schools in New Zealand to determine government funding; deciles range from 1 (low) to 10 (high). The lower the decile the more funding received.

Table 4.2. Characteristics of adult participants

Characteristic	Total (n=338)		Fathers (n=51)		Mothers (n=287)	
Age (years) ¹	41.5	(5.1)	43.6	(5.6)	41.1	(5.0)
Ethnicity ²						
Māori	18	(5.3)	4	(7.8)	14	(4.9)
Pacific	3	(0.9)	0	(0)	3	(1.0)
NZEO	317	(93.8)	47	(92.2)	270	(94.1)
BMI ²						
Normal (<25)	164	(48.5)	13	(25.5)	151	(52.6)
Overweight (25-29.9)	122	(36.1)	30	(58.8)	92	(32.1)
Obese (≥30)	52	(15.4)	8	(15.7)	44	(15.3)
NZDep13 ^{2,3}						
Low (1-3)	166	(49.1)	29	(56.9)	137	(47.7)
Medium (4-6)	109	(32.3)	9	(17.7)	100	(34.8)
High (7-10)	63	(18.6)	13	(25.5)	50	(17.4)
DQI score ⁴ (range from 0-68) ¹	50	(6)	49	(5)	51	(6)

¹ Presented as mean and standard deviation.

² Presented as number and percentage (%).

³ The New Zealand Deprivation Index 2013.

⁴ Diet Quality Index.

4.2 Overview of Parents' and Children's Dietary Intake

The percentage of children consuming foods at least everyday is shown in **Table 4.3**. Fruit and vegetables were consumed at least once everyday by 67% and 57% of children, respectively. Standard milk intake was more common than lite or trim, with 43% of children consuming standard, compared to 28% consuming lite or trim milk everyday. Thirty four percent of children consumed brown or wholegrain bread at least once everyday, whereas 21% consumed white bread everyday. Only 4% consumed soft drinks everyday. Less than 1% of parents consumed red meat, chicken or processed meat at least once everyday (**Table 4.4**). Light grain bread was the most commonly consumed bread by the parents (48.8%). Trim milk and standard milk were the most commonly consumed milk types, with 40.8% of parents consuming trim milk and 39.6% consuming standard milk (**Table 4.5**). Only 12.1% of parents consumed lite milk most commonly.

Table 4.3 Percentage of children consuming foods at least everyday

Food item	Percentage of children eating at least everyday (n= 338)
Fruit	67
Vegetables	57
Standard milk	43
Lite or trim milk	28
Cheese	17
Yoghurt	19
Ice cream	10
Processed meat ¹	15
Other meat ²	25
Fish	7
Fruit juice	15
Diet soft drink	4
Soft drinks	4
Breakfast cereals	47
White bread	21
Brown/wholegrain bread	34
Rice	5
Pasta	4
Potato	9
Crisps	6
Hot chips	5
Cake	10
Snack bars	13
Lollies	6
Chocolate	6
Ketchup/tomato sauce	10
Nutella	9
Jam	10

¹Such as meat pies, sausages, sausage rolls, salami, luncheon, bacon.

²Such as mince, beef, chicken.

Table 4.4 Percentage of parents consuming foods at least everyday

Food item	Percentage of parents eating at least everyday/always (n= 338)
Red meat	0.6
Chicken	0.6
Processed meat ¹	0.6
Shellfish	0
Battered fish	0
Canned fish	0
Hot chips	1
Soft drink	3
Fruit juice	2
Lollies	4

¹Such as meat pies, sausages, ham, salami, luncheon, bacon.

Table 4.5 Food types most commonly consumed by parents

Food item	Percentage of parents (n=338)
Type of bread	
<i>None</i>	5.9
<i>White</i>	17.8
<i>High fibre white</i>	6.8
<i>Light grain</i>	48.8
<i>Heavy grain</i>	20.7
Type of milk	
<i>None</i>	2.1
<i>Standard</i>	39.6
<i>Lite</i>	12.1
<i>Trim</i>	40.8
<i>Soy milk</i>	2.7
<i>Other (goat, rice)</i>	2.7
Type of spread	
<i>None</i>	6.2
<i>Butter</i>	26.9
<i>Butter margarine blend</i>	4.1
<i>Full fat margarine</i>	21.3
<i>Reduced fat/lite margarine</i>	37.9
<i>Plant sterol margarine</i>	3.6
Type of oil	
<i>None</i>	2.9
<i>Butter</i>	2.9
<i>Margarine</i>	0.9
<i>Oil</i>	92.0
<i>Dripping or lard</i>	1.2

4.3 Children's PCA Dietary Patterns

After visual examination of the PCA scree plot (**Figure 4.3**), three patterns were retained as there were three points before or on the bend of the plot. These three dietary patterns explained 45.6% of the total variance in the FFQ data. **Table 4.6** presents the factor loadings for each of the dietary patterns. All values ≥ 0.25 and ≤ -0.25 were considered to significantly contribute to a pattern (28). Positive loadings of ≥ 0.25 on a food group demonstrate that the food group is making a strong, positive contribution to a dietary pattern and negative loadings demonstrate the food group is making a negative contribution to a pattern. The three patterns identified were: 'Processed Foods', 'Low Fibre Foods' and 'Basic Foods'. 'Processed Foods' loaded positively for processed meat, meat and fish, diet soft drinks, sugary drinks, confectionary, basic carbohydrates, crisps and hot chips, sandwich spreads and tomato sauce, and other dairy. The 'Low Fibre Foods' pattern loaded positively for white bread, confectionary, sugary drinks, and crisps and hot chips, and loaded negatively for fruits, vegetables, brown/wholegrain bread and other dairy. The 'Basic Foods' pattern loaded highly for standard milk, white bread and breakfast cereals, and loaded negatively for brown/wholegrain bread and basic carbohydrates.

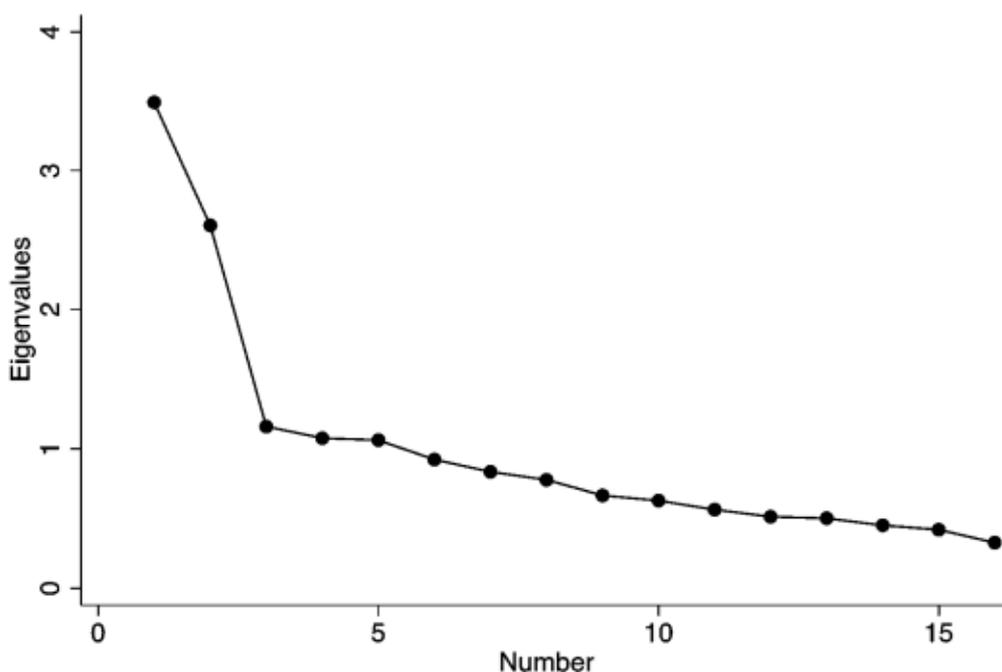


Figure 4.3 Scree plot of the eigenvalues for the 16 factors identified by PCA

Table 4.6. Factor loadings of three dietary patterns identified by PCA¹

Food item	Children's dietary patterns (variance explained)		
	Processed Foods (22.0%)	Low Fibre Foods (16.3%)	Basic Foods (7.3%)
Fruit	0.15	-0.37	0.21
Vegetables	0.19	-0.39	0.18
Standard milk	0.23	-0.13	0.46
Light or trim milk	0.17	-0.17	0.03
Processed meat	0.29	-0.03	-0.24
Diet soft drinks	0.26	0.23	-0.06
Breakfast cereal	0.21	-0.13	0.46
White bread	0.14	0.32	0.37
Brown/wholegrain bread	0.14	-0.38	-0.30
Confectionary	0.33	0.26	-0.02
Meat and fish	0.32	-0.12	-0.18
Sugary drinks	0.29	0.25	0.21
Basic carbohydrates	0.31	-0.06	-0.31
Crisps and hot chips	0.29	0.31	-0.13
Sandwich spreads and tomato sauce	0.28	0.15	-0.15
Other dairy	0.26	-0.27	-0.06

¹ Loadings that are strongly contributing to a dietary pattern (≥ 0.25 and ≤ -0.25) are presented in bold.

Table 4.7 Differences in dietary pattern scores between boys and girls

	Boys (n=165)		Girls (n=173)		Model 1 ²			Model 2 ³		
	μ^1	(SD)	μ	(SD)	μ	(95% CI)	P	μ	(95% CI)	P
Processed Foods	0.10	(1.02)	-0.13	(0.99)	0.23	(0.20, 0.45)	0.032	-0.22	(-0.44, -0.01)	0.039
Low Fibre Foods	0.02	(1.04)	-0.12	(0.96)	0.14	(-0.08, 0.35)	0.210	-0.15	(-0.36, 0.06)	0.152
Basic Foods	-0.01	(0.91)	0.03	(1.10)	-0.04	(-0.26, 0.18)	0.727	0.04	(-0.17, 0.26)	0.685

¹ Mean score, for all such values.

² Unadjusted difference between dietary pattern scores; girls compared to boys.

³ Adjusted difference between dietary pattern scores; girls compared to boys. Adjusted for child age and BMI, NZDep13 and school cluster.

The boys appeared to have higher ‘Processed Foods’ and ‘Low Fibre Foods’ scores and lower ‘Basic Foods’ scores when compared to girls (**Table 4.7**). However, the only pattern with a significant difference between girls and boys was the ‘Processed Foods’ pattern ($P=0.039$). Boys were therefore more likely to have a diet consisting of a frequent consumption of processed meats, diet soft drinks, confectionary, meat, fish, sugary drinks, basic carbohydrates, crisps, hot chips, sandwich spreads, tomato sauce, cheese and yoghurt, compared to girls.

4.4 Parent Dietary Patterns

The mean parent dietary pattern score was 50 (SD 6), with scores ranging from 34 to 64 (**Table 4.2**). The mean score for mothers was 51 (SD 6), two points higher than the mean father score of 49 (SD 5). There were no significant differences between scores for mothers and fathers.

4.5 Association Between Parent and Child Dietary Patterns

Mixed regression was used to examine the association between child dietary patterns and parent DQI scores (**Table 4.8**). The ‘Processed Foods’ and ‘Basic Foods’ patterns were not significantly associated with the parents’ DQI scores, however there was a significant association between the ‘Low Fibre Foods’ pattern and the parents’ DQI score ($P<0.001$). The higher the parent DQI score, the lower the score for the ‘Processed Foods’ pattern. Therefore, a less frequent consumption of low fibre foods and the more frequent consumption of fruit, vegetables, brown/wholegrain bread, yoghurt and cheese by children. Adjusting for covariates had no effect on the association. The interaction terms separating boys and girls in the regression model were all not significant. Therefore the relationship between the parents’ DQI scores and the children’s dietary patterns was not different between boys and girls. The interaction term for which parent completed the questionnaire was also not significant for the ‘Processed Foods’ ($P=0.717$), ‘Low Fibre Foods’ ($P=0.364$) or the ‘Basic Foods’ pattern ($P=0.793$), indicating that the relationship between parents’ DQI scores and the children’s dietary patterns was no different between mothers and fathers.

Table 4.8 Child PCA patterns vs. parent DQI scores

	DQI Score					
	Unadjusted			Adjusted ¹		
	β	(95% CI)	<i>P</i>	β	(95% CI)	<i>P</i>
Processed Foods	-0.013	(-0.03, 0.01)	0.147	-0.011	(-0.03, 0.01)	0.220
Low Fibre foods	-0.04	(-0.06, -0.02)	<0.001	-0.03	(-0.05, -0.02)	<0.001
Basic Foods	0.006	(-0.01, 0.02)	0.548	0.004	(-0.01, 0.02)	0.603

¹Adjusted for parent and child age and BMI, parent who completed the DQI, NZDep13, parent ethnicity and school cluster.

5. Discussion

This is the first study not only in New Zealand but globally to investigate the relationship between parental and child dietary patterns using empirical and theoretical methods of derivation. The results indicate that there is an inverse association between parent diet quality and the children's 'Low Fibre Foods' pattern; the higher the parent DQI score, the less frequent consumption of low fibre foods in children.

In this study 67% of children consumed fruit at least once daily, whereas only 4% had sugary drinks everyday. Having a low average score for the 'Low Fibre Foods' pattern, as well as the high percentage of children consuming high fibre foods at least daily suggests this sample of children have relatively healthy diets. However, it cannot be concluded whether or not the children were reaching three servings of vegetables and two servings of fruit per day as this data was not collected. It is possible that they are not reaching this target as a study representative of New Zealand children conducted in 2008/09 shows that only 30% of 5-9 year olds and less than 38% of 10-14 year olds were achieving both recommendations (150). Alternatively, it could also be argued that because the sample from the current study had relatively low levels of deprivation and the children were mainly from the NZEO group, that it would be expected more children were having five servings of fruit and vegetables per day compared to the national average (150). However, this can only be speculated given the nature of the FFQ.

In this sample of children three dietary patterns were derived using PCA: 'Processed Foods', 'Low Fibre Foods' and 'Basic Foods'. Using PCA to derive children's dietary patterns is becoming increasingly popular. Though these empirically derived dietary patterns are specific to the population of interest, similarities across studies are commonly seen, allowing for comparisons between populations. The 'Processed Food' and 'Low Fibre Foods' patterns derived in this study resemble patterns in other studies with similar aged children across the Western world (29, 30, 151). Whilst the naming of the patterns varies, the foods contributing the most to these patterns are comparable. For example, Craig *et al.* derived a 'Snacks' pattern in a sample of Scottish children aged 5-11 (n=1,233), which is similar to the 'Processed Foods' pattern derived in this

study. Food groups that loaded positively in both of these patterns include confectionary (biscuits, chocolate, lollies), sugary drinks, processed meat and crisps. Interestingly, no previous studies in the pre-adolescent age group have derived a pattern comparable to the 'Basic Foods' pattern derived in this study. However, a similar pattern has previously been described amongst the adolescent population of Dunedin, New Zealand (34). Using PCA, the adolescent study derived a 'Basic Foods' pattern, loading positively for standard (whole or high fat) milk, breakfast cereal and white bread. These three food groups also loaded positively in the 'Basic Foods' pattern derived in the present study. Milk, breakfast cereal and white bread are commonly consumed by children and adolescents in New Zealand, therefore it is not surprising the 'Basic Foods' pattern appeared in two New Zealand studies (107). The foods in this pattern are both readily available and affordable in New Zealand (152). It is possible that this pattern will not be derived in overseas studies as it was in the current study due to the limited food items included in the PEDALS FFQ and only measuring frequency of consumption, not amounts. For example, the ALSPAC study derived a 'Packed Lunch' pattern from a sample of nearly 4,000 ten year olds that positively loaded low-fibre bread, like the 'Basic Foods' pattern in the current study. However, there were a wider range of foods measured by the ALSPAC FFQ compared to the PEDALS FFQ. Other foods in the 'Packed Lunch' pattern that were not measured in the PEDALS FFQ were margarine, salty flavourings (such as yeast extract) and diet sugary drinks (such as diet cordial) (153). It would have been impossible to derive a similar pattern in the current study due to the limited food items included in the PEDALS FFQ.

The results from this study show that boys and girls had similar average scores for the 'Low Fibre Foods' and 'Basic Foods' patterns. However, boys had a higher score for the 'Processed Foods' pattern compared to the girls. This finding is similar to the findings of Oellingrath *et al.*, who worked with 9-10 year old Norwegian children (151). The 'Junk/Convenience Foods' pattern was comparable to the 'Processed Foods' pattern in the current study. The 'Junk/Convenience Foods' pattern was characterised by foods such as hot chips, pizza, processed meats, confectionary, sugary drinks and rice. The boys had a significantly higher score compared to girls, meaning they had a more frequent consumption of these foods with higher factor loadings for this pattern. Oellingrath *et al.* also found that boys had a higher score for their 'Snacking' pattern. This pattern was characterised by low factor loadings for vegetables and brown bread,

and high positive loadings for confectionary and sugary drinks, and is comparable to the current study's 'Low Fibre Foods' pattern. In addition, the Norwegian study derived two further dietary patterns: 'Varied Norwegian' and 'Dieting'. The 'Varied Norwegian' diet was characterised by fruit, vegetables, yoghurt, cheese, juice and brown bread, whereas the 'Dieting' pattern loaded highly for artificially sweetened drinks, sugar sweetened drinks and reduced fat cheese and yogurt. For both of these patterns girls had significantly higher scores compared to the boys. According to previous research, it is not surprising that in both the current study and the Norwegian study, boys had a more frequent consumption of 'treat and processed' foods. It has been suggested that taste is a major influence on boys' food preference and food choice (154). Conversely, girls are shown to be more influenced by how healthy foods are (155, 156). This can also be linked to girls' perceptions of an "ideal" body weight, particularly in the Western world (155). It is interesting to note that similar factors are influencing the diets of male and female children and adults (155).

In the current study parents' diet quality was associated with the children's 'Low Fibre Foods' dietary pattern. Children with a more frequent consumption of confectionary, white bread, sugary drinks, crisps and hot chips, and a less frequent consumption of fruit, vegetables, brown bread, yoghurt and cheese, would have a score for the children's 'Low Fibre Foods' dietary pattern, which was associated with lower parental DQI. This suggests that if parents have a poorer quality diet, their children's overall diet consists of a less frequent consumption of "healthy" foods and a more frequent consumption of "unhealthy foods". Though there are no other studies investigating the relationship between theoretically and empirically derived dietary patterns in parents and children, there is other evidence to suggest that diet quality is associated between parents and children. Both Australian and US cross-sectional research found that a higher diet quality in children was associated with a higher diet quality in parents (81, 99). Though these studies are not directly comparable methodologically with the current study, there are similar relationships shown in all three studies. The Australian study, undertaken by Robinson *et al.*, measured parent and child diet quality using the Australian Recommended Food Score, whereas the US Study, conducted by Beydoun and Wang, used the 2005 HEI score. Using an a priori dietary score to measure dietary quality in children is controversial, as some experts believe further validation and longitudinal research is needed before these can be used in epidemiological studies

(27). The rationale behind this is that it is unknown which study designs and settings are most appropriate when utilising a priori scores to determine pediatric disease risk (27). For this reason, the current study used PCA instead of a priori scores to derive the children's dietary patterns. Despite this, Beydoun and Wang had a nationally representative sample of over 2000 parent-child dyads and controlled for potential confounders such as gender, ethnicity, education, physical activity and smoking status. Robinson *et al.* only had a sample of 66 parent-child pairs, however the children were aged 8-12, similar to the PEDALS study, whereas the US study had a wider age range of 2-18 years. It is interesting that comparable results have been seen in different populations, even those with much larger sample sizes, and those using these a priori scores.

It is likely that the overall diets of 8-12 year old children are associated with their parent's diets due to the lack of autonomy children have at this age in regards to dietary choices. Children in this age range consume at least two-thirds of their meals at home and are provided with nearly all of their food by their parents (99). The literature convincingly suggests that many individual foods consumed by children are influenced by their parent's intakes (9-11, 80-93, 96-98), as well as other parental factors such as feeding styles, home food availability and nutritional knowledge (45, 67, 74). At this age, parents are considered to be one of the strongest influences on children's diets (7, 157). It is therefore interesting that in the current study only certain combinations of foods and drinks that loaded strongly in the patterns were significantly associated with parent diet quality ('Low Fibre Foods'), while others were not ('Processed Foods' and 'Basic Foods'). A possible reason for the association with the 'Low Fibre Foods' pattern is that this pattern was the only one to significantly load on fruits and vegetables (negative loading). Of all the food groups that have been researched, parent and child fruit and vegetable intake has shown the most consistent relationship. The literature agrees that if parents have a low fruit and vegetable consumption, so will their children (9-11). A novel aspect of this research is that the dietary patterns have allowed for fruit and vegetable intake to be looked at in context of the overall diet. It is plausible that the inclusion of fruits and vegetables into the 'Low Fibre Foods' pattern is contributing to the significant relationship between this pattern and parents diet quality. The inclusion of sugary drinks (soft drinks and fruit juice) may also be enhancing this association. There is increasing evidence supporting the relationship between parent and child

consumption of these beverages; as parent consumption increases, child consumption also increases (90, 96). White bread and confectionary consumption are two further foods that loaded positively in the 'Low Fibre Foods' pattern and lowered the parents DQI score. These may be additional factors playing a role in this relationship.

Evidence from this study suggests that if parent diet quality can be improved then this could lead to the improvement of children's diets. The diets of parents therefore need to be as healthy as possible. Data from the 2013/14 New Zealand Health Survey shows that approximately 64% of adults consume three or more servings of vegetables daily and 57% consume two or more servings of fruit daily (158). More New Zealand parents need to be reaching these targets to increase the likelihood of their children having a healthy diet. As previously mentioned, the latest figures on New Zealand children's diets show that only 30% of 5-9 year olds and less than 38% of 10-14 year olds were consuming both three vegetable servings and two fruit servings per day (150). It is during these childhood years that parents should be helping their children to develop good habits as their influence is strongest before adolescence. As children grow into adolescents the association between parents' and children's diets may weaken due to increased autonomy and greater influences outside of the home, such as school, jobs and social activities (159). This is a period of growing independence where the amount of time something takes becomes an important factor influencing dietary choices, more so than parental influence. (159). Beydoun and Wang found that the age of children was a significant effect modifier between parent and child diet quality (99). The odds ratio for healthy diet agreement between parents and children fell from 4.05 for 2-10 year olds, to 1.55 for children and adolescents older than 10 years. Such findings highlight how the influences of children's diets change as they grow into adolescents. Parents need to help their children have a high quality diet during their primary school years so they develop good habits to carry on into adolescence. This is particularly important because childhood dietary habits can track into adulthood and will therefore determine disease risk later in life.

The findings of this study may be important to help improve the quality of children's diets. It appears that there is a relationship between the overall diets of parents and children, therefore this could be a target area for further longitudinal and intervention studies, and public health programs. If parents' diet quality can be improved then this

could also lead to the improvement of children's diets. Late childhood is a critical stage in life as habits developed during this period can continue into adulthood, and as the research suggests, parents have less of an influence over their children's dietary habits once they reach adolescence (4). Healthy choices should be taught to children by their parents before other external factors become more important influences. Future work to improve children's diets should focus on home life and the family setting. If both parents and children are targeted there is a greater possibility of long-term results.

Strengths and Limitations

Some important limitations of this study are as follows. The FFQ used to measure the children's dietary intake only measured frequency, not amounts. This means that the foods selected by each child could not be quantified so it was only known how often foods were consumed. In addition to this, the FFQ was relatively short with only 28 items, meaning the entire diet was not extensively covered. Despite this, the FFQ was previously validated in a sample of 9-10 year old children from Dunedin, New Zealand. It was found to be a valid tool for ranking participants according to food group intake. Also, dietary patterns derived from this FFQ were similar to those found using longer FFQs in similar aged children (29,30,151). Therefore, this FFQ was an appropriate dietary assessment method for this study. There was also a minor limitation to the parents' DHQ for food groups that could not be defined as "optimum" or "poor". For example, goat's milk, rice milk and soymilks are neither "unhealthy" nor recommended for the majority of the population so scoring of these was based on current knowledge. This decision may influence the overall "healthfulness" of the scores. However, this issue would only impact a very small percent of parents in this study as these foods and drinks were not common choices. The DHQ was previously validated in the ANS population so was suitable to be used in this study (unpublished data).

Secondly, the cross-sectional nature of this study means that directions of relationships cannot be measured. All measurements were taken at one time point therefore, causality cannot be determined. In this study all relationships found are associations; this is important to note when interpreting the results. However, cross-sectional studies are appropriate for initial investigations into potential relationships and can help to determine factors for future intervention studies to focus on.

Furthermore, the sample of participants in the PEDALS Study was not nationally representative of the New Zealand population. There were less Māori and Pacific Island participants and a greater percent of participants in the NZEO group compared to the national population (149). There were also no low decile schools involved and few parents from areas of high deprivation. Less than 16% of the parents in the sample population were obese, this is considerably less than the 30% of obese adults in New Zealand (158). It should be noted however, that nearly 59% of fathers in this sample were overweight. Overall, these results are still generalisable to the majority of adults and children in the NZEO group as their characteristics are relatively comparable to this sample. The sample is also representative of children in the Otago province, where the research was undertaken.

This study has many strengths, in particular the use of dietary patterns. This is advantageous as dietary patterns look at the diet as a whole. As previously discussed people eat meals, not foods in isolation, therefore they have the potential to represent real world conditions. The use of PCA to derive the children's dietary patterns is also important. Using PCA allowed for population specific dietary patterns to be derived and to identify how combinations of foods were consumed in this population of children. All PCA analyses require some potentially subjective decisions to be made, but this was minimised through the use of standardised methods to group foods and naming patterns in a similar way to previous studies.

Sufficient children were recruited into the PEDALS Study to meet the requirements for PCA. At least ten participants per food group entered into PCA are required in order to obtain robust results (148) and the study sample more than met this. There was a high compliance with the children's questionnaire, anthropometry and fitness data. Most children were able to complete all three components in the school day provided. There was a low burden on the school, parents and children, as all consent forms were sent directly to the candidate at the university and all parent questionnaires and activity monitors were given to the children to take home. These factors contributed to the high recruitment rate (46.2%) and high compliance.

Lastly, all questionnaires used were previously tested and validated in similar populations to this sample. The children and parent questionnaires have been used and validated in large-scale population studies in Europe, the US and Australia. The parents' DHQ and the children's FFQ have also both been validated in New Zealand populations. The DHQ and FFQ allowed for comprehensive dietary data to be collected from a large number of people, whilst limiting the burden on participants. In addition, due to the wide variety of data collected from parents and children, covariates could be adjusted for to reduce confounding. Parent and child demographics and lifestyle behaviours, such as smoking and physical activity levels, were all included as part of data collection.

6. Conclusion

This study has used the novel approach of empirical and theoretical dietary patterns to investigate the relationship between parents' and children's diets. Dietary patterns are seen by many experts as a valid tool to assess the diets of people in a range of age groups, and can be used as an alternative and complementary method of dietary analysis. Both empirically and theoretically derived dietary patterns have notable strengths when used appropriately.

The current study found an association between parental diet quality and selected children's dietary patterns. Parents with a poor diet quality were more likely to have children that had a frequent consumption of processed foods. This finding is consistent with limited previous research investigating the relationship between parent and child diet quality. These studies found poor parent diet quality to be associated with poor child diet quality. The current study is also in agreement with dietary intake research, which suggests that parental consumption of individual foods influences children's consumption of those foods. However, only one of the three children's dietary patterns was associated with parental diet quality in this study. This raises the questions: are only some children's dietary patterns associated with their parents diets, are these patterns consistent across different populations and is there a causal relationship between poor diet quality in the parents and unhealthy dietary patterns in children? Further longitudinal research in this area is needed to answer such questions.

This study has begun to address the gap in the literature by investigating the relationship between parent and child dietary patterns. It is important to continue this research, as children's diet quality remains poor in large parts of the world, contributing the growing issue of childhood obesity. Areas of intervention need to be identified to improve the health outcomes of today's children.

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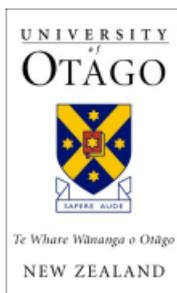
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Appendices

- Appendix A PEDALS Principal recruitment letter
- Appendix B Child information sheet
- Appendix C Child consent form
- Appendix D Parent information sheet
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Appendix A: PEDALS Principal recruitment letter



Dear Principal X,

We are writing to inform you about a study entitled the “Physical Activity, Exercise, Diet and Lifestyle Study (PEDALS)”. This study is a follow-up to research we have conducted in Otago secondary schools. This research showed that factors influencing diet and activity in older secondary school students were different to those in younger secondary school students. As research from other countries shows these relationships may also be different in even younger children, we have developed the PEDALS study. PEDALS is designed to investigate the importance of diet and activity on the health of younger children, specifically those in Years 5 and 6 from schools in Otago and Southland. Below is an outline of the study explaining why we are conducting the study and what the study involves. We would be grateful if you could take the time to read through this information and consider whether your school would be able to participate.

What is the study about?

Evidence shows that a poor diet and a lack of physical activity and fitness in children are contributors to health problems both in adolescence and in adult life, such as the development of obesity and diabetes. However, to date we still know little about children’s diet and their levels of activity and fitness. It is very important that we learn more about patterns of physical activity and diet in children, and their relationship with fitness, in order to target our prevention efforts effectively. It is also crucial that we improve our understanding of which factors are associated with diet, physical activity and fitness in children. This will enable us to design interventions to promote increases in healthy eating, physical activity and fitness amongst children. The aims of this study, therefore, are to identify patterns and

correlates of physical activity and diet in students aged 9 to 10 years old in Otago and Southland.

What will the study involve?

We are aiming to recruit 2500 students from primary schools in Otago and Southland. All students will be invited individually with a letter for themselves and their parents, allowing each student to decide with their parents whether or not they would like to take part. The study will take place during 2015. In order for students to fill in the study questionnaires, we ask the participating schools to allow us access to their schools on one or two days during school time and allow students whose parents allow them to participate to take part in this study. The study involves completing questionnaires, taking physical measurements and fitness testing, so we would require access to a classroom and either the school gym or an outdoor area in which children can run safely. We will also ask participating children to wear an activity monitor for a week and for them to take home a questionnaire and an activity monitor for their parent/primary caregiver. A member of the study team will return to the school about a week after the study visit to collect the activity monitors, activity logs, and parent questionnaires.

What involvement is asked from you and your school?

If your school decides to participate, we would kindly ask for some assistance with recruiting children to the study, organizing the visit day and with helping us to remind the children to return questionnaires and activity monitors to school. We will also ask you to fill in a questionnaire about food and activity in the school. In order for students to fill in the study questionnaires and participate in fitness testing, we ask that participating schools allow us access to their school on two days during school time and allow students whose parents have allowed them to participate to take part in this study. We would require access to a classroom in order for students to complete the study questionnaires. If possible we would like access to a second room to take the physical measurements in private. If this is not possible we can screen off a corner of the classroom for privacy. We would also require access to the school gym/sports hall or a suitable area outside in order to undertake fitness testing. We would also appreciate the support of class teachers for handing out invitation packs to students (containing information for the student

and their parent/guardian and a consent slip) and for collating the returned packs. We would also ask for the help to send reminders to parents to return questionnaires and activity monitors.

What will the research team do?

A convenient initial visit date will be determined with the school principal and class teachers to come into the school, explain the study to the children and answer questions about the study. The availability of the classroom(s) and school gym/sports hall will be confirmed at this visit. A member of the research team will provide information packs that are ready to give to students. On the day of the data collection visits three or more research assistants will visit the school. The Principal Investigators may also visit the school on the data collection date. The research team will supervise all students taking part in the study, including escorting them between the designated areas for questionnaire completion, physical measurements and fitness testing. No teachers will need to be present during the study, unless you would prefer this. All study materials will be provided by the study team. While we would like the school to help us facilitate the return of parental questionnaires and activity monitors, should further follow-up be needed (i.e. telephoning parents), the study team will contact parents directly.

What happens next?

Thank you for reading this information letter. We would greatly appreciate it if you and your staff would consider taking part in this important study. We will phone you within the next two weeks to further discuss the project and to ask for your school's participation in this study. If you would like to obtain more information or if you have any questions regarding the study please contact me or the study co-ordinator. Our contact details are below.

Yours sincerely,

Dr Paula Skidmore, Principal Investigator, Department of Human Nutrition

Any questions?

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

Dr Paula Skidmore	Contact phone number:
Position Principal Investigator/Senior Lecturer	03 479 8374
Department Human Nutrition	Contact e-mail: paula.skidmore@otago.ac.nz

Miss Brittany Davison	Contact phone number:
Position PEDALS Study Co-ordinators	0273497836
Department Human Nutrition	Contact e-mail: pedals@otago.ac.nz

Appendix B: Child information sheet



Physical activity, Exercise, Diet and Lifestyle Study (PEDALS)

Participant Information Sheet for Children

We are writing to ask you and other children your age to help us with an important study. This sheet gives you some information about this study.

Why are we doing this study?

PEDALS is a study looking at the health of children, what activities they do and what they eat. We are especially interested in what you think about physical activity and healthy eating. We hope that you will be a part of this important study, which we hope will help make children in New Zealand healthier.

Why me?

We are interested in the activities and diet of children in Years 5 and 6 in Otago and Southland and that includes you. You do not have to take part in the study but if you do it will be of great help to us.

What will I have to do?

If you do decide to take part, we will come to your school during school time so you will not have to give up any of your free time to take part. We will then ask you to fill in a questionnaire and researchers will take some simple measurements.

Questionnaire - We will ask you to fill in a questionnaire about what activities you do, what you eat and how you feel about different things in your life. These questions are not like a school test - there are no right or wrong answers and you do not have to answer all the questions if you don't want to. Your teachers will not see the answers that you write on the questionnaire.

Your height and weight - We will use scales and tapes to measure these and will ask you to take off only your shoes and socks.

Blood pressure - We will ask you to lie down and we will place a blood pressure cuff around your arm and thigh, over your clothes, and will put a small measurer on your neck for a few minutes. We will do this the same way as we showed you when we visited your school to tell you about the study. This will take a couple of minutes and will not hurt.

Fitness - We will ask you to take part in a beep test. This is a test where you run between two lines of cones until you are tired. We will also ask you to grip a measuring device so we can measure how strong your hands are.

Activity - We will ask you to wear a small activity monitor on a band around your wrist for a week. They look similar to a wrist-watch. Instead of giving the time, these monitors tell us when you are moving, how fast you are moving, and how long that you sleep. The monitor is very light so you will hardly feel it when you are wearing it. We will ask you to wear the device on your wrist for 8 days straight. The monitor should be removed for bathing and swimming.



All of these tests have been used before in studies in children and are very safe. Once you have completed the study you will go into a draw to win one of twenty-five \$30 movie vouchers.

What if I change my mind and decide not to take part?

You can stop taking part at any time and don't have to give a reason. Also, if you feel uncomfortable answering any of the questions you don't have to answer them.

What happens after the study?

After the measurements have been finished you will get a certificate to show that you have played an important part in this research. When we have finished visiting all the schools, we will send your head teacher the results of the study. These will be for all the children together and we will make sure that the head teacher will not see your answers to the questions and the results of your measurements. The student researchers will write up some of the results from this study for their University work. The results may also be written up in journals and talked about at conferences. Group results only will be reported back to you and your parents/caregivers in a school newsletter.

What do I do now?

Thank you for reading this information. We hope you will be able to take part in our study. Please fill in the reply form with your parent or caregiver, and give it to them to send back to us using the envelope provided or via email consent. If you have any questions you can contact us by telephone or email:

Name Dr Paula Skidmore Position Principal Investigator/Senior Lecturer Department Human Nutrition	Contact phone number: 03 479 8374 Contact e-mail: pedals@otago.ac.nz
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Name Miss Brittany Davison Position Study Co-ordinator Department Human Nutrition	Contact phone number: 0273497836 Contact e-mail: pedals@otago.ac.nz
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This study has been approved by the University of Otago Human Ethics Committee (Ref No. 14/227). 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 C: Child consent form

Barcode:



The Physical activity, Exercise, Diet And Lifestyle Study (PEDALS)

CONSENT FORM FOR CHILD PARTICIPANTS

Following signature and return to the research team, this form will be stored securely for ten years.

Name of participant: _____

Date of birth (DD/MM/YY): _____

Dominant hand (writing hand, please circle): **Left** **Right**

Thank you for reading the attached information sheet for this study. Please ask us if there is anything that is not clear or if you would like more information.

"I understand what this study is about. All my questions have been answered in a way that makes sense. I know that:

1. Participation in this study is voluntary, which means that I do not have to take part if I don't want to and nothing will happen to me if I choose not to participate. I can also stop taking part at any time and don't have to give a reason.
2. Anytime I want to stop, that's okay.
3. If I don't want to answer some of the questions, that's fine.
4. If I have any worries or if I have any other questions, then I can talk about these with Paula, Hannah, Brittany, Harriet, Pouya or Jens.
5. The computer file with my answers will only be seen by Paula and the people she is working with. They will keep whatever I say private.
6. Paula, Brittany, Harriet and Pouya will write up the results from this study for their University work. The results may also be written up in journals and talked about at conferences. My name will not be on anything they write up about this study.
7. I will be entered into a draw to win a \$30 movie voucher.
I agree to take part in the study".

Signed:.....

Date:

In order to participate in PEDALS, this form must be signed and returned to us EITHER in the Freepost envelope provided OR via email within 3 DAYS of receiving this information sheet and consent form.

Appendix D: Parent information sheet



Physical activity, Exercise, Diet and Lifestyle Study (PEDALS)

Participant Information Sheet for Parents/Caregivers

Introduction

Thank you for showing an interest in this project. Please read this information sheet carefully. Take time to consider and, if you wish, talk with relatives or friends, before deciding whether or not to participate. If you decide to participate 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.

What is the aim of this research project?

We are interested in how nutrition, physical activity and physical fitness altogether relate to the health of New Zealand children. We would like to collect information on these things so that we can identify behaviours that will help develop interventions to be used to promote healthy lifestyles in children. This study aims to provide data on food choices, physical activity, physical fitness and other markers of health in 9-10 year old children who go to school in Otago or Southland. We are also interested in the lifestyle of their parent/caregiver. We would like to determine what behaviours in children and parents/caregivers are part of a healthy lifestyle. This study is funded by the University of Otago and the National Heart Foundation.

Who are we seeking to participate in the project?

We are asking children aged 9-10 from year five and year six classes in schools in Otago and Southland, and their primary parent/caregiver, to take part in the PEDALS study.

If you participate, what will you and your child be asked to do?

We will visit your child's school once to collect information. If you and your child agree to take part we will ask your child to fill in some questionnaires about the food that they eat and the activities that they do. We will also measure their height, weight, and body

fat, and measure their blood pressure. Your child will also take part in a shuttle run, or beep test as it is also known, so that we can measure their fitness. We will then ask them to complete a handgrip test so we can test their strength. We will also ask them to wear an activity monitor for a week after we visit the school.

If you are the primary caregiver of the child participating in the study you will be asked to complete two questionnaires about you and your child. We will ask about your food choices, physical activity, how you feel about life and we will ask about your child's sleep. We will text you or email you to remind you when to fill these in. The questionnaires will be sent home from school with your child, and we ask you to return them to your child's school. If this is not possible we can contact you to arrange to have them picked up from your home.

Participation in any of these measurements is voluntary and you and/or your child can pull out at any stage. There will be no disadvantage to your child if you or your child chooses not to participate.

Once your child has completed the study they will go into the draw to win one of twenty-five \$30 movie vouchers.

Is there any risk of discomfort or harm from participation?

There is low risk to all children taking part in the study. No invasive measurements such as blood samples will be taken. Your child may experience minor discomfort from the blood pressure cuff, however, procedures will be put in place to ensure that they are as comfortable as possible. Your child will also be able to refuse to do any particular measurement if they are not happy to do them.

What data or information will be collected, and how will they be used?

Dietary, physical activity and health-related data will be collected and used to help improve the lifestyles of New Zealand children. The student investigators will write up some of the results from this study for their University work. The results may also be written up in journals and talked about at conferences. Group results only will be reported back to you and your children via a school newsletter.

What about anonymity and confidentiality?

All body measurements will be taken in private and your child's classmates will not be able to see any of your results. Your name, or your child's name, will not be linked to any answers from the questionnaires. All information collected will be locked away and only researchers involved in the study will be able to gain access to it. All results that are released will be group results only.

If you agree to participate, can you withdraw later?

You or your child may withdraw from the study at any time without any disadvantage to you or your child. Also, if you or your child feels uncomfortable about answering any of the questions you have the right to leave them unanswered.

Any questions?

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

Name Dr Paula Skidmore Position Principal Investigator/Senior Lecturer Department Human Nutrition	Contact phone number: 03 479 8374 Contact e-mail: pedals@otago.ac.nz
Name Miss Brittany Davison Position Study Coordinator Department Human Nutrition	Contact phone number: 0273497836 Contact e-mail: pedals@otago.ac.nz

This study has been approved by the University of Otago Human Ethics Committee (Ref No. 14/227). 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 E: Parent consent form



The Physical activity, Exercise, Diet And Lifestyle Study (PEDALS)

Principal Investigator: Dr Paula Skidmore
(paula.skidmore@otago.ac.nz; 03 479 8374)

CONSENT FORM FOR ADULT PARTICIPANTS

Following signature and return to the research team, this form will be stored securely for ten years.

Name of adult participant:.....

Name of participating child:.....

1. I have read the Information Sheet concerning this study and understand the aims of this research project.
2. I have had sufficient time to talk with other people of my choice about participating in the study.
3. I confirm that my child meets the criteria for participation which are explained in the Information Sheet.
4. All my questions about the project have been answered to my satisfaction, and I understand that I am free to request further information at any stage.
5. I know that my and my child's participation in the project are entirely voluntary, and that we are free to withdraw from the project at any time without disadvantage.
6. I know that if my child and I participate in the study:
 - I will complete two questionnaires involving questions about diet, activity and lifestyle
 - My child will complete a diet and a physical activity questionnaire, and physical fitness testing

- My child will have body measurements taken including height, weight, waist circumference and blood pressure
7. I know that the questionnaires will explore my and my child's dietary and physical activity habits, and that if the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) , and /or may withdraw from the project without disadvantage of any kind.
 8. I understand the nature and size of the risks of discomfort or harm which are explained in the Information Sheet.
 9. 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.
 10. 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.
 11. I know that there is no remuneration offered for this study, and that no commercial use will be made of the data. However I know that my child will be entered into the draw to win one of twenty-five \$30 movie vouchers.

Signature of parent/caregiver: _____ Date: _____

Telephone number(s):

Home phone: _____

Cell phone: _____

Postal address: _____

Email address: _____

We are asking for your phone number(s) and addresses so we can arrange collection of the activity monitors and questionnaires, if needs be, and to send you a reminder text or e-mail about when to fill in and return the questionnaires.

Would you (the parent/caregiver who will be filling in the most of the Parent Questionnaires) like to help us out by wearing an activity monitor for 8 days?

It will be the same type of monitor as the one your child will wear. Data from this monitor will be used to provide important information about your activity level, the amount of sleep, and the quality of sleep you are getting.

Please tick:

- Yes, I would like to wear an activity monitor for 8 days**
- No**

Do you give your permission for the researchers to contact you in a year or two for a short follow-up questionnaire? Please tick:

- Yes**
- No**

Please EITHER:

- Return this consent form along with your child's consent form using the Freepost envelope provided.
- OR**
- If you would prefer, you can give consent via email for you and your child to participate. Please contact pedals@otago.ac.nz and we will initiate this.

Appendix F: Child Questionnaire One

UNIVERSITY
of
OTAGO



Barcode



PEDALS

(Physical Activity, Exercise, Diet And Lifestyle
Study)

CHILDREN'S QUESTIONNAIRE #1

All the questions in this questionnaire are about how you feel and think
about

FOOD AND DRINK

If you have any questions about this questionnaire please contact the
PEDALS research team
on 0273497836 or email them at pedals@otago.ac.nz

- Please answer the questions as honestly and accurately as you can.
- This is not a test - there are no right or wrong answers to the questions.
- We will not tell anyone your answers unless we consider you or someone else to be at risk from harm, then we will tell one adult.

Part 1: You and your family

These questions ask about you and your family. If the question asks about your parents, we mean your mum or dad or other adults who live with you and take care of you.

1. a. When is your birthday? (for example 7th February) _____

b. How old are you? _____ (years)

2. Are you a boy or a girl?

Boy

Girl

3. What Year are you in at school?

Year 5

Year 6

4. How many people live at your home altogether, including you? _____

5. How many **adults** do you usually live with? (include mum, dad or anyone else like grandmother)

Please circle a number

1 2 3 4 5 6 7

8

6. How many **brothers and sisters** do you have? (include step-brothers/sisters and half-brothers/sisters)

Please circle a number 0 1 2 3 4 5 6 7
8

7. Which of the following things do you have at home? (Please place a tick in the box for each thing you have at home. Leave the box empty for things you don't have.)

- A car (or van)
- More than one car (or van)
- A garden
- Play equipment in the garden (such as a trampoline, slide or swing)
- A television
- A home computer (PC) or tablet (such as an iPad)
- A games console (such as Xbox, Playstation, Wii, Nintendo)
- None of the above

8. Which of these do you have in **your bedroom**? (Please place a tick in the box for each thing you have in your bedroom. Leave the box empty for things you don't have.)

- A television
- A home computer (PC) or tablet (such as an iPad)
- A games console (such as Xbox, Playstation, Wii, Nintendo)
- None of the above

9. At what time do you usually go to sleep and wake up?

- a. On school days: I go to bed at _____ at night
I get up at _____ in the morning
- b. In the weekend: I go to bed at _____ at night
I get up at _____ in the morning

10. Do you share a bedroom at home with your brother(s) or sister(s)? Please

circle: **Yes / No**

11. Do you have a dog at home? Please circle:

Yes / No

12. Do you have a bike that you can use? Please circle:

Yes / No





Part 2: Food and drink

13. How many days **during the WEEK** do you usually have these meals ?

Please tick the box that matches the number of times you eat these meals on week days (e.g. if you eat breakfast on Mondays, Tuesdays and Fridays you would tick "3")

	Number of days during the week					
	0	1	2	3	4	5
a. Breakfast (more than a glass of milk or juice)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Lunch (more than a drink or snack)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Evening Meal (more than a drink or snack)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. How many days **during the WEEKEND** do you usually have these meals?

Please tick the box that matches the number of times you eat these meals on the weekend.

0 = Never or no days during the weekend

1 = either Saturday OR Sunday, but not both days

2 = Both weekend days (Saturday AND Sunday)

	Number of days during the weekend		
	0	1	2
a. Breakfast (more than a glass of milk or juice)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Lunch (more than a drink or snack)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Evening Meal (more than a drink or snack)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. On school days at lunch break do you mostly...

Please choose ONLY ONE answer and tick the box:

- a. Eat food bought at school or ordered through the school (e.g. Subway, sushi)

- b. Eat a lunch brought from home
- c. Go home for lunch
- d. Eat food bought on the way to school
- e. Skip (don't eat) lunch

16. Are these things important to you when you decide what to eat?

- | | Important | Not important |
|---|--------------------------|--------------------------|
| a. The healthiness of the food | <input type="checkbox"/> | <input type="checkbox"/> |
| b. The taste of the food | <input type="checkbox"/> | <input type="checkbox"/> |
| c. That the food is quick and easy to eat | <input type="checkbox"/> | <input type="checkbox"/> |
| d. That the food is easy to get | <input type="checkbox"/> | <input type="checkbox"/> |

17. Do you believe that eating fruit and vegetables every day...

- | | Yes | No |
|--|--------------------------|--------------------------|
| a. ...will make you look better | <input type="checkbox"/> | <input type="checkbox"/> |
| b. ...will make you become better at sport | <input type="checkbox"/> | <input type="checkbox"/> |

18. Were the following available to you at home in the past week? *Tick only ONE box per line.*

	Yes	No
a. Fruit or vegetables on the kitchen counter or somewhere out in the open	<input type="checkbox"/>	<input type="checkbox"/>
b. Fruit juice, fruit or cut up vegetables in the fridge as a snack	<input type="checkbox"/>	<input type="checkbox"/>

19. I can choose to eat fruit or vegetables... *Tick ONE box per line.*

	Yes	No
a. ...when there are also sweets available	<input type="checkbox"/>	<input type="checkbox"/>
b. ...for a dessert	<input type="checkbox"/>	<input type="checkbox"/>

c. ...instead of crisps

20. Do your parents encourage you to eat fruit and vegetables?

Please circle ONE answer: **Yes / No**

21. How many times a week do you usually eat or drink these foods...? Please tick ONE box for each food

	Never	Less than once a week	Once a week	2 - 4 days a week	5 - 6 days a week	Every day, once a day	Every day, more than once
a. Fruits	<input type="checkbox"/>						
b. Vegetables (excluding potato)	<input type="checkbox"/>						
c. Milk (blue) [including on cereals, milo, hot chocolate]	<input type="checkbox"/>						
d. Light or trim milk (green/light blue/yellow) [including on cereals, milo, hot chocolate]	<input type="checkbox"/>						
e. Cheese	<input type="checkbox"/>						
f. Yoghurt	<input type="checkbox"/>						
g. Ice cream	<input type="checkbox"/>						
h. Processed meat (such as meat pies, sausage, sausage roll, salami, luncheon, bacon, ham)	<input type="checkbox"/>						
i. Other meats (such as mince, beef, chicken)	<input type="checkbox"/>						
j. Fish (including canned tuna or salmon, fish cakes, fish fingers, fish pie, battered fish)	<input type="checkbox"/>						
k. Fruit juice (such as Orange juice, Apple juice, Raro, Refresh, Keri, Twist, Ribena)	<input type="checkbox"/>						
l. Diet fizzy drinks (Diet Coke, Pepsi Max, Sprite Zero and any other "light" or "sugar free" varieties)	<input type="checkbox"/>						



m.	Fizzy drinks (Coke, Pepsi, Sprite, L P, Fanta, Ginger Beer)
n.	Breakfast cereals
o.	White bread
p.	Brown /Wholemeal bread
q.	Rice, rice-based dishes
r.	Pasta (such as spaghetti, macaroni), noodles
s.	Potato (such as mashed, boiled)
t.	Potato chips, potato snacks, corn chips
u.	Hot chips, wedges, French fries
v.	Biscuits, cakes, muffins, doughnuts, fruit pies
w.	Snack bars (muesli bar, fruit bar, rice bubble bar)
x.	Lollies
y.	Chocolate, Chocolate bars
z.	Tomato sauce, Ketchup
aa.	Peanut butter, Nutella
bb.	Jam, honey

22. For each of these foods, please tick which answer you think is right.
Please tick *ONE* box per line.

	Has lots of sugar	Has lots of fat	Has lots of fibre
a. Cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Jam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. All Bran	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Beef burgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Sweets/lollies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. Do you like these foods? Please tick *ONE* box per line.

	Like	They're ok	Dislike
a. Apples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Oranges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Strawberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Grapes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Peas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I. Sweetcorn

24. How much do you agree with these statements? *Please tick ONE box for each sentence.*

	Fully disagree	Disagree	Neither agree nor disagree	Agree	Fully Agree
a. Eating fruit every day makes me feel good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Eating vegetables every day makes me feel good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Eating fruit every day gives me more energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Eating vegetables every day gives me more energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I like to eat fruit every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I like to eat vegetables every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Fruit tastes good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Vegetables taste good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. My mother eats fruit every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. My father eats fruit everyday	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. My best friends eat fruit everyday	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. My mother eats vegetables every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. My father eats vegetables every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

n. My best friends eat vegetables every day	<input type="checkbox"/>				
o. I don't eat vegetables, they are too messy	<input type="checkbox"/>				

25. How much do you like each of these foods and how healthy do you think they are? Please tick **ONE** box to say how much you like the food **AND ONE** to say how healthy you think it is.

	Like	They're ok	Dislike		Healthy	They're ok	Un-healthy
a. Apples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	a. Apples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Oranges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b. Oranges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c. Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Strawberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d. Strawberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Grapes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e. Grapes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f. Pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Peas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	g. Peas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	h. Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	i. Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	j. Salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Tomato	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	k. Tomato	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Sweet Corn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	l. Sweet Corn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Butter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	m. Butter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Pasta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	n. Pasta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. Rice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	o. Rice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. Cake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	p. Cake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	q. Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. Sausages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	r. Sausages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
s. Chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	s. Chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

t. Potatoes (not hot chips/ potato chips)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	t. Potatoes (not hot chips/ potato chips)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
u. Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	u. Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
v. Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	v. Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
w. Ice cream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	w. Ice cream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
x. Chocolat e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	x. Chocolate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. For each of these questions, please select which answer you think is right. Please choose the *BEST* answer for each item and place a tick in the box.

	None	Very Little	Some	Quite a lot	Lots
a. Do you think that you eat a lot of fruit?	<input type="checkbox"/>				
b. Do you think that you eat a lot of vegetables?	<input type="checkbox"/>				

27. How many portions (handfuls) of fruit and vegetables do health experts such as doctors say you should eat every day? _____ portions every day

28. How much do you agree with these statements? Please tick *ONE* box for each sentence.

	Fully disagree	Disagree	Neither agree or disagree	Agree	Fully Agree
a. It is difficult for me to eat fruit every day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. It is difficult for me to eat vegetables every day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

c. If I decide to eat fruit every day I can do it.	<input type="checkbox"/>				
d. If I decide to eat vegetables every day I can do it.	<input type="checkbox"/>				
e. I can choose to eat fruit or vegetables instead of sweets or chocolate.	<input type="checkbox"/>				
f. I can choose to eat fruit or vegetables instead of crisps.	<input type="checkbox"/>				
g. I can choose to eat fruit or vegetables for a dessert.	<input type="checkbox"/>				
h. I want to eat fruit every day.	<input type="checkbox"/>				
i. I want to eat vegetables every day.	<input type="checkbox"/>				
j. To eat fruit every day is a habit for me.	<input type="checkbox"/>				
k. To eat vegetables every day is a habit for me.	<input type="checkbox"/>				

29. How much do you agree with these statements? *Please tick ONE box for each sentence.*

	Fully disagree	Disagree	Neither agree or disagree	Agree	Fully Agree
a. I don't eat fruit because it takes too long for me to eat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I don't eat fruit because I want something else (e.g. lollies).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I don't eat fruit because it is too messy to eat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

d. I don't eat fruit because it gets squashed in my school bag.	<input type="checkbox"/>				
e. I don't eat vegetables because it takes too long for me to eat.	<input type="checkbox"/>				
f. I don't eat vegetables because I want something else (e.g. lollies).	<input type="checkbox"/>				
g. I don't eat vegetables because they are too messy to eat.	<input type="checkbox"/>				

30. For each of these questions, please tick which answer you think is right. Please tick only ONE box for each question.

	Fully disagree	Disagree	Neither agree nor disagree	Agree	Fully Agree
a. My mother encourages me to eat fruit every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. My father encourages me to eat fruit every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. My mother encourages me to eat vegetables every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. My father encourages me to eat vegetables every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. My parents demand that I eat fruit and vegetables every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I am allowed to eat as many fruits and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vegetables as I like
at home

— — — — —

31. For each of these questions, please tick which answer you think is right. Please tick only ONE box for each question.

	Not				
	Never	often	Sometimes	Often	Always
a. If I ask for fruit that I like my parents will buy it for me	<input type="checkbox"/>				
b. If I ask for vegetables that I like my parents will buy them for me	<input type="checkbox"/>				
c. There are usually different kinds of fruit available at home	<input type="checkbox"/>				
d. There are usually different kinds of vegetables available at home	<input type="checkbox"/>				
e. There is usually fruit at home that I like	<input type="checkbox"/>				
f. There are usually vegetables at home that I like	<input type="checkbox"/>				



Part 3: About me

32. How much do you agree with these statements? *Please tick ONE box for each sentence.*

	Not at all true	A little bit true	Pretty much true	Very much true
a. I have goals and plans for the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I plan to stay in school until I am 16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I plan to go to university or college.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I know where to go for help with a problem.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I try to work out problems by talking or writing about them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I can work out my problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I can work with someone who has different opinions than me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. There are many things that I do well.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. I feel bad when someone gets their feelings hurt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. I try to understand what other people go through.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. When I need help I find someone to talk with.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

33. We are interested in how YOU FEEL about YOUR body and NOT what other people think.

Please tick only ONE box for each sentence.

	Much too small/thin	A bit too small/thin	About the	A bit too	Much too
--	------------------------	-------------------------	--------------	--------------	-------------

			right size	big/fat	big/fat
a. I think my body is...	<input type="checkbox"/>				
b. I think my hips are...	<input type="checkbox"/>				
c. I think my stomach is...	<input type="checkbox"/>				
d. I think my bottom is...	<input type="checkbox"/>				
e. I think my thighs are...	<input type="checkbox"/>				
f. I think my figure/shape is...	<input type="checkbox"/>				



All done :) Thank You!

Appendix G: Child Questionnaire Two



PEDALS

(Physical Activity, Exercise, Diet And Lifestyle
Study)

CHILDREN'S QUESTIONNAIRE #2

All the questions in this questionnaire are about how you feel and think
about

PHYSICAL ACTIVITY

If you have any questions about this questionnaire please contact the PEDALS
research team

on 0273497836 or email them at pedals@otago.ac.nz

- Please answer the questions as honestly and accurately as you can.
- This is not a test - there are no right or wrong answers to the questions.
- We will not tell anyone your answers unless we consider you or someone else to be at risk from harm, then we will tell one adult.

By PHYSICAL ACTIVITY we mean:

Activities that you do before, during, and after school, and that make you breathe harder or sweat.

Examples of physical activities are:

walking, biking, running, PE lessons, gym time, team sports like football, and organized activities such as swimming lessons.



Part 1: Physical activity questionnaire

This is a questionnaire about the activities **YOU** did during the **PAST 7 DAYS**

- Important:**
- there are no right and wrong answers - **this is not a test**
 - please answer all questions as honestly and as best you can
 - please **tick a box on every line** in the questionnaire
 - please ask if you have a question

FOR EXAMPLE:

If you normally play in the playground for **30 minutes** please write

If you played in the playground **three times** in the past 7 days you must tick this

	Each time that you did this, how long did you normally do it for?	Never	Once	2 to 3 times	4 or more times
Play in playground	0 hrs 30 min	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**How many times did you do the following PHYSICAL
ACTIVITIES
in the PAST 7 DAYS?**

1. PHYSICAL ACTIVITIES AT SCHOOL IN THE PAST 7 DAYS:

	Each time that you did this, how long did you normally do it for?	How many times did you do this activity?			
		Never	Once	2 to 3 times	4 or more
a. PE class/Gym class	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Walk to school	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Cycle to school	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Travel to school by car / bus	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Travel to school by skateboard/scooter	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you did not do the activity in the past 7 days, write a '0' (zero) in this box

2. SPORTS & PHYSICAL ACTIVITIES OUTSIDE SCHOOL IN THE PAST 7 DAYS:

	Each time that you did this, how long did you normally do it for?	How many times did you do this activity?			
		Never	Once	2 to 3 times	4 or more
SPORTS ACTIVITIES (NOT AT SCHOOL)					
a. Gym classes (Aerobics, Yoga, Crossfit Kids)	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Softball / Rounders	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Basketball / Volleyball	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Cricket	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Dancing	____ hrs ____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Each time that you did this, how long did you normally do it for?	How many times did you do this activity?			
		Never	Once	2 to 3 times	4 or more
f. Soccer/Football	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Gymnastics	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Hockey (field or ice)	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Martial arts (e.g. karate or judo)	_____ hrs – min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Netball	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Rugby/League	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Running or jogging	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Swimming lessons	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Swimming for fun	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. Tennis/Badminton/Squash/ other racquet sport	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PHYSICAL ACTIVITIES (OUTSIDE OF SCHOOL)					
p. Bike riding (not to/from school)	_____ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. Trampolining	_____ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. Bowling	_____ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
s. Household or farm chores	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
t. Playing on playground equipment	___ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
u. Playing with pets or horse riding	_____ hrs __ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

v. Rollerblading / Roller skating	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
w. Playing on scooter	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
x. Skateboarding	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
y. Skiing, snowboarding, or sledging	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
z. Skipping	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
aa. Walking the dog	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bb. Walking for exercise	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cc. Other (please write here):	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How many times did you do the following NON-PHYSICAL ACTIVITIES?

3. NON - PHYSICAL ACTIVITIES OUTSIDE OF SCHOOL IN THE PAST 7 DAYS:

	Each time that you did this, how long did you normally do it for?	How many times did you do this activity?			
		Never	Once	2 to 3 times	4 or more
a. Art & craft (eg. pottery, sewing, drawing, painting)	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Doing homework	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Listening to music	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Playing indoors with toys	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

e. Playing board games / cards	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Playing a musical instrument	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Reading	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Sitting talking	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Talking on the phone	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Other non-physical activities you do (please write here): _____	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

On how many days did you watch TV or use the computer
OUTSIDE SCHOOL in the **PAST 7 DAYS**?

4. ON **SCHOOL DAYS** IN THE PAST 7 DAYS:

FOR EXAMPLE:

If on a normal school day you watch TV for:

- half an hour (30 minutes) **before school**
- 1 hour **after school**
- 2 hours **after tea**

please write **3 hrs and 30 min** in the box

	On the WEEK DAYS that you did this, how long did you normally do it for?	On how many days did you do this activity?			
		Never	One day	2 to 3 days	4 or more
a. Watching TV / DVDs	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Using computer / internet	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Playing computer games (like Xbox, PlayStation / Game Boy/ DS/ PSP)	_____ hrs ___ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. ON A **WEEKEND DAY** IN THE PAST 7 DAYS:

	On the WEEKEND DAYS that you did this, how long did you normally do it for?	On how many days did you do this activity?		
		Never	One day	Two days
a. Watching TV / DVDs	_____ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Using computer / internet	_____ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Playing computer games (like Xbox, PlayStation / Game Boy/ DS/ PSP)	_____ hrs _____ min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Have you ticked a box on every line?

Part 2: What do you think about physical activity?

18. After school I would normally prefer to... *Please tick the ONE you would prefer for each line.*

- | | | | | |
|-----------------------------|--------------------------|----|--------------------------|--------------------------|
| a. play indoors | <input type="checkbox"/> | OR | play outdoors | <input type="checkbox"/> |
| b. take a walk with friends | <input type="checkbox"/> | OR | watch TV | <input type="checkbox"/> |
| c. run around with friends | <input type="checkbox"/> | OR | take a walk with friends | <input type="checkbox"/> |
| d. watch TV | <input type="checkbox"/> | OR | run around with friends | <input type="checkbox"/> |

19. Watching TV is... *Please tick the ONE option you agree with most for each line*

- | | | | | |
|--------------|--------------------------|----|---------------|--------------------------|
| a. unhealthy | <input type="checkbox"/> | OR | healthy | <input type="checkbox"/> |
| b. important | <input type="checkbox"/> | OR | not important | <input type="checkbox"/> |
| c. boring | <input type="checkbox"/> | OR | fun | <input type="checkbox"/> |

20. Walking or cycling to get somewhere such as going to school, the shops or a friend's is...*Please tick the ONE option you agree with most for each line:*

- | | | | | |
|--------------|--------------------------|----|---------------|--------------------------|
| a. unhealthy | <input type="checkbox"/> | OR | healthy | <input type="checkbox"/> |
| b. important | <input type="checkbox"/> | OR | not important | <input type="checkbox"/> |
| c. boring | <input type="checkbox"/> | OR | fun | <input type="checkbox"/> |
| d. dangerous | <input type="checkbox"/> | OR | safe | <input type="checkbox"/> |

21. Are you ever stopped from doing a physical activity because..(Circle Yes or No)

- | | |
|---|---------|
| a. ...there is a programme on TV that you want to watch? | Yes/ No |
| b. ...you don't think you are very good at physical activity? | Yes /No |

- c. ...other children make fun of you when you are active? Yes /No
- d. ...you don't like physical activity? Yes/ No
- e. ...you don't have the equipment you need? Yes/ No
- f. ... you are scared that you might get hurt? Yes /No

22. Do you agree with the following statements? *(Please circle Yes or No)*

- a. I can ask my parent or another adult to sign me up for a sport, dance class, or other physical activity. Yes/No
- b. I can do something active even if it is hot or cold outside. Yes/No
- c. I can do something active even if I have a lot of homework. Yes/No
- d. I can ask my parent or another adult to take me to play a sport or do a physical activity. Yes/No
- e. I can ask my best friend to do something active with me.
- f. I can do something active no matter how tired I feel.

!! REMEMBER !! Examples of physical activities are:
walking, biking, running, PE lessons, gym time, team sports like football,
and organised activities such as swimming lessons.

23. Do you feel that doing physical activity or sports will.....? *(Please circle Yes or No)*

- a. ...make you stronger Yes /No
- b. ...keep you from getting too heavy Yes /No
- c. ...make you very tired Yes /No
- d. ...make you look better Yes /No
- e. ...make you feel like you are not good at sports Yes /No

f. ...take up too much time

Yes /No

24. Compared with other boys or girls your age, would you say that you were...
(Please tick ONE box only)

- Much more active
- More active
- About average
- Less active
- Much less active



25. During a typical week, do the following things happen? (Please tick Yes or No)

	Yes	No
a. My friends do physical activities or play sports with me.	<input type="checkbox"/>	<input type="checkbox"/>
b. I ask my friends to play outside or play sports with me.	<input type="checkbox"/>	<input type="checkbox"/>
c. My friends ask me to play outside or play sports with them.	<input type="checkbox"/>	<input type="checkbox"/>
d. The teacher talks about exercise and sports in lessons.	<input type="checkbox"/>	<input type="checkbox"/>
e. The teachers organise or play games with us, apart from PE.	<input type="checkbox"/>	<input type="checkbox"/>
f. The teacher tells me to exercise or play sports.	<input type="checkbox"/>	<input type="checkbox"/>

26. Do you agree with the following statements? (Please tick Yes or No)

	Yes	No
a. I am not allowed to play outside because my parents think it's not safe.	<input type="checkbox"/>	<input type="checkbox"/>
b. At school there are playgrounds or fields where I can run around.	<input type="checkbox"/>	<input type="checkbox"/>
c. There is somewhere at home where I can go outside and play.	<input type="checkbox"/>	<input type="checkbox"/>

d. It is safe to walk or play alone in my neighbourhood during the day.	<input type="checkbox"/>	<input type="checkbox"/>
e. There are other children near my home for me to go out and play with.	<input type="checkbox"/>	<input type="checkbox"/>
f. There are playgrounds, parks, or sports halls close to home I can use.	<input type="checkbox"/>	<input type="checkbox"/>
g. It is difficult to walk or play near my house because I don't feel safe.	<input type="checkbox"/>	<input type="checkbox"/>
h. I always have to tell my parents where I am going.	<input type="checkbox"/>	<input type="checkbox"/>
i. If I am going out I always have to be back by a certain time.	<input type="checkbox"/>	<input type="checkbox"/>

27. During a normal week, someone in my family such as my parents or other family members... Please tick ONE box for each letter (a-f)

	Never/ Hardly ever	Once or twice a week	Nearly every day	Every day
a. ...encourages me to do physical activities or play sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...does a physical activity or plays sports with me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...takes me to a place where I can do activities or play sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...watches me take part in physical activities or sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...tells me that I am doing well in physical activities or sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ...tells me that physical activity is good for my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Part 3: Travelling to school and other places

28. HOW do you usually travel **TO** school?
(Please choose the ONE you do the most and tick the box)

- Car
- Bus
- Bicycle
- Walk
- Skateboard/scooter

29. HOW do you usually travel **HOME FROM** school?
(Please choose the ONE you do the most and tick the box)

- Car
- Bus
- Bicycle
- Walk
- Skateboard/scooter

30. Who do you usually travel **TO** school with?
(Please tick ALL those you usually travel with)

- Alone
 - A brother or sister
 - A parent or another adult
 - Friend(s)
 - Another person *(Please write: e.g. neighbour)*
-

31. Who do you usually travel **HOME FROM** school with?
(Please tick ALL those you usually travel with)

- Alone
 - A brother or sister
 - A parent or another adult
 - Friend(s)
 - Another person *(Please write: e.g. neighbour)*
-

32. When you are at school what do you mostly do during...
Please tick ONE box for the activity that you do the MOST.

- | | Sit down
talking/reading | Stand or
walk around | Run around
playing
games |
|------------------------------------|-----------------------------|--------------------------|--------------------------------|
| a. Morning break | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Lunch break (apart from eating) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

33. Do you usually go anywhere else on your way home from school?
(Please tick ALL places you usually go)

- No, I go straight home
- I go to a friend's house
- I go to the shops
- I go to the park
- I go to somewhere else (*please write where you go: _____*)

34. How do you usually travel to.....*Please tick ONE box for each letter (a-d)*

	Car	Bus/train	Bicycle	Walk
a. ...visit friends in the neighbourhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...the park	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...visit other members of your family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...the shops				

35. Do you agree with the following statements about your journey to and from school?

(Please circle Yes or No)

- | | |
|--|--------|
| a. I can chat to my friends on my journey to school. | Yes/No |
| b. My parents think it is not safe to walk or cycle to school. | Yes/No |
| c. My friends encourage me to walk or cycle to school. | Yes/No |
| d. My journey to school gives me exercise. | Yes/No |
| e. There are nice things to look at on my way to school. | Yes/No |
| f. Walking or cycling to school takes up too much time. | Yes/No |
| g. My parents encourage me to walk or cycle to school. | Yes/No |

Part 4: Physical Activity and Sports

36. Are you involved in any sport or do you belong to any sports team?
Please tick Yes or No.

Yes

No

37. We would like to know about the sports that you do. Please list the sports you play below:

38. I choose to do **PHYSICAL ACTIVITY** because...
(Please tick Yes if you agree, or No if you disagree with each sentence)

	Yes	No
a. ...it's fun	<input type="checkbox"/>	<input type="checkbox"/>
b. ...it passes the time	<input type="checkbox"/>	<input type="checkbox"/>
c. ...I get to hang out with friends	<input type="checkbox"/>	<input type="checkbox"/>
d. ...I'm good at it	<input type="checkbox"/>	<input type="checkbox"/>
e. ...I like competing	<input type="checkbox"/>	<input type="checkbox"/>
f. ...I like winning	<input type="checkbox"/>	<input type="checkbox"/>
g. ...I have to (my parents or school make me)	<input type="checkbox"/>	<input type="checkbox"/>
h. ...I want to keep fit	<input type="checkbox"/>	<input type="checkbox"/>
i. ...it is good for my health	<input type="checkbox"/>	<input type="checkbox"/>

j. ...it helps me to look good

k. ...my friends will like me

39. I choose to participate in **SPORTS because...**

(Please tick Yes if you agree, or No if you disagree with each statement)

a. ...it's fun

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

b. ...it passes the time

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

c. ...I get to hang out with friends

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

d. ...I'm good at it

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

e. ...I like competing

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

f. ...I like winning

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

g. ...I have to (my parents or school make me)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

h. ...I want to keep fit

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

i. ...It is good for my health

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

j. ...it helps me to look good

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

k. ...my friends will like me

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

All done :) Thank You!!



Appendix H: Parent Questionnaire One



PEDALS

(Physical activity, Exercise, Diet And Lifestyle Study)

PARENT/GUARDIAN QUESTIONNAIRE #1 **About Your Family and Your Physical Activity**

- The questions in this questionnaire relate to you or your 9- or 10-year- old child (*please fill in your child's name* _____)
- *and the school they attend* _____)

- Completing this questionnaire will take approximately 30 minutes.
- Please answer the questions as honestly and accurately as you can.
- If you make a mistake, please cross out the incorrect answer, and give a new answer.
- Your answers will be treated as confidential.
- If you have any questions, please contact the study team on:

0273497836 or pedals@otago.ac.nz

Section 1: About Your Family and Your Household

In this questionnaire the terms 'father' and 'mother' refer to the child's biological parents if they live in the household, or their step-parents/guardians otherwise.

1. Is there a father/stepfather/male guardian living in the household?

Yes

No

2. Is there a mother/stepmother/female guardian living in the household?

Yes

No

3. This questionnaire is being completed by:

Mother

Father

Other (e.g. male guardian, please state:) _____

4. What is your home address and postcode?

5. How many people live in your household? (including yourself and children, or anyone else e.g. grandparents, stepbrothers, stepsisters)

6. Do you own or have access to a car? *Please circle the correct answer:*

Yes / No

7. Do you rent or own your home? *Please choose the best option below.*

- Own it/buying it
- Rent it
- Living with relatives/ landlord

8. What is your combined annual household income? *This is the total income that everyone in your house got from all sources, before tax or anything was taken out of it, in the last 12 months. Please tick ONE box.*

- | | |
|--|--|
| <input type="checkbox"/> \$0 | <input type="checkbox"/> \$35,001 - \$40,000 |
| <input type="checkbox"/> \$1 - \$5,000 | <input type="checkbox"/> \$40,001 - \$50,000 |
| <input type="checkbox"/> \$5,001 - \$10,000 | <input type="checkbox"/> \$50,001 - \$60,000 |
| <input type="checkbox"/> \$10,001 - \$15,000 | <input type="checkbox"/> \$60,001 - \$70,000 |
| <input type="checkbox"/> \$15,001 - \$20,000 | <input type="checkbox"/> \$70,000 - \$100,000 |
| <input type="checkbox"/> \$20,001 - \$25,000 | <input type="checkbox"/> \$100,001 - \$150,000 |
| <input type="checkbox"/> \$25,001 - \$30,000 | <input type="checkbox"/> \$150,001 - Above |
| <input type="checkbox"/> \$30,001 - \$35,000 | |

9. How long have you and your family been living in this neighbourhood?
Please tick only *ONE* option.

- Less than 1 year
- Between 1 and 2 years
- Between 2 and 5 years
- Between 5 and 10 years
- More than 10 years

10. Do you have any of the following qualifications? Please tick *ALL* that apply.

- | | |
|---|---|
| <input type="checkbox"/> None | <input type="checkbox"/> Completed Apprenticeship |
| <input type="checkbox"/> School Certificate | <input type="checkbox"/> Diploma |
| <input type="checkbox"/> NCEA Level 1 | <input type="checkbox"/> Trade Certificates |
| <input type="checkbox"/> NCEA Level 2/University Entrance | <input type="checkbox"/> University Degree |
| <input type="checkbox"/> NCEA Level 3/University Bursary | <input type="checkbox"/> Other (Please describe): _____ |

11. At what age did you finish full-time education? _____
years

Remember: In this questionnaire the terms 'father' and 'mother' refer to the child's biological parents if they live in the household, or their step-parents/guardians otherwise.

12. Which ethnic group does the **child** belong to? *Please tick the box or boxes which apply.*

- | | |
|---|---|
| <input type="checkbox"/> New Zealand European | <input type="checkbox"/> Niuean |
| <input type="checkbox"/> Maori | <input type="checkbox"/> Chinese |
| <input type="checkbox"/> Samoan | <input type="checkbox"/> Indian |
| <input type="checkbox"/> Cook Island Maori | <input type="checkbox"/> Other: (please specify)_____ |

13. Which ethnic group does the **child's mother** belong to? *Please tick the box or boxes which apply.*

- | | |
|---|---|
| <input type="checkbox"/> New Zealand European | <input type="checkbox"/> Niuean |
| <input type="checkbox"/> Maori | <input type="checkbox"/> Chinese |
| <input type="checkbox"/> Samoan | <input type="checkbox"/> Indian |
| <input type="checkbox"/> Cook Island Maori | <input type="checkbox"/> Other: (please specify)_____ |

14. Which ethnic group does the **child's father** belong to? *Please tick the box or boxes which apply.*

- | | |
|---|---|
| <input type="checkbox"/> New Zealand European | <input type="checkbox"/> Niuean |
| <input type="checkbox"/> Maori | <input type="checkbox"/> Chinese |
| <input type="checkbox"/> Samoan | <input type="checkbox"/> Indian |
| <input type="checkbox"/> Cook Island Maori | <input type="checkbox"/> Other: (please specify)_____ |

BOTH PARENTS/GUARDIANS

If there is only one parent living with the child, leave questions for the other parent blank.

	Mother:	Father:
15. Date of birth of each parent.	_____ (DD/MM/YY)	_____ (DD/MM/YY)
16. Has each parent ever smoked?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
17. Does each parent smoke now?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
18. How often does each parent drink alcohol? <i>(please tick ONE box)</i>	<input type="checkbox"/> Never <input type="checkbox"/> Once a month <input type="checkbox"/> Once a week <input type="checkbox"/> A few times a week <input type="checkbox"/> Daily	<input type="checkbox"/> Never <input type="checkbox"/> Once a month <input type="checkbox"/> Once a week <input type="checkbox"/> A few times a week <input type="checkbox"/> Daily
19. Approximately how much does each parent weigh? (stones and pounds or kilograms)	_____ stones _____ lbs <i>OR</i> _____ kg	_____ stones _____ lbs <i>OR</i> _____ kg
20. Approximately how tall is each parent? (feet & inches or metres)	_____ ft _____ inch <i>OR</i> _____ cm	_____ ft _____ inch <i>OR</i> _____ cm

Section 2: Health and well-being

For each of the following questions, please select the ONE response that best describes your answer. Please enter the date today (DD/MM/YY):

21. In general, would you say that your health is:

- Excellent
- Very Good
- Good
- Fair
- Poor

22. Compared to one year ago, how would you rate your health in general now?

- Much better now than one year ago
- Somewhat better now than one year ago
- About the same as one year ago
- Somewhat worse now than one year ago
- Much worse now than one year ago

23. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? *Please tick ONE box per line.*

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Lifting or carrying groceries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Climbing <u>several</u> flights of stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Climbing <u>one</u> flight of stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

f. Bending, kneeling or stooping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Walking more than a kilometre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Walking half a kilometre (500m)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Walking 100 metres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Bathing, showering, or dressing yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities, as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the amount of time you spent on work or other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Accomplished less than you would like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Were limited in the kind of work or other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Had difficulty performing the work or other activities (for example, it took extra effort)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time

a.	Cut down on the amount of time you spent on work or other activities	<input type="checkbox"/>				
b.	Accomplished less than you would like	<input type="checkbox"/>				
c.	Did work or other activities less carefully than usual	<input type="checkbox"/>				

26. During the past 4 weeks, to what extent have your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

- Not at all Quite a bit
 Slightly Extremely
 Moderately

27. How much bodily pain have you had during the past 4 weeks?

- No bodily pain Moderate
 Very mild Severe
 Mild Very severe

28. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

- Not at all Quite a bit
 A little bit Extremely
 Moderately

29. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give ONE answer that comes closest to the way you have been feeling.

How much of the time during **the past 4 weeks...**

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. ...did you feel full of life?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...have you been very nervous?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...have you felt so down in the dumps that nothing could cheer you up?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...have you felt calm and peaceful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...did you have a lot of energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ...have you felt downhearted and depressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. ...did you feel worn out?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. ...have you been happy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. ...did you feel tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. How TRUE or FALSE is each of the following statements for **you**?

	Definitely True	Mostly True	Don't know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am as healthy as anybody I know.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I expect my health to get	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

worse.

d. My health is excellent.

31. Below are some statements about feeling and thoughts. Please tick the ONE box that best describes your experience of each over the **past 2 weeks**.

	None of the time	Rarely	Some of the time	Most of the time	All of the time
a. I've been feeling optimistic about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I've been feeling useful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I've been feeling relaxed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I've been feeling interested in other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I've had energy to spare.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I've been dealing with problems well.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I've been thinking clearly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I've been feeling good about myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. I've been feeling close to other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. I've been feeling confident.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. I've been able to make up my own mind about things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. I've been feeling loved.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. I've been interested in new things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. I've been feeling cheerful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

obstacles.

g. Under pressure I stay focused and think clearly.	<input type="checkbox"/>				
h. I am not easily discouraged by failure.	<input type="checkbox"/>				
i. I think of myself as a strong person when dealing with life's challenges and difficulties.	<input type="checkbox"/>				
j. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	<input type="checkbox"/>				

34. Do you generally have trouble falling asleep? Please choose only ONE of the following:

- Never Sometimes
 Rarely Often

35. Do you generally have trouble staying asleep? Please choose only ONE of the following:

- Never Sometimes
 Rarely Often

36. When you have trouble sleeping, how often do you eat something during the night?

Only answer this question if you did not answer "Never" for the previous question

Please choose only ONE of the following:

- Never Sometimes
 Rarely Often

37. Do you feel tired when you wake up on weekdays? Please choose one of the following:

- Never or seldom
- 1-3 days per week
- 4 or more days per week

38. Do you think that you get enough sleep? Please choose one of the following:

- Yes
- No

Section 3: Your environment

39. We are interested in what you think about living in your neighbourhood. Please tick the ONE box that best indicates how you feel about each statement.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. People in this neighbourhood know each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. People in this neighbourhood talk to each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. People in this neighbourhood take care of each others' houses during holidays.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. When someone in this neighbourhood has a problem, it's easy to get help from neighbours.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. People in this neighbourhood feel isolated from each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

f. People in this neighbourhood watch out for each other.	<input type="checkbox"/>				
g. The people in this neighbourhood make it a safer place to live.	<input type="checkbox"/>				

40. Below are a number of statements that might be made about your neighbourhood. Where mentioned, 'within easy walking distance' means within a 10-15 minute walk from your home. *Please tick the ONE box that best indicates your agreement or disagreement with each statement.*

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. There are shops to visit within easy walking distance of my home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. There is a park or open space to visit within easy walking distance of my home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. There is a sports or leisure centre within easy walking distance of my home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. It is pleasant to walk in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. There are pedestrian crossings to help walkers cross busy streets in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I feel generally safe walking in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. It is easy to walk to a bus stop from my home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

h. There are few culs-de-sac (dead-end streets) in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. There are a lot of busy junctions in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. There are major barriers to walking in my neighbourhood that make it hard to get from place to place (for example, busy roads, railway lines, rivers, hills).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. There are many alternative routes for getting from place to place in my neighbourhood. (I don't have to go the same way every time.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. There are pavements on most of the streets in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. There are cycle paths in or near my neighbourhood that are easy to get to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. There is a verge that separates the streets from the pavements in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. There are trees along the streets in my neighbourhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. There are diverse and interesting things to look at in my neighbourhood (e.g. buildings and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

views).					
q. There is so much traffic along <u>nearby</u> streets that it makes it difficult or unpleasant to walk in my neighbourhood.	<input type="checkbox"/>				
r. There is so much traffic along <u>nearby</u> streets that it makes it difficult or unpleasant to cycle in my neighbourhood.	<input type="checkbox"/>				
s. The speed of traffic on most <u>nearby</u> streets is usually slow (50 kph or less).	<input type="checkbox"/>				
t. Most drivers exceed the posted speed limits while driving in my neighbourhood.	<input type="checkbox"/>				
u. My neighbourhood streets are well lit at night.	<input type="checkbox"/>				
v. Walkers and cyclists on the streets in my neighbourhood can be easily seen by people in their homes.	<input type="checkbox"/>				
w. There is a high crime rate in my neighbourhood.	<input type="checkbox"/>				

Section 4: Parental Activities

The following set of questions is about the parents/guardians who live with the child now. **Please ask your partner to answer these questions** if/where appropriate or discuss the answers with him/her.

MOTHER/STEPMOTHER/FEMALE GUARDIAN'S ACTIVITIES

41. Which form of transport have you used **most often** in the last 4 weeks apart from your journey to and from work? *Please tick ONE box only*

Car/Van/Motorbike Walk Bus Bicycle

42. On average over the **last 4 weeks**, how much time per day did **the mother/ stepmother/female guardian** spend on TV or video viewing and computer use at home:

a. TV viewing or video watching at home. *Please tick ONE box per line.*

Hours of TV or video watched (per day)	Average over the last 4 weeks					
	None	Less than 1 hour a day	1 to 2 hours a day	2 to 3 hours a day	3 to 4 hours a day	More than 4 hours a day
On a weekday before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekday after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

b. Computer use at home but not at work (such as internet, email, PlayStation, Xbox, Game Boy). Please tick ONE box per line.

Hours of home computer use (per day)	Average over the last 4 weeks					
	None	Less than 1 hour a day	1 to 2 hours a day	2 to 3 hours a day	3 to 4 hours a day	More than 4 hours a day
On a weekday before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekday after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

before 6pm						
On a weekend day after 6pm	<input type="checkbox"/>					

c. Stair climbing at home. Please tick ONE box per line.

Number of times you climbed up a flight of stairs (approximately 10 steps) each day at home	Average over the last 4 weeks					
	None	1 to 5 times a day	6 to 10 times a day	11 to 15 times a day	16 to 20 times a day	More than 20 times a day
On a weekday	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MOTHER/STEPMOTHER/FEMALE GUARDIAN'S WORK ACTIVITIES

Please answer this section to describe if you have been in paid employment at any time **during the last 4 weeks** or have done regular, organised voluntary work.

43. Have you been in employment during the last 4 weeks? *Please tick Yes or No:*

- Yes
- No

44. During the **last 4 weeks** how many hours of work did you do **per week**? *Please place a number in EACH box.*

	4 weeks ago	3 weeks ago	2 weeks ago	1 week ago
Work hours (excluding travel)				

45. We would like to know the type and amount of physical activity involved in **the mother/ stepmother/female guardian's** work. *Please tick the ONE option that **best** matches **your** occupation(s) in the last 4 weeks from the following four possibilities.*

Sedentary occupation
Spends most of the time sitting (such as in an office)

Standing occupation
Spends most of the time standing or walking. However, the work does not require intense physical effort (e.g. shop assistant, hairdresser, guard etc.)

Manual work
This involves some physical effort including handling of heavy objects and use of tools (e.g. plumber, cleaner, nurse, sports instructor, electrician, carpenter, etc.)

Heavy manual work
This involves very vigorous physical activity including handling of very heavy objects (e.g. dock worker, miner, bricklayer, construction worker etc.)

46. What is the approximate distance from your home to your work in kilometres? _____ kilometres

47. How many times a week did you travel from home to your main work in the last 4 weeks? Count **outward** journeys only.

48. How do you normally travel to work? Please tick only ONE box per line.

	Always	Usually	Occasionally	Never/Rarely
By car/motor vehicle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By work-organised or public transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By bicycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By foot (walk)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

49. What is your address for your main place of work during the last 4 weeks?

FATHER/STEPFATHER/MALE GUARDIAN'S ACTIVITIES

50. Which form of transport have you used **most often** in the last 4 weeks apart from your journey to and from work? *Please tick ONE box only*

Car/Van/Motorbike Walk Bus Bicycle

51. On average over the **last 4 weeks**, how much time per day did **the father/ stepfather/male guardian** spend on TV or video viewing and computer use at home:

a. TV viewing or video watching at home. *Please tick ONE box per line*

Hours of TV or video watched (per day)	Average over the last 4 weeks					
	None	Less than 1 hour a day	1 to 2 hours a day	2 to 3 hours a day	3 to 4 hours a day	More than 4 hours a day
On a weekday before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekday after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

b. Computer use at home but not at work (such as internet, email, PlayStation, Xbox, Game Boy). *Please tick ONE box per line*

Hours of home computer use (per day)	Average over the last 4 weeks					
	None	Less than 1 hour a day	1 to 2 hours a day	2 to 3 hours a day	3 to 4 hours a day	More than 4 hours a day
On a weekday before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekday after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day before 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day after 6pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

c. Stair climbing at home. Please tick ONE box per line.

Number of times you climbed up a flight of stairs (approximately 10 steps) each day at home	Average over the last 4 weeks					
	None	1 to 5 times a day	6 to 10 times a day	11 to 15 times a day	16 to 20 times a day	More than 20 times a day
On a weekday	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On a weekend day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

FATHER/STEPFATHER/MALE GUARDIAN'S ACTIVITIES AT WORK

Please answer this section to describe if you have been in paid employment at any time **during the last 4 weeks** or have done regular, organised voluntary work.

52. Have you been in employment during the last 4 weeks? *Please tick Yes or No:*

- Yes
- No

53. During the **last 4 weeks** how many hours of work did you do **per week**? *Please place a number in EACH box.*

	4 weeks ago	3 weeks ago	2 weeks ago	1 week ago
Work hours (excluding travel)				

54. We would like to know the type and amount of physical activity involved in **the father/ stepfather/male guardian's** work. *Please tick the ONE option that **best** matches **your** occupation(s) in the last 4 weeks from the following four possibilities.*

Sedentary occupation
Spends most of the time sitting (such as in an office)

Standing occupation
Spends most of the time standing or walking. However, the work does not require intense physical effort (e.g. shop assistant, hairdresser, guard etc.)

Manual work
This involves some physical effort including handling of heavy objects and use of tools (e.g. plumber, cleaner, nurse, sports instructor, electrician, carpenter, etc.)

Heavy manual work
This involves very vigorous physical activity including handling of very heavy objects (e.g. dock worker, miner, bricklayer, construction worker etc.)

55. What is the approximate distance from your home to your work in **kilometres**? _____ kilometres

56. How many times a week did you travel from home to your main work **in the last 4 weeks**?
Count **outward** journeys only. _____

57. How do you normally travel to work? *Please tick only ONE box per line.*

	Always	Usually	Occasionally	Never/Rarely
By car/motor vehicle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By work-organised or public transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By bicycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By foot (walk)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

58. What is your address for your main place of work **during the last 4 weeks**?

We would like BOTH parents /guardians to complete their respective recreation questionnaires (if possible/relevant). We have provided two copies of the questionnaire on the following pages.

RECREATION

To be completed by the mother/stepmother/female guardian

The following questions ask about how you spend your leisure time. Please indicate how often you did each activity on average over the last 4 weeks, and the average length of time that you spent doing the activity on each occasion.

Example: If you went walking for pleasure for 40 minutes once a week, you would tick the "Once a week" box and write "40" in the minutes box of the table below:

! " # \$ % & !	Number of times you did the activity in the last 4 weeks					! " # \$ % & # ' () # * # \$ # * (+ , - # 8, 9 \$ + : (/ 9 ' # +
	. , / #	0 / 1 # / ' 2 # 3 % + ' 4 weeks	5 ' , 6 ' () # + / ' 2 # 3 % + ' 4 weeks	0 / 1 # % week	5 ' , 6 ' () # + % week	
; % 3 < (/ & = , \$ * 3 # % + 9 \$ #				<input checked="" type="checkbox"/>		4 >

Please give an answer for the NUMBER OF TIMES you did the following activities in the past 4 weeks AND the AVERAGE TIME you spent on each activity.

Mother/stepmother/female guardian	Number of times you did the activity in the last 4 weeks					Average time per episode	
	Once in the last 4 weeks	! " # times in the last 4 weeks	Once \$ week	! " # times \$ week	% " & times \$ week	Hours	Minutes
None					Every day		

Example: If you went walking for pleasure for 40 minutes once a week, you would tick the "Once a week" box and write "40" in the minutes box of the table below:

! " # \$ % & !	Number of times you did the activity in the last 4 weeks						! " # \$ % & # ' () # * # \$ # * (+ , - #
	./ #	0/1# '2# 3%+ 4 weeks	5', 6 '0 #+ ('2# 3%+ '4 weeks	0/1# % week	5', 6 '0 #+ '0 #+ % week	4', 7 '0 #+ % week	
; %3< (/ & =, \$ * 3#%+ 9\$#				✓			8, 9\$+ : (/ 9' #+ 4 >

Please give an answer for the NUMBER OF TIMES you did the following activities in the past 4 weeks AND the AVERAGE TIME you spent on each activity.

Father/stepfather/male guardian	Number of times you did the activity in the last 4 weeks						Average time per episode	
	Once in the last 4 weeks	! " # times in the last 4 weeks	Once \$ week	! " # times \$ week	% " & times \$ week	Every day	Hours	Minutes
Swimming – competitive	None							
Swimming - leisurely								
Backpacking or mountain climbing								
Walking for pleasure not for transport)								
Cycling for competition e.g. racing or								

Please have a quick check over the questionnaire to make sure you have answered every question. Thank you for your help!



PEDALS

Appendix I: Parent Questionnaire Two



PEDALS

(Physical activity, Exercise, Diet And Lifestyle Study)
PARENT/GUARDIAN QUESTIONNAIRE #2
About Your Food and Drink & Your Child

- The questions in this questionnaire relate to you or your 9- or 10-year-old child (*please fill in your child's name* _____)
- *and the school they attend* _____)
- Completing this questionnaire will take approximately 30 minutes.
- Please answer the questions as honestly and accurately as you can.
- If you make a mistake, please cross out the incorrect answer, and give a new answer.
- Your answers will be treated as confidential.
- If you have any questions, please contact the study team on:

0273497836 or pedals@otago.ac.nz

1. This questionnaire is being completed by:

- Mother
- Father
- Other (e.g. male guardian, please state:) _____

Section 1: Your opinion about food

2. On average, how many servings of fruit (fresh, frozen, canned or stewed) do you eat PER DAY? *Do not include fruit juice or dried fruit. A serving is the same as a medium piece of fruit such as an apple, or two small pieces of fruit such as two apricots, or half a cup of stewed fruit.*

- Never, I don't eat fruit
- Less than one serving per day
- 1 serving
- 2 servings
- 3 servings

3. On average, how many servings of vegetables (fresh, frozen or canned) do you eat PER DAY? *Do not include vegetable juices. A serving is the same as one potato/kumara, half a cup of peas, or a cup of salad. For example, 2 potatoes + 1/2 cup of peas = 3 servings.*

- Never, I don't eat vegetables
- Less than one serving per day
- 1 serving
- 2 servings
- 3 servings
- 4 or more servings
- Don't know

4. How important are the following factors when deciding what **you** personally eat? *Please tick the ONE box you agree with most:*

	Not Important	Important	Very Important
a. Prevention of disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

b. General health and wellbeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Taste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Speed and convenience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Weight control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. How important are these factors when deciding what **your child** eats?
Please tick the box you agree with most:

	Not Important	Important	Very Important
a. Prevention of disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. General health and wellbeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Taste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Speed and convenience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Weight control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Do you think these foods are high or low in **fat**?

	High	Low	Not Sure
a. Pasta (without sauce)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Light margarine/spread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Luncheon meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Bread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Olivio margarine/spread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Do you think these are high or low in **sugar**?

	High	Low	Not Sure
a. Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Rice bubbles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Ice cream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Cordial/fruit juice concentrate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Tomato ketchup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Tinned fruit in natural juice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Do you think these are high or low in **salt**?

	High	Low	Not Sure
a. Sausages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Pasta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Tinned sardines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Frozen vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Do you think these foods are high or low in **fibre**?

	High	Low	Not Sure
a. Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Baked potatoes with	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

skins

e. Chicken

f. Baked beans

10. Are there any foods that you don't let **your child** eat?

Meat

Fish

Dairy products

Foods made with wheat

Nuts

I do not restrict their diet

Other foods (please specify):

If there are foods that you do not allow your child to eat, can you please tell us why this is?

11. How often do you usually have the following meals (more than a drink or snack) **ON WEEK DAYS**? Please choose only **ONE** of the following for each meal. (You may have eaten at home, in a car, at work or in a café):

	0 days	1 day	2 days	3 days	4 days	5 days
Breakfast	<input type="checkbox"/>					
Lunch	<input type="checkbox"/>					
Dinner/Evening Meal	<input type="checkbox"/>					

12. How often do you usually have the following meals (more than a drink or snack) **ON THE WEEKEND**? Please choose only **ONE** of the following for each meal (You may have eaten at home, in a car, at work or in a café):

	0 days	1 day (Saturday OR	Both days (Saturday AND
--	---------------	-------------------------------	------------------------------------

		Sunday)	Sunday)
Breakfast	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lunch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dinner/Evening Meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. On work days during lunch break do you generally... *Please choose only ONE of the following:*

- ...eat food bought at work
- ...eat a lunch brought from home
- ...go home for lunch
- ...eat food bought on the way to work
- ...skip (don't eat) lunch

14. How often do you eat **TAKEAWAYS** (such as McDonalds, KFC, Fish 'n' chips, Domino's Pizza, Hell Pizza, Pizza Hut, Country Fried Chicken, Asian Takeaways) when you are **in the following situations**? *Please choose only ONE of the following and tick the box:*

	Never	Less than once per week	Once per week	2-4 days per week	5-6 days per week	Once a day	More than once a day
a. Alone or with work colleagues	<input type="checkbox"/>						
b. With family	<input type="checkbox"/>						

15. When you eat takeaways, do you usually pick healthier options if these are available? *Please choose only ONE of the following:*

- Yes
- No
- I don't eat takeaways

+%) , /@ %/ - + %\$ - (/ #+B

- -4 How often do you eat hot chips, French fries, wedges, or kumara chips PER WEEK? F2(/< about lunch and dinner as well as snacks.

- .4 How often do you drink soft drinks or energy drinks PER WEEK?

C, /, ' (/139-# -(#' "%\$(#'(#+B G, =' -\$(/ <+ %\$# often carbonated or 'fizzy' and include Coca-cola, Pepsi, Lemonade, Ginger Beer, Energy drinks include 'V', Red Bull, Lift Plus, Powerade, E2, and G-force.

- /4 How often do you drink fruit juices and drinks

+ (, ' (() *

C, /, ' (/139-# -(#' , \$ -(%A#'(1 "%\$(#'(#+B H\$9(' juices and drinks include freshly squeezed "%\$(#'(#+@ %/ - A\$%/ - + +912 %+ 19+' 19(1# H\$#+2J K* @ L#\$(@ M, 3-# / E(\$13# @ N(A# / % @ F2#0' , / + @ McCoy and Charlie's.

- O4 How often do you eat lollies, sweets, chocolate or confectionery PER WEEK?

	Never	Rarely	Some- times	Regularly	Always	Don't know
26. How often do you remove excess fat from meat?	<input type="checkbox"/>					
27. How often do you remove the skin from chicken?	<input type="checkbox"/>					
28. How often do you add salt to your food after it has been cooked or prepared?	<input type="checkbox"/>					
29. How often do you choose low or reduced fat varieties of foods instead of the standard variety?	<input type="checkbox"/>					
30. How often do you choose low or reduced salt varieties of foods instead of the standard variety?	<input type="checkbox"/>					

31. What type of bread, bread rolls or toast do you eat **most** of? *Please tick only ONE box.*

- White
- High fibre white
- Light grain bread (eg. Molenberg, Freya's, Ploughmans, MacKenzie High Country)
- Heavy grain bread (eg. Vogels and Burgen)
- Other (please state _____)
- Don't know

32. What type of milk do you use the **most** of? *Please tick only ONE box.*

- None, I don't use milk
- Standard milk (dark blue/silver)
- Reduced fat (light blue)
- Skim or trim (green or yellow)
- Soy milk
- Other (such as rice, goat's milk)
- Don't know

33. What type of butter or margarine spread do you use the **most** of?
Please tick ONE box.

- Never, I don't use butter or margarine as spread
- Butter (including semi-soft)
- Butter and margarine blend
- Margarine (full-fat e.g. Canola, Sunflower, and olive-oil-based)
- Light or reduced-fat margarine (e.g. Canola, Sunflower, and olive-oil-based)
- Plant sterol margarine (full and low fat varieties e.g. Proactive or Logicol)
- Don't know

34. What type of fat or oil do you use most often **when cooking**? *Please tick ONE box.*

- None, I don't use fat or oil
- Butter
- Margarine
- Butter blend
- Oil
- Dripping or Lard
- Other
- Don't know

Section 3: Food Security

35. We know that some people can't afford to eat properly and we are interested in whether you think you eat properly. It's what **you** think eating properly is, not what we or anyone else thinks.

*For each of the following questions, please tick the ONE box that **most** applies to you.*

"I/WE CAN AFFORD TO EAT PROPERLY" *How often has this been true for you (or your household) over the past year?*

- Always Sometimes Never Don't know

36. We are interested in whether you run out of basics, like bread, potatoes, etc., because you do not have enough money. We are not referring to treats or special foods.

"FOOD RUNS OUT IN MY/OUR HOUSEHOLD DUE TO LACK OF MONEY"
How often has this been true for you (or your household) over the past year?

Always Sometimes Never Don't know

37. We are interested in whether a lack of money leads you to sometimes have smaller meals than you would like, or whether a lack of money means there is not enough for seconds or you sometimes skip meals.

"I/WE EAT LESS BECAUSE OF LACK OF MONEY" *How often has this been true for you (or your household) over the past year?*

Always Sometimes Never Don't know

38. Now we are going to talk about the variety of foods you eat. By variety we mean the number of different kinds of foods you have.

"THE VARIETY OF FOODS I AM/WE ARE ABLE TO EAT IS LIMITED BY A LACK OF MONEY" *How often has this been true for you (or your household) over the past year?*

Always Sometimes Never Don't know

39. Some people rely on support and assistance from others for supplying their regular food. We are interested in finding out how many people fall into this group.

"I/WE RELY ON OTHERS TO PROVIDE FOOD AND/OR MONEY FOR FOOD, FOR MY/OUR HOUSEHOLD, WHEN I/WE DON'T HAVE ENOUGH MONEY"
How often has this been true for you (or your household) over the past year?

Always Sometimes Never Don't know

40. Also, some people have to rely on other sources of help such as food grants or food banks.

"I/WE MAKE USE OF SPECIAL FOOD GRANTS OR FOOD BANKS WHEN I/WE DO NOT HAVE ENOUGH MONEY FOR FOOD" *How often has this been true for you (or your household) over the past year?*

Always Sometimes Never Don't know

41. We know that some people get quite stressed and worried about providing enough food even though they don't actually go without food.

"I/WE FEEL STRESSED BECAUSE OF NOT HAVING ENOUGH MONEY FOR FOOD" *How often has this been true for you (or your household) over the past year?*

Always Sometimes Never Don't know

42. We recognize that for some people food and sharing food with others is important, to the point that they won't have enough food for themselves. In this question we are only interested in **social situations which are gatherings within, or outside, the household.** As a result people might find themselves stressed/whakamā (embarrassed) about their koha (gift) when providing food for others.

"I FEEL STRESSED BECAUSE I CAN'T PROVIDE THE FOOD I WANT FOR SOCIAL OCCASIONS" *How often has this been true for you (or your household) over the past year?*

Always Sometimes Never Don't know

Section 4: Food and Drink Attitudes

For each of these questions, please tick which answer you think is right. These questions ask about eating healthily. When we ask about vegetables, we mean all vegetables EXCEPT FOR POTATOES/KUMARA. *Please choose ONE answer per question.*

43. Do you eat healthily?

- I've eaten healthily for more than 6 months
- I've eaten healthily for 6 months or less
- I don't eat healthily now but I intend to do so in the next month
- I don't eat healthily now but I intend to in the next 6 months
- I don't eat healthily now and have no intention to do so

44. Do you think your diet is....

- Very healthy
- Healthy
- Neither healthy nor unhealthy
- Unhealthy
- Very unhealthy

45. Do you think that you should eat a healthy diet? *Please choose only ONE of the following.*

- Definitely not
- Probably not
- Maybe
- Probably yes
- Definitely yes

46. How much do you agree with the following statement? *Please choose the most appropriate response.*

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
a. If I eat healthily I think that my food will taste less good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

47. A reason or benefit for me to eat healthily is that....

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
a. ...I like the taste of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

healthy food					
b. ...I feel better eating healthily	<input type="checkbox"/>				
c. ...I will stay in good health	<input type="checkbox"/>				
d. ...I will lose weight	<input type="checkbox"/>				
e. ...I can keep my weight the same and I won't become overweight	<input type="checkbox"/>				
f. ...other people will admire me	<input type="checkbox"/>				
g. ...I will have an attractive body	<input type="checkbox"/>				

48. If you wanted to eat healthily every day...

	Very Hard	Hard	It's okay	Easy	Very Easy
a. ...how hard is it for you to eat healthily every day?	<input type="checkbox"/>				
b. ...how hard is it for you to eat healthy food at home?	<input type="checkbox"/>				
c. ...how hard is it for you to eat healthy food at work?	<input type="checkbox"/>				

49. A reason why I do NOT always eat healthily is that...

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
a. ...I do not have the self-discipline to continue to eat healthily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...I feel the urge to eat unhealthy foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...I have family or friends that criticise me for eating healthily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...my family make unhealthy food that I am supposed to eat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...I have too little time to prepare healthy food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ...I don't have the opportunity to make healthy food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. ...I don't really know what is healthy and what is not	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. ...I think it is too expensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

50. How many servings of FRUIT per day do you think you should have in a healthy diet?

_____ *serves per day*

51. How many servings of VEGETABLES per day do you think you should have in a healthy diet?

_____ *serves per day*

52. How much do you agree with the following statements?

	All of them	Some of them	None of them
a. I like the taste of fruit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I like the taste of vegetables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

53. We would like to ask some questions about your fruit and vegetable intake. *Please choose the most appropriate response for each item.*

	Yes	No
a. It is difficult for me to eat fruit every day.	<input type="checkbox"/>	<input type="checkbox"/>
b. It is difficult for me to eat vegetables every day.	<input type="checkbox"/>	<input type="checkbox"/>
c. I want to eat fruit every day.	<input type="checkbox"/>	<input type="checkbox"/>
d. I want to eat vegetables every day.	<input type="checkbox"/>	<input type="checkbox"/>
e. To eat fruit every day is a habit for me.	<input type="checkbox"/>	<input type="checkbox"/>
f. To eat vegetables every day is a habit for me.	<input type="checkbox"/>	<input type="checkbox"/>

54. Are these important to you when you decide what to eat? *Please choose the most appropriate response for each item.*

	Not Important	Important
a. The healthiness of the food	<input type="checkbox"/>	<input type="checkbox"/>
b. The taste of the food	<input type="checkbox"/>	<input type="checkbox"/>
c. That the food is quick and easy to get	<input type="checkbox"/>	<input type="checkbox"/>
d. That the food is easy to get	<input type="checkbox"/>	<input type="checkbox"/>

Section 5: Your Body

55. In this section we are interested in how YOU FEEL about YOUR body and not how you think other people view it. *Please choose the most appropriate response.*

	Much too small/thin	A bit too small/thin	About the right size	A bit too big/fat	Much too big/fat
g. I think my body is...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I think my hips are...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. I think my stomach is...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. I think my bottom is...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. I think my thighs are...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. I think my figure/shape is...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 6: Your child

In this section we would like to ask about you and your child.

56. What was your child's weight at birth?

- Birth weight not known

Birth weight in pounds and ounces: _____ lbs _____ oz **OR** in grams: _____ gr

57. When was your child born?

- Very pre-term (early, before 33 weeks)
- Pre-term (early, between 33 and 36 weeks)
- At term (between 36 and 42 weeks)
- Post-term (late, after 42 weeks)

58. Please tick the box that best indicates your opinion about your child's current weight. Would you describe your child as:

- Underweight
- Normal weight
- Overweight
- Obese

59. Does your child have a condition that affects his/her ability to be physically active?

- No
- Yes (Please describe briefly): _____

60. For this question, please tick the box that best indicates your agreement or disagreement with each statement. Would you describe **your child** as:

	Strongly disagree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
a. physically active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. restless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. well-behaved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

d. outgoing	<input type="checkbox"/>				
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Section 7: Your child's travel to school & other destinations

61. Below are a number of statements that might be made about your child's journey to school. *Please tick the box that indicates your level of agreement or disagreement with each statement.*

	Strongly disagree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
a. The traffic makes it too dangerous for my child to walk or cycle to school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. My child cannot walk to school as it's too far away.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. My child cannot cycle to school as it's too far away.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. It is more convenient to take my child to school by car.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I am worried that something	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

will happen to my child on the way to school.					
f. I am usually around to take my child to school.	<input type="checkbox"/>				
g. I take my child to school on the way somewhere.	<input type="checkbox"/>				
h. There are no safe cycle paths en route to school.	<input type="checkbox"/>				
i. There are no safe pavements en route to school.	<input type="checkbox"/>				
j. I like or would like my child to walk/cycle to school.	<input type="checkbox"/>				

62. How does your child usually travel **TO** school? *(Please tick ONE box only)*

- By car
- By public transport
- By bike
- By skateboard/scooter
- On foot
- Others (please specify): _____

63. How does your child usually travel **HOME FROM** school? *(Please tick ONE box only)*

- By car
- By public transport

- By bike
- By skateboard/scooter
- On foot
- Others (please specify): _____

64. How long does the journey **TO** school usually take? *(Please tick ONE box only)*

- Less than 5 minutes
- 5 - 15 minutes
- 15 - 30 minutes
- 30 minutes – 1 hour
- More than 1 hour

65. How often does your child **walk to or ride a bike to** the following places?

	Never	Not within walking/ biking distance	Less than once per week	1 to 3 times per week	4 to 5 times per week	6 or more times per week
a. Friend's house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Parks / playgrounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Shops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Sports venue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 8: Your view on your child's activity

66. How physically active would you say **your child** is? *Please tick ONE box only.*

- Very inactive
- Fairly inactive
- Neither inactive nor active
- Fairly active
- Very active

67. Who do you feel should take the **MAIN** responsibility for **children's** physical activity levels?

- The child themselves
- Their parents
- Their school
- Someone else (if so, who?)_____

68. Do you feel there are enough **extra-curricular activities** (including sports and exercise) run by your child's school?

- Yes
- No

69. What do you consider to be an **acceptable distance** for your **child** to walk to school?

- 400 metres (less than 10-minute walk)
- 800 metres (approximately 15-minute walk)
- 1600 metres (approximately 30-minute walk)
- 3200 metres (approximately 1-hour walk)

Section 9: Rules and restrictions at home

For the following four questions, please tick ONE box for each statement.

70. In general, how often do you or your partner restrict your child in these activities?

	Never	Rarely	Some- times	Often	Very often
a. Watching TV	<input type="checkbox"/>				
b. Playing computer games	<input type="checkbox"/>				
c. Playing outside	<input type="checkbox"/>				
d. Using the computer/lap top	<input type="checkbox"/>				

e. Using cell phone, iPod, etc.	<input type="checkbox"/>				
f. Walking or cycling to a friend's house	<input type="checkbox"/>				

71. In general, how often do you or your partner allow your child to do the following?

	Never	Rarely	Some- times	Often	Very Often
a. Watch TV at meal times	<input type="checkbox"/>				
b. Go to bed when they want to	<input type="checkbox"/>				
c. Run around in the house	<input type="checkbox"/>				
d. Play outside after dark	<input type="checkbox"/>				
e. Play outside anywhere within the neighbourhood	<input type="checkbox"/>				
f. Play ball games in the house	<input type="checkbox"/>				
g. Not finish their food at dinner	<input type="checkbox"/>				
h. Eat what they want between meals	<input type="checkbox"/>				

72. In an average week, how often do you do these activities together as a family?

	Number of times per week		
	0	1 to 4	More than 4
a. Eat meals together	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Read a book	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Play sport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

d. Visit family or friends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Go to the park	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Go swimming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Go for a bike ride	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Watch TV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Prepare meals together	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 10: Your child's sleep

The following statements are about your child's sleep habits. Think about the **past week (last 7 days)** when you answer the questions.

Please tick 'Always' if something occurs every night, 'Usually' if it occurs 5 or 6 times a week, 'Sometimes' if it occurs 2 to 4 times a week, 'Rarely' if it occurs once a week, and 'Never' if it occurs less than once a week.

The following questions are about **your child's** sleep habits in the past week. If last week was unusual for a specific reason, choose the most recent typical week.

73. BEDTIME:

Please write in your child's **usual** bedtime:

a. *School day = has school the next day School day _____am/pm

b. *Non-school day = has no school the next day

Non-school day _____am/pm

	7 days Always	5-6 Usually	2-4 days Sometimes	1 day Rarely	0 Never
c. Child goes to bed at the same	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

time at night.					
d. Child falls asleep within 20 minutes after going to bed.	<input type="checkbox"/>				
e. Child falls asleep alone in own bed.	<input type="checkbox"/>				
f. Child falls asleep in parent's or sibling's bed.	<input type="checkbox"/>				
g. Child needs parent in the room to fall asleep.	<input type="checkbox"/>				
h. Child struggles at bedtime (cries, refuses to stay in bed, etc.).	<input type="checkbox"/>				
i. Child is afraid of sleeping in the dark.	<input type="checkbox"/>				
j. Child is afraid to sleep alone.	<input type="checkbox"/>				

74. SLEEP BEHAVIOR:

Please write in your child's **usual amount** of sleep each day (combining night-time sleep and naps)

a. *School day = has school the next day School day _____ hours

b. *Non-school day = has no school the next day

Non-school day _____hours

	7 days Always	5-6 Usually	2-4 days Sometimes	1 Rarely	0 Never
c. Child sleeps too little.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Child sleeps the right amount.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Child sleeps about the same amount each day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

f. Child wets the bed at night.	<input type="checkbox"/>				
g. Child talks during sleep.	<input type="checkbox"/>				
h. Child is restless and moves a lot during sleep.	<input type="checkbox"/>				
i. Child sleepwalks during the night.	<input type="checkbox"/>				
j. Child moves to someone else's bed during the night (parent, brother, sister, etc.).	<input type="checkbox"/>				
k. Child grinds teeth during sleep (your dentist may have told you this).	<input type="checkbox"/>				
l. Child snores loudly.	<input type="checkbox"/>				
m. Child seems to stop breathing during sleep.	<input type="checkbox"/>				
n. Child snorts and/or gasps during sleep.	<input type="checkbox"/>				
o. Child has trouble sleeping away from home (visiting relatives, and holidays).	<input type="checkbox"/>				
p. Child awakens during the night screaming, sweating, and inconsolable.	<input type="checkbox"/>				
q. Child awakens alarmed by a frightening dream.	<input type="checkbox"/>				

r. Child naps during the day.	<input type="checkbox"/>				
s. Child wakes up once during the night.	<input type="checkbox"/>				
t. Child wakes up more than once during the night.	<input type="checkbox"/>				

75. Please write the number of minutes your child usually sleep walks:

_____ hours and _____ minutes

76. MORNING WAKE UP:

Write in the time your child usually wakes up in the morning:

a. *School day = has school that day School day _____ : _____ am/pm

b. *Non-school day = has no school that day Non-school day ____ : ____ am/pm

	7 Always	5-6 Usually	2-4 Sometimes	1 Rarely	0 Never
c. Child wakes up by him/herself.	<input type="checkbox"/>				
d. Child wakes up in a negative mood.	<input type="checkbox"/>				
e. Adults or siblings wake up child.	<input type="checkbox"/>				
f. Child has difficulty getting out of bed in the morning.	<input type="checkbox"/>				
g. Child takes a long time to become alert in the morning.	<input type="checkbox"/>				

77. DAYTIME SLEEPINESS:

	7 Always	5-6 Usually	2-4 Sometimes	1 Rarely	0 Never
Child seems tired.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

78. During the past week, how has your child appeared during the following activities (Tick ALL that apply):

	1 Not Sleepy	2 Very Sleepy	3 Falls Asleep
a. Watching TV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Riding in car	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please have a quick check over the questionnaire to make sure you have answered every question. Thank you for your help!



PEDALS

Appendix J: Principal Questionnaire



Barcode:



PEDALS

(Physical activity, Exercise, Diet And Lifestyle Study)

QUESTIONNAIRE FOR PRINCIPALS

About your school, physical activity and healthy eating

- This questionnaire asks about physical activity and healthy eating-related aspects of your school and should take about 20-30 minutes to complete.
- Please choose one answer per question or item (either tick one box or circle one response).
- Please complete every question in the questionnaire.
- Your answers will be treated as confidential.
- If you have any questions, please contact the study team on:

0273497836 or pedals@otago.ac.nz

Name of school: _____

1. What is your position at the school? *Please tick:*

- Principal
 Deputy Principal
 Other (please specify): _____

2. What time does the normal school day start: _____ and finish:

3. At what time are breaks held, and how long do they last?

	Start time	Duration (minutes)
<input type="checkbox"/> Morning Break	_____	_____
<input type="checkbox"/> Lunchtime	_____	_____
<input type="checkbox"/> Afternoon break	_____	_____
<input type="checkbox"/> Other (please specify): _____	_____	_____

Section 1. Physical activity opportunities at school

4. Does your school have access to: (Please circle your response)

- a. A specific hall for gym or sports (indoors)? Yes No
b. A shared facility used for sports activities (indoors)? Yes No
c. A sports or football field/pitch (on school grounds) Yes No
d. A school playground? Yes No
e. A swimming pool? Yes No
f. A local park or playground (off school grounds), which you use?
Yes No
g. A nearby beach, which you use? Yes No
h. Changing facilities (purpose-built)? Yes No
i. Play equipment for use at break times (e.g. hoops, balls) Yes No

j. Sports equipment (e.g. gymnastics equipment)? Yes No

In regards to j above:

If you answered "Yes", do you think there is sufficient equipment?

Yes No

5. Are sports days compulsory for Year 5 and 6 students to participate in?

Please tick ONE option:

- Yes for Years 5 and 6
- Yes for Year 6, No for Year 5
- Yes for Year 5, No for Year 6
- No for Years 5 and 6

6. a. Do Year 5 students receive any teaching on the importance of physical activity as part of any subject? *Please tick ONE option and provide information as necessary:*

Subject:

Number of hours each year:

Yes, _____

No

b. Do Year 6 students receive any teaching on the importance of physical activity as part of any subject? *Please tick ONE option and provide information as necessary:*

Subject:

Number of hours each year:

Yes, _____

No

7. How would you rate the quality of the following with respect to its use for gym classes or sports? (Please take into account the level of maintenance, cleanliness, accessibility etc.)

Please circle ONE response per facility (n.a. = facility not available)

- a. Specific hall for gym or sports (indoors) high medium low n.a.
- b. Shared facility used for sports activities (indoors) high medium
low n.a.
- c. Sports or football field/pitch (on school grounds) high medium
low n.a.
- d. Playground (on school ground) high medium low n.a.
- e. Swimming pool high medium low n.a.
- f. Local park or playground (off school grounds) high medium
low n.a.
- g. Nearby beach, which you use high medium low n.a.
- h. Changing facilities (purpose-built) high medium low n.a.
- i. Play equipment for use at break times high medium low n.a.
- j. The available sports equipment high medium low n.a.

8. How many hours of physical education do the children in Years 5 and 6 usually have per week? (Please round to the nearest $\frac{1}{2}$ hour)

a. _____ hours per week for Year 5

b. _____ hours per week for Year 6

9. Do the children in Years 5 and 6 have compulsory swimming lessons? Please tick ALL that apply and write in the time spent on lessons over the school year.

Yes for Year 5

Total number of hours over school year for Year 5: _____ (Please round to the nearest $\frac{1}{2}$ hour)

- Yes for Year 6

Total number of hours over school year for Year 6: _____ (Please round to the nearest $\frac{1}{2}$ hour)

- No for Year 5
- No for Year 6

10. Do the children in Years 5 and 6 have non-compulsory swimming lessons? Please tick ALL that apply and write in the time spent on lessons over the school year.

- Yes for Year 5

Total number of hours over school year for Year 5: _____ (Please round to the nearest $\frac{1}{2}$ hour)

- Yes for Year 6

Total number of hours over school year for Year 6: _____ (Please round to the nearest $\frac{1}{2}$ hour)

- No for Year 5
- No for Year 6

11. Does your school or any other organisation provide any extra-curricular physical activity or sports programmes for students? (Please tick/circle your response in each case)

	No	Yes	If Yes, are these activities open to everybody? (If No, please give details)
a. Before school	<input type="checkbox"/>	<input type="checkbox"/> →	Yes _____ No, _____
b. During lunch	<input type="checkbox"/>	<input type="checkbox"/> →	Yes _____

breaks			No,	
			Yes	
c. After school	<input type="checkbox"/>	<input type="checkbox"/> →	No,	_____
			Yes	
d. At weekends	<input type="checkbox"/>	<input type="checkbox"/> →	No,	_____

Section 2. Food learning opportunities at school

12. a. Do you have access to cooking/food preparation facilities for teaching use at your school?

Yes No

b. If not, do you have access to facilities at another school?

Yes No

13. Do children have cookery lessons as part of the planned curriculum for Years 5 and 6?

Yes for Year 5

Total number of hours over school year for Year 5: _____ (Please round to the nearest $\frac{1}{2}$ hour)

Yes for Year 6

Total number of hours over school year for Year 6: _____ (Please round to the nearest $\frac{1}{2}$ hour)

No for Year 5

No for Year 6

14. Other than curriculum-based activities, does your school or any other organisation provide any programmes for learning about food preparation (e.g. cookery club)?

	No	Yes	If yes are these activities open to everybody? (If no, please give details)
<input type="checkbox"/> Before school	<input type="checkbox"/>	<input type="checkbox"/> →	Yes No, _____
<input type="checkbox"/> During lunch breaks	<input type="checkbox"/>	<input type="checkbox"/> →	Yes No, _____
<input type="checkbox"/> After school	<input type="checkbox"/>	<input type="checkbox"/> →	Yes No, _____

<input type="checkbox"/> At weekends	<input type="checkbox"/>	<input type="checkbox"/> →	Yes	
			No,	_____

15. a. Do Year 5 students receive any teaching on healthy eating as part of any subject?

	Subject:	Number of hours each year:
<input type="checkbox"/> Yes	_____	_____
<input type="checkbox"/> No		

b. Do Year 6 students receive any teaching on healthy eating as part of any subject?

	Subject:	Number of hours each year:
<input type="checkbox"/> Yes	_____	_____
<input type="checkbox"/> No		

16. a. Do Year 5 students receive any teaching about smoking and health as part of any subject?

	Subject:	Number of hours each year:
<input type="checkbox"/> Yes	_____	_____
<input type="checkbox"/> No		

b. Do Year 6 students receive any teaching about smoking and health as part of any subject?

Subject:

Number of hours each year:

Yes

No

17. Has your school received funding from HEHA, or any other source to implement any initiatives on the following topics? *Examples of such initiatives may include school gardens, physical activity clubs, breakfast clubs or any other initiative that may provide a food or activity component.*

Healthy eating

Physical activity

Any other lifestyle factors (please state):

If you ticked any of the above, please give details:

18. Does your school receive any non-financial help to implement any initiatives on the following topics? *Examples of this could be voluntary support from parents, community groups or businesses that supply free equipment.*

Healthy eating

Physical activity

Any other lifestyle factors (please state):

If yes, please give details:

Section 3. School's rules and attitudes

19. Are extra-curricular activities, such as belonging to school sports clubs, compulsory for students? *Please tick ONE box and provide information if necessary.*

- Yes, for all students
- Yes, for year(s): _____
- No, it is not compulsory

Please tick the box that BEST indicates your agreement or disagreement with each of the following statements.

20. It is your school's view that it is important to...

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. ...encourage students to be physically active at school (for example, during school breaks).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...encourage students to do sports activities outside of school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...educate students about the risks of physical inactivity.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...provide information on how to be physically active in a safe manner.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...encourage students to use active transport to school (e.g. walking, cycling).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Which of the following statements BEST describes your rules relating to where children can play during breaks (including lunchtime)? *Please tick ONE box only.*

- a. It is compulsory for all children to play outside, irrespective of the weather.
- b. When the weather allows, it is compulsory for all children to play outside. However, all children are kept inside in bad weather.
- c. When the weather allows, it is compulsory for all children to play outside. However, if the weather is bad, they are allowed to play inside or outside.
- d. The children are allowed to play inside and outside, irrespective of the weather.
- e. It is compulsory for all children to play inside, irrespective of the weather.

22. Are the children in Year 5 allowed to do the following during breaks?

	Yes, always	Yes, in bad weather	No, never
a. Use a computer/tablet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Watch TV or videos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use the school's sports equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Play a ball game indoors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Play a running game indoors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Play ball games outdoors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Use a cell phone to text/play games	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. Are the children in Year 6 allowed to do the following during breaks?

Yes, always	Yes, in bad weather	No, never
----------------	------------------------	-----------

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| a. Use a computer/tablet | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Watch TV or videos | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Use the school's sports
equipment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Play a ball game indoors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Play a running game indoors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Play ball games outdoors | | | |
| g. Use a cell phone to text/play
games | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

24. Does your school have the following? Please tick ONE box per letter:

- | | Yes | No |
|---|--------------------------|--------------------------|
| a. A travel plan
(This is a formal document, which identifies ways of encouraging more children to walk, cycle or use public transport to get to school) | <input type="checkbox"/> | <input type="checkbox"/> |
| b. A bicycle rack for the children to park bicycles on site | <input type="checkbox"/> | <input type="checkbox"/> |
| c. A 'walking' school bus
(where children walk to school in a group along a set route accompanied by adults, picking up children on the way) | <input type="checkbox"/> | <input type="checkbox"/> |
| d. A 'Park and Stride'
(where parents park their cars or stop and drop children off away from the school and children walk the remainder of the journey) | <input type="checkbox"/> | <input type="checkbox"/> |
| e. A 'walk to school' week or day | <input type="checkbox"/> | <input type="checkbox"/> |
| f. An entrance to the school for pedestrians/cyclists separate from cars | <input type="checkbox"/> | <input type="checkbox"/> |
| g. A breakfast club | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Road patrol / a person/people who man the crossings outside the school before and after school | <input type="checkbox"/> | <input type="checkbox"/> |

25. Does your school offer cycle training? *Please tick ONE box only.*

- Yes, it is compulsory for all children
- Yes, children can choose to do it
- No, we do not offer it

26. Does your school offer pedestrian training? *Please tick ONE box only.*

- Yes, it is compulsory for all children
- Yes, children can choose to do it
- No, we do not offer it

27. Are children allowed to bike to school?

- Yes
- No

If No, why not? _____

28. Over and above the basic National Curriculum requirements, does your school provide the children with additional information on the following topics? *Please circle your response for each letter.*

- | | | |
|------------------------------------|-----|----|
| a. Healthy eating | Yes | No |
| b. Physical activity | Yes | No |
| c. Health promotion in general | Yes | No |
| d. Risks of an unhealthy lifestyle | Yes | No |
| e. Smoking | Yes | No |
| f. Alcohol | Yes | No |

29. Does your school have a policy to promote physical activity among the children?

Please tick ONE box:

Yes, a written policy

Yes, an informal policy

No

30. Does your school have a policy to promote healthy eating among the children?

Please tick ONE box:

Yes, a written policy

Yes, an informal policy

No

31. Does your school have any student-led groups for healthy eating? *Please tick*

ONE box:

No

Yes Please give details:

32. Does your school have any student-led groups for encouraging activity? *Please*

tick ONE box:

No

Yes Please give details:

33. Does your school have any student-led groups on other lifestyles, e.g. smoking?

Please tick ONE box:

No

Yes Please give details:

34. a. Does your school have an annual school camp for Year 5? Please tick ONE box:

No

Yes

b. Does your school have an annual school camp for Year 6? Please tick ONE box:

No

Yes

35. a. Apart from an annual school camp, does your school use education outside the classroom to encourage physical activity, healthy eating, or health promotion in general for Year 5?
Please tick ONE box:

Yes

No

b. Apart from an annual school camp, does your school use education outside the classroom to encourage physical activity, healthy eating, or health promotion in general for Year 6?
Please tick ONE box:

Yes

No

36. How much do you agree with the following statements about your school?
Please choose the BEST response for each item and tick the box:

Fully disagree	Disagree	Neither agree nor disagree	Agree	Fully agree
----------------	----------	----------------------------	-------	-------------

- | | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. It is possible to buy unhealthy snacks at school during break and lunch times. | <input type="checkbox"/> |
| b. It is possible to buy soft drinks at school during break and lunch times. | <input type="checkbox"/> |
| c. It is possible to buy fruit at school or get it for free during break and lunch times. | <input type="checkbox"/> |
| d. The school has enough sports grounds and courts. | <input type="checkbox"/> |
| e. Allowing free access to drinks during class leads to disruption e.g. increased litter and spillages. | <input type="checkbox"/> |
| f. The school provides the right sports gear. | <input type="checkbox"/> |
| g. Sport is well organised at the school. | <input type="checkbox"/> |
| h. Everyone can participate in sports at the school. | <input type="checkbox"/> |
| i. The school offers good opportunities for the best players. | <input type="checkbox"/> |
| j. The school offers good opportunities for social players. | <input type="checkbox"/> |
| k. Students can influence how sport is run in the school. | <input type="checkbox"/> |
| l. Results and successes are acknowledged for all sports at the school. | <input type="checkbox"/> |
| m. The school values sports exchanges with other schools. | <input type="checkbox"/> |

Section 4. Food provision and catering

37. Does your school have a canteen / tuck shop? *Please tick one box:*

- Yes
- No

38. Does your school prepare food for the canteen / tuck shop on-site? *Please tick one box:*

Yes Please give details:

No

39. What foods are available at the canteen / tuck shop? *Please choose the MOST appropriate response for each item, if no canteen / tuck shop is available go to Section E.*

	Yes, always	Yes, sometimes	No, never
a. Potato crisps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Chocolate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Lollies / sweets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Pre-made sandwiches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Filled rolls, wraps, paninis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Pies / sausage rolls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Hot chips	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Battered fish / sausage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Sushi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Cakes / slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Fresh fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Vegetables (e.g carrot sticks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Ice cream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Ice blocks / frozen juice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. Nachos / quiche / noodles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. Cold salads (pasta, potato, garden)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- q. Toasties- e.g. spaghetti,
cheese, ham
- r. Burgers

40. What beverages are available at the canteen / tuck shop? Please choose the most appropriate response for each item:

- | | Yes,
always | Yes, sometimes | No,
never |
|--|--------------------------|--------------------------|--------------------------|
| a. Fruit juice | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Sugary soft drinks (e.g. Coke, Sprite) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Diet soft drinks | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Hot drinks (tea, coffee, hot chocolate) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Plain milk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Flavoured milk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Water | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

41. Are water fountains available for students on school grounds? Please tick one box:

- Yes No

42. Can students access these between classes? Please tick one box:

- Yes No

43. Are the following dietary needs catered for students at the canteen / tuck shop? Please tick one box for each item:

- Yes No

- a. Vegetarianism
- b. Veganism
- c. Common religious beliefs
- d. Common food allergies

44. Where are students allowed to eat? Please tick one box:

- Anywhere on the school grounds
- In a designated area outside
- In a designated area inside
- Inside and a designated area outside
- Outside and a designated area inside (e.g. if weather is poor)

45. With regard to food at break times/lunch, which of the following is true of your school? Tick ALL that apply:

- a. Students may bring in any food to eat at break times
- b. Students may only eat healthy food (sandwiches, fruit, vegetables) during break times
- c. Students are not allowed to bring in sugary drinks for consumption
- d. Students may only bring water to school as a drink 1)
- e. We have a tuck shop that sells only healthy foods at break time
- f. We have a tuck shop that sells healthy options at break time
- g. We allow students to order food from food outlets e.g. sushi, Subway, local dairy etc

In regards to question g. above:

Where is the food ordered from?

How often can they order it? Everyday Once a week More than once/week

46. Are there recycling facilities available for students at school?

- Yes No

47. Is your school part of the 'Milk in Schools' programme?

- Yes No

48. Does your school hold sausage sizzles?

- Yes No

49. Does your school have foods available to buy at school events?

- Yes No

If Yes, please list and describe which foods can be bought:

Section 5. The environment around your school

50. For the next set of questions we need you to think about the area around your school.

Please tick the box that BEST indicates your agreement or disagreement with each of the following statements:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. There is heavy traffic in the streets near the school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. There are pathways for the students to walk on near the school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Cars drive slowly near the	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

school.

- d.** Streets are safe to walk or ride on near the school.
- e.** There are safe places like traffic lights or pedestrian crossings to cross streets near the school.
- f.** Streets near the school are free from rubbish.
- g.** It is easy to get to the school on foot.
- h.** There is a dairy near the school that students can use on the way to/from school.
- i.** There are supermarkets near the school that students can use on the way to/ from school.
- j.** There are fast food outlets near the school (e.g. McDonalds, pizza, fish and chips etc....) that students can use on the way to/from school.

Section 6. Edible gardens in your school

51. Does your school currently have a garden where students are involved in growing edible foods? *Please tick ONE box:*

- No Please complete question 52, **then you have finished the questionnaire**
- Yes Please continue to question 53

52. If not, why? *Please tick ONE box:*

- No interest
- No space
- No money to do this
- Other reason (please specify): _____

53. Which types of edible foods does your school garden grow? *Please tick ALL that apply:*

- Vegetables
- Herbs
- Nut trees (e.g. walnut trees)
- Fruit trees (e.g. apples, plums, pears)
- Berry fruit (e.g. strawberries, blackcurrants, gooseberries)
- Edible flowers (e.g. nasturtium)
- Other, please specify:

54. For how many years has your school had an edible garden? *Please indicate:*

_____ years _____ months

55. How is your school garden funded? *Please tick ALL that apply:*

- Parents/ students

- School
- Fundraising
- Private business
- Community grant
- Other Please specify: _____

56. Please describe student participation in the garden. *For example: "Students participate in a garden club"*

57. Tick the most appropriate statement regarding participation in the garden:

- Participation is compulsory
- Participation is optional

58. Which of the following groups of people help to maintain the garden *during* school hours (e.g. 9am-3pm)?
Please tick ALL that apply:

- Year 5 students
- Year 6 students
- Teachers
- Other school staff
- Parents / Whanau
- Community of volunteers
- Other Please specify: _____

59. Which of the following groups of people help to maintain the garden *outside* school hours (e.g. outside 9am-3pm, during weekends and holidays)?

Please tick ALL that apply:

- Year 5 students
- Year 6 students
- Teachers
- Other school staff
- Parents / Whanau
- Community of volunteers
- Other Please specify: _____

60. What happens to the edible foods harvested from the garden?

Please tick ALL that apply:

- Eaten in the garden
- Eaten in the classroom
- Used in classroom lessons
- Used in school canteen or cafeteria
- Taken home by students or staff
- Donated to charity
- Sold to community
- Other Please specify:

61. a. Do you provide cooking lessons or cooking recipes using produce from the edible garden for Year 5 students?

- No Yes

b. Do you provide cooking lessons or cooking recipes using produce from the edible garden for Year 6 students?

Yes No

62. a. Do you provide an "increase your fruit and vegetable consumption" message that is linked to the edible garden to Year 5 students?

Yes
No

b. Do you provide an "increase your fruit and vegetable consumption" message that is linked to the edible garden to Year 6 students?

Yes No

Thank you for completing this questionnaire, we really appreciate it.
Please return the questionnaire to the PEDALS research team.



Appendix K: Diet Quality Index scoring table

Components and scoring of the Healthy Dietary Habits Score for Adolescents

Cluster	Item	Description	Original Question(s) ¹	Scoring Criteria ²				
				0	1	2	3	4
<i>Fat from meat, poultry and fish</i>	1	Meat fat trimming before consumption	In the past four weeks, have you eaten red meat? If yes, how often do you remove excess fat from meat?	Yes	Rarely	Sometimes	Regularly	No
	2	Chicken fat trimming before consumption	In the past four weeks, have you eaten chicken? If yes, how often do you remove the skin from chicken?	Yes	Rarely	Sometimes	Regularly	No
	3	Processed meat intake	In the past four weeks, have you eaten processed meat ³ ? If yes, how often do you eat processed meat products ³ ?	7 or more times	5-6 times	3-4 times	1-2 times	<1 time, Never
	4	Proportion of fried fish/shellfish relative to total fish/shellfish	How often do you eat fresh or frozen fish or shellfish? How often do you eat battered or fried fish or shellfish? How often do you eat canned fish or shellfish?	Never consume fish/shellfish	100%	67-75%	44-50%	13-33%

Cluster	Item	Description	Original Question(s) ¹	Scoring Criteria ²				
				0	1	2	3	4
<i>Other fats</i>	5	Types of fat spread used	What type of butter or margarine spread do you use the most of?	Butter	Butter & margarine blend	Margarine ⁴ (full fat)	Plant sterol margarine ⁵	None / Margarine (light or reduced fat)
	6	Types of cooking fat	What type of fat or oil do you use most often in cooking?	Lard / Dripping	Butter	Butter blend	Margarine	None /oil
	7	Use of low-fat products	How often do you choose low or reduced fat varieties of food instead of the standard variety?	Never	Rarely	Sometimes	Regularly	Always
	8	Types of milk consumed	What type of milk do you use the most of?	None	Whole / Standard milk	Other (e.g. rice, goats milk)	Reduced fat / Soy milk	Skim or trim milk
	9	Intake of potatoes and kumara fries	How often do you eat hot chips, French fries, wedges, or kumara chips?	7 or more times	5-6 times	3-4 times	1-2 times	<1 time, Never
<i>Fruit, vegetables and bread</i>	10	Fruit intake	On average, how many servings of fruit – fresh, frozen, canned or stewed – do you eat per day?	Never	Less than one serving	1 serving		2 servings, 3 servings, 4 servings
	11	Vegetable intake	On average, how many	Never	Less than 1 serving	1 serving	2 servings	3 servings,

Cluster	Item	Description	Original Question(s) ¹	Scoring Criteria ²				
				0	1	2	3	4
			servings of vegetables – fresh, frozen or canned – do you eat per day?		one serving			4 or more servings
	12	Types of bread consumed	On average, how many slices of bread/toast or bread rolls do you eat per day?	Don't eat bread	White / Other	1-2 times	Light grain bread ⁶ / High fibre white	Heavy grain bread ⁷
<i>Sugar sources</i>	13	Fruit juice or drink consumption	How often do you drink fruit juices or drinks?	7 or more times	5-6 times	3-4 times	1-2 times	<1 time, Never
	14	Soft drink or energy drink consumption	How often do you drink soft drinks or energy drinks?	7 or more times	5-6 times	3-4 times	1-2 times	<1 time, Never
	15	Confectionary consumption	How often do you eat lollies, sweets, chocolate and confectionary?	7 or more times	5-6 times	3-4 times	1-2 times	<1 time, Never
<i>Meal habits</i>	16	Breakfast consumption	How many days in an average week do you have something to eat for breakfast?	0	1-2	3-4	5-6	7
	17	Purchasing food away from home	How often do you eat fast food or takeaways from	7 or more times/week	5-6 times/week	3-4 times/week	1-2 times/week	Never, <1/week

Cluster	Item	Description	Original Question(s) ¹	Scoring Criteria ²				
				0	1	2	3	4
			places like McD, KFC, Burger King, Pizza shops or Fish' n' Chip shops?					

¹Original questions from the Dietary Habits Questionnaire.

²Scoring criteria based on responses from the Dietary Habits Questionnaire.

³Including ham, bacon, sausages, luncheon, canned corned beef, pastrami and salami.

⁴Fat spread made from vegetables oils such as canola, sunflower and olive oils.

⁵Margarine spread containing phyosterols, including both full and low-fat varieties such as Proactive and Logical.

⁶Including commercial brands such as Molenberg, Freya's, Ploughmans, and MacKenzie High Country

⁷Including commercial brands such as Vogels and Burgen.