The dietary habits of female adolescents in New Zealand

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Abstract

Background: Adolescence is a complex and vulnerable period of life, where significant physical, developmental and social transformations occur. With these transitions, changes in dietary habits become apparent. The dietary habits of a national sample of female adolescents has not been examined since the ANS 08/09. Given changes in food trends and availability, it is important to investigate current dietary habits. There are dietary habits which have received substantial attention in the literature. Specifically, breakfast consumption has been investigated because the progressive complications of skipping breakfast. Socioeconomic status (SES) and how it relates to adolescents’ dietary habits is also an important variable to analyse, as it has been identified as a predictor of negative health outcomes due to unhealthy dietary habits.

Objective: To examine the dietary habits of New Zealand adolescent females aged 15-18 years, using a dietary habit questionnaire specific to the population. In particular, this thesis will focus on breakfast habits in the population group, and whether SES influences the dietary habits of this group.

Design: The Survey of Nutrition, Dietary Assessment and Lifestyles project (SuNDiAL) is an observational, cross-sectional survey based on female adolescents aged 15-18 years. Participants were recruited from 8 schools in NZ. In total 145 participants enrolled in the study, with 124 participants completing a self-administered online dietary habits questionnaire administered in REDCap software. Participants also completed an online demographic questionnaire. Height and weight were measured at a school visit.

Results: A total of 62% of participants reported consuming fruit two or more servings per day, while 41% reported consuming three or more servings of vegetables per day.
Twenty-three percent reported consuming red meat once a day or more. Sugar-sweetened beverages were consumed never or rarely by 60% of participants. Fifty percent reported consuming fast food rarely or monthly. Snacking frequency was varied, with 14.0% reporting to never or rarely consume discretionary snacks, 25.0% reported consumption 1-3 times per month, and 26.0% reported consumption 2-4 times per week.

Breakfast was consumed everyday by 42% of participants. Thirty-four percent of Māori participants consumed breakfast ≥5 times a week. Sixty percent of not overweight participants reported consuming breakfast ≥5 times a week, compared to 48% of overweight/obese participants.

Thirty-six percent of low decile participants reported never/rarely consuming breakfast, versus 8.9% of high decile participants. Participants from lower decile schools showed a pattern of an apparent increased consumption of fast food and sugar-sweetened beverages (SSBs), and an apparent lower consumption of fruit, vegetables and light/heavy grain bread compared to those in higher deciles.

**Conclusion:** The dietary habits among female adolescents in NZ remain poor in number of areas. In particular, red meat consumption appears to have increased compared to ANS 08/09, and those from lower decile schools seemed to show a pattern of undesirable dietary habits. Breakfast consumption was low in Māori and low decile subgroups. There were some promising results, for example, the frequency of SSBs appears to have decreased compared to the ANS 08/09. Future research in larger, representative samples are needed to confirm these findings.
Preface

This Master of Dietetics project was part of the Survey of Nutrition, Dietary Assessment and Lifestyles (SuNDiAL), which was run out of the Department of Human Nutrition at the University of Otago. The SuNDiAL project ran from February and September 2019, however data entered and cleaned before June 2019 was used in this thesis. The current thesis (hereafter referred to as the ‘research project’) adds to the SuNDiAL project by examining the dietary habits of female adolescents in New Zealand. The ‘researcher’ refers to the Master of Dietetics student who conducted this research project. The research project was designed by the principal investigators, Dr Jill Haszard, Dr Meredith Peddie and Assoc Prof Lisa Houghton. The researcher’s primary supervisor was Assoc Prof Rachel Brown. The researcher accepted this project due to a personal interest in dietary habits and its relation to adolescents, particularly females. This project was funded by the University of Otago Human Nutrition Department and began on the 5th September 2018 until June 15th, 2019. Over this period, the researcher and supervisors met regularly, alongside emails and Zoom meetings, to provide counsel, feedback, and to ensure that the research project was progressing and conducted appropriately.

The researcher was responsible for the following tasks as part of the research project:

- Participated in training for data collection, including anthropometric measurements and 24-hour recall training
- Review of the literature on dietary habits of female adolescents
- Participated in formulating and developing the dietary habits questionnaire
- Responsible for the initial contact of one of the high schools into the SuNDiAL project
• Co-ordinated a school visit and liaised with school principals and staff during data collection
• Presented the SuNDiAL project to eligible students and initiated recruitment
• Collected 24-hour recall data, anthropometric data and administered accelerometry equipment alongside another MDiet student for one school in the study
• Responsible for communication with students via email, text and Facetime
• Reported back to the Principal Investigators about how the study was progressing
• Entered data from the 24-hour recalls into a FoodWorks database
• Interpreted, analysed and reported demographic data using Excel
• Interpreted, analysed and reported REDCap data of the Dietary Habits Questionnaire using Excel
• Full thesis write-up, with guidance of Assoc Prof Rachel Brown

The candidate was responsible for re-running the statistical analyses and interpreting and tabling the data. Dr. Haszard provided guidance on how to correctly write up the Statistical Analysis section in the Methods.
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List of Abbreviations


BMI – body mass index

DQI – diet quality indices or indicators

DHQ – dietary habits questionnaire

ID – identification

NZ – New Zealand

NZDep – New Zealand Sociodemographic Deprivation Indices

NZEO – New Zealand European and Others

REDCap - Research Electronic Data Capture

SD – standard deviation

SES – socioeconomic status

SSBs – sugar-sweetened beverages

SuNDiAL – Survey of Nutrition, Dietary Assessment and Lifestyles

WHO – World Health Organisation

1 Introduction

Adolescence is a complex and vulnerable period of life, where significant physical, developmental and social transformations occur (1). With these transitions, changes in dietary habits become apparent. Healthy dietary habits are associated with a reduced risk of undesirable health outcomes such as cardiovascular disease and type 2 diabetes mellitus developing later in life (2). As food behaviour in adolescence can track into adulthood (3), it is important for healthy dietary habits to be developed in adolescence. Several previous surveys have investigated dietary habits in New Zealand. For example, the dietary habits of New Zealanders were analysed in the Adult Nutrition Survey 2008/2009 (ANS 08/09) (4, 5). Although ANS 08/09 did report on those aged 15-18-years, this research did not investigate adolescents in great detail, or females specifically. Overall this study found that female adolescents aged 15 to 18 years had a low intake of red meat, chicken and seafood, as well as a low intake of wholegrain bread compared to the Ministry of Health guidelines. Conversely, they had a high intake of fast food and sugar-sweetened beverages (SSBs). Breakfast consumption increased with increasing age, whereby breakfast consumption was lowest in the younger age groups, especially for females (5). International data from studies and reviews examining adolescent dietary habits found similar results to this, where many female adolescents fell short of meeting the country’s dietary recommendations. This included a low intake of fruit and vegetables and a high intake of SSBs, putting female adolescents at risk of chronic diseases (6-9). The ANS 08/09 data is now 10 years old. Given there are changes in food availability and food trends over time (10), it is important to continue to obtain updated information on dietary habits to understand how the female adolescent population eats, to guide health initiatives.

There are several dietary habits which have received substantial attention in the literature. Specifically, breakfast consumption has been investigated because the progressive complications of skipping breakfast as adolescents can track into young adulthood. Breakfast
plays an important role in growth, energy, cognitive development and academic outcomes (11). Skipping breakfast is associated with negative health outcomes, such as a high BMI, high waist circumference and higher cardiometabolic risk factors (12). This topic is therefore essential to assess at this time due to the evolving complication of obesity, in not only New Zealand, but countries worldwide (13-15).

Socioeconomic status (SES) and how it relates to the way adolescents eat is also an important variable to analyse, as SES has been identified as an explanation for health status, with poor dietary behaviour being linked to negative health outcomes (16, 17). It is reported that more disadvantaged groups have dietary habits that do not comply with food and nutrition guidelines (16-19). This link has not been recently examined in New Zealand research in a group of female adolescents.

The aim of this thesis is to use the dietary habits questionnaire (DHQ) from the Survey of Nutrition, Dietary Assessment and Lifestyle (SuNDiAL) Project, to examine the dietary patterns and habits of female adolescents. Current breakfast consumption, and how SES relates to dietary habits will also be analysed due to the gaps in the literature on these topics.
2 Literature review

2.1 Diet in adolescence

Adolescence is one of the most complex and intensive stages of life. Growth and sexual maturation influence nutritional requirements, and consequently, dietary habits may change to address the nutritional demands of adolescence. This life-stage is also a period where dietary habits may change due to greater independence on food choice (20). The World Health Organisation (WHO) defines adolescence as young people between the ages of 10 and 19 years (21), however throughout this thesis, adolescence refers to the period when young people are aged between 15 to 18 years.

2.1.1 Importance of diet in female adolescence

Adolescence is a period of significant pubertal growth associated with physical, developmental and social changes, which carries an increased demand of energy and micronutrient intake (1). Adolescence is a vulnerable period that can be strongly influenced by macro-environmental characteristics, including socioeconomic status (SES) (22), and micro-environmental characteristics (10), such as family and peer environments (23). Along with increased requirements, it is also a period of time where young people gain autonomy of their dietary habits (20). Healthy dietary habits are associated with more desirable nutrient intake and diet quality, which in turn reduces the risk of undesirable health outcomes such as cardiovascular disease and type 2 diabetes mellitus developing later in life (2). It has been suggested that food behaviour and dietary habits can track into adulthood (3). A prospective cohort study by Mikkila et al followed a total of 1768 children and adolescents aged 3-18 years for 21 years. A principal component analysis was conducted to identify major dietary pattern scores. Of those originally belonging to the uppermost quintile of the two dietary pattern scores identified, 38% and 41% respectively persisted in the same quintile 21 years later (3). This suggests the that food choices and food behaviour are established in childhood or adolescence and can track into adulthood. Therefore, it is important for dietary habits to remain optimal to lead to positive health outcomes.
for the future. Understanding the dietary habits of the population of interest and how diet influences health outcomes is critical to create a framework for public health interventions and education.

2.2 Measuring dietary habits in adolescence

It is important to consider the study group of interest when conducting research on dietary habits. The validity of reported dietary habits among adolescents may be influenced by several factors including sex, age and time frame (24, 25). Misreporting is evident in most studies of this age group, with under-reporting more frequent than over-reporting (24). Particularly, snacking is frequently misreported, with discretionary foods prone to being forgotten (26). The validity and reproducibility of the reported diets is an essential element to ensure that the most accurate data is gathered. It is also important for tools which collect information on dietary habits, such as dietary habit questionnaires, to be frequently updated due to changes in dietary habits and food availability over time (10).

2.2.1 Adolescents as the study population

The age category investigated for this thesis is 15-18 years, capturing the adolescent period. Accurate data is essential for monitoring dietary intake or habits in a population for conducting any research linking diet and health, which in turn can result in identification of priorities for public health interventions. The measurement of dietary data in adolescents, particularly females, can be challenging due to a number of reasons, including the unstructured nature of adolescents’ diets, misreporting and the commonality of dieting. Although more capable than younger children, adolescents are often reported to be neither more interested nor cooperative with regards to food reporting (27). The culture of adolescent dietary habits can be heavily unstructured, due to an increase in autonomy which results in meal skipping, a high intake of energy-dense snack foods and eating outside of home (10, 28). This poses a challenge to collect accurate and reliable self-reported dietary intake among adolescents. The study population of female adolescents is particularly prone to reporting errors (29). Although misreporting occurs
in both directions, under-reporting of energy intake is particularly more prevalent. It is well known that this is associated with the female sex (30), specifically those with a higher BMI (31). Reviews have shown female adolescent under-reporters compared with non-under-reporters showed different meal habits, including fewer meals, less energy per meal and a shorter time span between the first and last meal. It can be speculated that these findings point to specific omissions of sweet and/or snack foods (31). It is well known that female adolescents are often more concerned about their body image than males (32), with dieting due to a fear of overweight and obesity a common theme (33). The media also influences female adolescents’ weight concerns (34). These adolescent-specific challenges must be considered when formulating questionnaires used for measuring dietary habits and collecting and interpreting data.

2.2.2 Approaches to define dietary habits
Dietary habit questionnaires have been used to collect qualitative data on usual dietary patterns in New Zealand (35-37) and around the world, with some specifically examining adolescents (10, 24, 38). Dietary habit questionnaires are frequently used in large population studies, as they are easy to administer, and readily interpretable. Rather than assessing food intake directly, the questionnaires collect data on the frequency of consumption of certain items of food, food preparation, eating patterns, meal skipping and reasons for food choice (39-41). The results of these questionnaires are then compared to dietary guidelines. Compared with quantitative reporting of food intake, dietary habits are perceived to be more accurately documented by participants (39), with a reduced risk of under-reporting. However, it is difficult to quantify dietary habits partially because they often need to be examined collectively rather than in isolation (4). One way to examine dietary habits collectively is to score the overall diet. Dietary Quality Indices or Indicators (DQIs) are algorithms that evaluate the diet and provide a score to show the extent to which the diet is healthy or unhealthy (42). Data from ANS 08/09 were collated into a food-based diet quality index, based on ‘adequacy’ and ‘variety’ of five food
groups reflecting the New Zealand Food and Nutrition Guidelines for Healthy Adolescents. A higher score reflected a better quality of diet, and therefore lower risk of all-cause mortality and disease-specific mortality. It was shown that this score is relatively valid (r= 0.39) and showed good reliability (r=0.65) in ranking diet quality in adolescents at a group level, even in a small sample size. The scores derived from either the food questionnaires and records were comparable and reproducible when repeated within two weeks. (2).

2.2.3 Dietary habits of female adolescents in New Zealand

In New Zealand, dietary habits of female adolescents have been assessed at the population level with the use of nationwide nutrition surveys, such as the 1997 National Nutrition Survey (1997 NNS) and ANS 08/09 (5, 43). This data indicated that female adolescents aged 15 to 18 years had a low intake of red meat, chicken and seafood, as well as a low intake of wholegrain bread compared to the Ministry of Health guidelines. Conversely, adolescents had a high intake of fast food and SSBs. Breakfast consumption was lowest in the younger age groups, especially for females, and increased with increasing age (5). Similar data regarding a high intake of fast food and SSBs and a low intake of breakfast are evident throughout the world, in studies and reviews examining adolescent dietary habits (6-9). A comprehensive review of dietary status of female adolescents in New Zealand has not been undertaken since ANS 08/09. Recent research on current dietary trends in many Western countries suggest that adolescents consume a large amount of energy dense foods that are micronutrient poor, such as SSBs (8-10, 44). It has been reported internationally that females aged 6-18 years tend to have a higher or more frequent intake of fruit and vegetables compared to males (16). Further data on this population is needed to understand if similar patterns are evident among New Zealand adolescents.

A particular concern among adolescents both in New Zealand and worldwide is the evolving complication of obesity. Adolescent patterns have increasingly been associated with obesity in Western countries in recent decades (31). In ANS 08/09, the prevalence of obesity was 13.6% in females aged 15-18 years. This prevalence rate was 1.3 times that reported in 1997 NNS. The
prevalence of overweight or obesity (BMI $\geq 25$ or WHO BMI Z-score equivalent in $<$18 years) in adults aged 15+ years has been reported in recent years by the Ministry of Health in the Annual Data Explorer (45). The Ministry of Health reported that the unadjusted prevalence of overweight or obesity in those aged 15-17 years in 2017/18 was 41.8%, and in 18-24 years was 52.1%. This has increased from 2016/17, where 30.8% of those aged 15-17 years were overweight or obese, and 49.3% of those aged 18-24 years (45). This increase is displayed in further detail in Figure 2.1.
Figure 2.1: Unadjusted prevalence of overweight or obesity in New Zealand1 (45)

1 BMI ≥25, or WHO BMI Z-score equivalent in <18 years
2.2.4 Limitations of assessment of dietary habits
Assessing dietary habits is more difficult than other areas of dietary assessment, specifically due to the differences of defining dietary habits across various studies. Different countries have different nutrition guidelines, which can limit the direct comparison across studies (31). A limitation specific to the study population, adolescents, is that a number of validation studies have shown that adolescents misreport in dietary studies. Therefore, data collected must be interpreted and evaluated with caution (29, 31). As discussed, it is important to frequently update dietary habit questionnaires due to changes in dietary habits over time. This can be a limitation for some dietary habit questionnaires, as they may not be relevant to current dietary trends and food availability. These questionnaires could fail to register habits that have changed over time, often due to sociocultural trends in food availability and nutrition goals (46). The dietary habits questionnaire used in ANS 08/09 had some limitations. For example, there was no section on plant-based proteins, which appears to be a food group of importance with the growing popularity of vegetarianism and plant-based diets (47). There were also no sections on nut consumption and nut butters, and minimal questions regarding processed food, particularly snack foods, which appear to be consumed more often, particularly by adolescents (10). Failing to include these food groups in updated questionnaires means that food groups that could potentially contribute a significant portion of energy, macronutrient, and micronutrient intake would be overlooked.

2.3 Analysing specific dietary habits
A DHQ provides a vast amount of information and detail from numerous topics. Therefore, this thesis will have a particular focus on two main areas; breakfast consumption and how socioeconomic status (SES) influences the dietary habits of this population group.

2.3.1 Breakfast consumption in female adolescents
Investigating the breakfast consumption of female adolescents in New Zealand is a fundamental habit to examine as breakfast plays an important role in growth, energy, cognitive development
and academic outcomes (11). Monitoring this variable in adolescents is important, as regular breakfast consumption in adolescents has been shown to predict consumption into young adulthood (48). Skipping breakfast as an adult was associated with a higher BMI, higher waist circumference and higher cardiometabolic risk factors compared to those who ate breakfast as an adolescent and as an adult (12). The progressive complications of skipping breakfast means it is important to investigate at a young age.

2.3.1.1 Factors influencing breakfast skipping
Several factors have been identified to influence breakfast skipping, including age, sex, parental influence, socioeconomic status, cultural habits, stress and sleep habits (5, 49-51). A higher percent of breakfast skipping is reported among adolescents compared to younger children (52). Breakfast eaters tend to have a higher daily intake of total carbohydrate, total protein, total fat and saturated fat (53-55). Fibre has also been found to be significantly higher in breakfast eaters than breakfast skippers (54, 55), with the consumption of ready-to-eat cereal seeming to contribute to daily fibre intake (56, 57). Breakfast eaters have higher intakes of micronutrients and are more likely to meet nutritional recommendations than those who are not consuming breakfast (58). Nutrients that seem to be of a particular concern to breakfast skippers are vitamin A and C, riboflavin, calcium, iron and zinc (57, 59). Calcium intake is of a particular importance for adolescents, as bone calcium accretion is highest during adolescence, for a healthy bone mass in the future (60). Literature suggests that adolescents who skip breakfast do not make up for the nutrient deficits throughout the day (53). Breakfast consumers have also been shown to make better food choices throughout the day (52), such as consumption of vegetables and milk and fewer SSBs (61). Breakfast skipping also has been associated with increased snacking, in particular, high fat snacks (55).

ANS 08/09 revealed that 44.5% of 15 to 18-year-old New Zealand females ate breakfast daily, with 21% reporting to consuming breakfast 0-2 times per week (5). This is in agreement with data from the Australian Health Survey 2011/12, which found that 39% of Australian young adults reported eating breakfast less than 5 days per week, compared to 10% of children (8-11
years) and 33% of all adults (>18 years) (62). Socioeconomic status (SES) appears to be associated with breakfast eating in New Zealand. Those living in socioeconomically deprived areas were less likely to eat breakfast at home every day compared to those in less deprived areas (5). Additionally, the role of sleep behaviour are reported to have particular influence on the consumption of breakfast. Those who are more evening chronotypes (have greater activity in the evenings) are more likely to be breakfast skippers (63). This suggests that those with an evening chronotype may want to sleep longer or are not yet hungry in the morning. The main reasons reported for not consuming breakfast is a lack of time and not being hungry (64), however, as discussed, there are a multitude of factors influencing the reasoning behind skipping this meal.

2.3.1.2 Relationship between breakfast consumption and weight
Evidence suggests that decreased breakfast consumption has been related to the risk of obesity or a high BMI, however the relationship has not clearly been established (52, 65). Breakfast eaters usually consume more daily calories yet were less likely to be overweight (52). This could be due to breakfast skippers being more inclined to eat late at night, resulting in abnormal metabolism (66, 67). Breakfast skippers may also be more likely to deliberately under-report, due to dieting (68). Those who skip breakfast seem to have lower nutrient intakes, as nutrients missed by skipping breakfast were not compensated for in other meals (53). Usual breakfast consumption (eating breakfast on school days) was associated with a 30% reduced risk of being obese in female adolescents (69). Dieting and weight control behaviours have been inversely associated with the frequency of breakfast consumption, suggesting that the reasoning behind breakfast skipping could be due to weight loss intentions (70). The role of breakfast habits also appears to influence food intake, as those who skipped breakfast consumed more in the early evening than breakfast eaters. Therefore, the timing of food intake and normal breakfast consumption are important factors when examining why breakfast consumption may be associated with BMI (71).
2.3.2 Dietary habits and their relation to socioeconomic status
Socioeconomic position can influence health by many means, throughout the life-cycle, with the
effect of the inequality possibly accumulating over time (72). SES is usually measured by the
level of education, income and occupation of the person (73). SES is a well-established variable
often included in dietary habits studies as an explanation for health status (17), with findings
being consistent throughout the literature (16). This link is also fixed in adolescents, in the sense
that a higher parental SES is positively correlated with a better diet quality in adolescents (74).

2.3.2.1 International data on dietary habits and their relation to socioeconomic status
An important link in the relationship between dietary habits and SES is the resulting health
outcomes from poor dietary behaviour. It seems that more disadvantaged groups have habits that
do not comply with recommended food and nutrition guidelines, which increases the risk for
mortality and morbidity rates for chronic diseases (75-77). In addition, parental education level,
in particular the mothers, showed an impact on adolescents’ health-related dietary habits (16,
78). The association between fruit and vegetable consumption and SES has received particular
attention. There is a fairly consistent pattern showing that adolescents from high socioeconomic
families eat more fruit and vegetables compared to those with a lower socioeconomic position
(16, 18, 19, 77). Family income, parental occupation, and parental education were clearly
associated with low or less frequent consumption of fruit and vegetables (16).

2.3.2.2 New Zealand data on dietary habits and their relation to socioeconomic status
In New Zealand, SES has been examined by Sociodemographic Deprivation Indexes (NZDep).
NZDep provides a score of deprivation of each geographical meshblock in New Zealand. A
meshblock could be the size of a city block or large area of rural land. The scores are then
matched to those whose meshblock of usual residence can be ascribed, using census information
and dwelling forms from private dwellings (79). This measure can be a good indication of SES;
however, location of residence is the only thing that is considered in this measure. Therefore, a
limitation of this measure is that someone living in an area with low rates of deprivation,
therefore a generally high-income area, could in fact have a low income, indicating that the
NZDep score is not reflective of their situation. Despite this, it is an inexpensive measure, using data that has already been provided to the New Zealand government, that is reasonably reliable and therefore is a suitable measure to use. Data from the ANS 08/09 was analysed in relation to the different degrees of deprivation using the NZDep2006 index. The results suggested that SES influences dietary habits, as data from each quintile was variable, with a general trend of increasing degrees of deprivation being related to unhealthy dietary habits, i.e., the more deprived you are, the poorer your dietary habits. With increasing degrees of deprivation, consumption of breakfast, fruit and vegetables and light or heavy grain bread consumption decreased, while consumption of fast food and soft drinks or energy drinks increased (5). For example, vegetable consumption of three or more servings per day (the recommended daily intake) in the least deprived group of females in ANS 08/09 was 82.2%, compared to 62.4% in the most deprived group. Conversely, consumption of fast food or takeaways three or more times per week in the least deprived group of females was 2.5%, compared to 8.1% in the most deprived group. Similar patterns can be seen in SSB consumption, with 13.9% of least deprived females in New Zealand reporting consuming soft drink or energy drinks three or more times per week, compared to 24.8% of the most deprived females in ANS 08/09 (5).

2.4 Conclusion
This literature review demonstrates that the dietary habits of female adolescents are influenced by a variety of factors and can vary from person to person. Diet is particularly important for this sex and age group, due to the period of rapid growth with increasing nutritional requirements, hence influencing dietary habits. It can also be a time period of increased autonomy over food intake. Dietary habits may track into adulthood; therefore, it is important for dietary habits to remain optimal at an early age, leading to positive health outcomes for the future of the adolescent. Measuring dietary habits can be difficult due to a number of reasons, including misreporting. Thus, it is important that tools assessing dietary habits, such as dietary habit questionnaires, are continually updated for accuracy.
There are many dietary habits that are of particular interest regarding female adolescents. The aim of this thesis was to address some of the gaps in the dietary habit literature. Particularly addressed in this thesis is breakfast consumption, and dietary habits and their relation to socioeconomic status. Dietary habits among female adolescents represent an important public health issue due to the long-term effects on health and dietary behaviour. Knowledge of this topic related to females and adolescents may provide good basis for future recommendations.
3 Objective Statement

The aim of the study is to examine the dietary habits of New Zealand adolescent females aged 15-18 years, using a dietary habit questionnaire specific to the population group. Specifically, this thesis will focus on breakfast habits and socioeconomic status.

4 Methods

4.1 Study Design

This thesis uses data collected from the Survey of Nutrition, Dietary Assessment and Lifestyles (SuNDiAL) Project. This observational, cross-sectional survey was based on female adolescents aged 15-18 years. The project was conducted across fourteen secondary schools distributed throughout New Zealand between February and September 2019. However, this thesis only includes data collected, entered and cleaned before June 2019, which covered eight secondary schools. Data were collected on a number of different topics regarding nutrition and lifestyles of the study population; however, this thesis only includes data regarding dietary habits. This data was collected from a dietary habits questionnaire (DHQ) which was completed online by participants using REDCap (Research Electronic Data Capture) software (Vanderbilt University, USA). This study was approved by the University of Otago Human Ethics Committee (Health): H19/004, and is registered with the Australian New Zealand Clinical Trials Registry: ACTRN12619000290190 (Appendix A). Māori consultation was undertaken (Appendix B).

4.2 Participants and Recruitment

The participants were recruited from the secondary school that they attended. Secondary schools were selected to be invited to participate based on their location (limited to accessible schools regarding location for data collectors), decile (to ensure good representation) and female roll number (a preference for schools with higher rolls). Interested schools were provided with information about the project via email (Appendix C). This included what the survey was about,
what was involved, benefits for the school, and included the SuNDiAL Project website link (Appendix D) for further information.

Females aged between 15 and 18 years, who were enrolled in one of the recruited secondary schools, and who spoke and understood English, and were able to complete the required online questionnaires were eligible to participate. Participants who self-identified as female were eligible. Participants were asked not to participate in the study if they knew that they were pregnant.

Master of Dietetic students (the data collectors) visited participating schools early in the 2019 academic year to initiate recruitment of students within the school. A presentation regarding the study was provided to students at each school. The presentations were either in a school assembly or provided to individual classes. Individuals interested in taking part in the study were invited to sign up via email. An ID number was assigned to each participant. The participant received a link to a REDCap questionnaire, where they completed online consent. Where a participant was 15 years of age, they were asked to provide the email address of a parent/guardian, who provided online consent for the participant to take part in the study.

The decile of the secondary school that the participant attended was used as a proxy for SES. A school’s decile in New Zealand measures the extent to which the school’s students live in low socioeconomic or poorer communities. Decile 1 schools are the 10% of schools with students from low socioeconomic communities, and decile 10 represents the 10% of schools with the lowest proportion of students from these communities. The decile ratings are based on Census data for households with school-aged children in each school’s zone. The data incorporates household income, employed parents and their occupations, the percentage of parents with no tertiary or school qualifications, if the parents are receiving a benefit, and household crowding. Deciles are recalculated every five years, after each Census (80). As the SES of the adolescent is directly correlated to parental SES (74), it can be assumed that living with their parents/caregivers in a lower SES area results in being in zone for lower decile schools, which the adolescent may attend, hence, the decile of the attending school can be related to the SES of the adolescent.
Although school deciles indicate the extent the school draws from low SES communities (80), it is a broad measure of relative poverty and does not represent the nature of the whole school intake. Caution in the interpretation of this data is needed, as cluster analysis was not used to analyse the decile data. A better measure of SES would be using NZDep data, providing a deprivation score of each geographical meshblock in New Zealand (79), however due to the constraints of this project, secondary school decile was used as a substitution.

4.3 Data Collection
Data collection for the project began with the participants having the opportunity to complete three online questionnaires in their own time. These questionnaires included the demographics questionnaire (Appendix E), the DHQ (Appendix F) and the attitudes and motivations questionnaire, administered in REDCap, a web application used for building and managing online surveys. Data collection was completed in schools over the time period of 6th March 2019- 5th April 2019. Data was collected in the school sick bay or a private room within the school. Students were staggered to ensure that each individual was able to have a private session with a data collector, either in school time or during their study period or lunch time. The session began with anthropometry measurements: height, weight and ulna length. More detail on anthropometric measurements can be found in Section 0. Dietary intakes were recorded with a detailed 24-hour dietary recall. If the participants had consented to accelerometry, it was usually administered in this session. Blood and urine collection for those who consented was on a separate day with a phlebotomist. A second 24-hour dietary recall was performed preferably on a weekend, approximately one week after the first recall.

Participants received a $5 supermarket voucher for every stage of the study that was completed, with a possibility of receiving a maximum $35 voucher as a recompense for the time they invested to be a part of the study. The school was given a personalised report of their school results from the fields that were investigated.
Due to the aims of this thesis, this research project will only focus on the dietary habits of the population. This research project focuses on information from measurements bolded in
Table 4.1. The following parts of the methods section will describe further details into the measurement tools used in this thesis. The process on data collection is included in Figure 4.1.
<table>
<thead>
<tr>
<th>Measurement tools used in data collection</th>
<th>Information used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, vegetarianism and health questionnaire</td>
<td>Demographics</td>
</tr>
<tr>
<td>Dietary habits questionnaire</td>
<td>Main source of information for this thesis</td>
</tr>
<tr>
<td>Attitudes and motivations to food choice questionnaire</td>
<td></td>
</tr>
<tr>
<td>Anthropometry data</td>
<td>Height and weight for baseline data</td>
</tr>
<tr>
<td>First 24-hour dietary recall</td>
<td></td>
</tr>
<tr>
<td>Biological specimens (blood, urine)</td>
<td></td>
</tr>
<tr>
<td>24-hour activity (accelerometry)</td>
<td></td>
</tr>
<tr>
<td>Second 24-hour dietary recall</td>
<td></td>
</tr>
</tbody>
</table>
Contact school via email or school visit to recruit into SuNDiAL Project

Principal/teacher visit to answer questions and finalise dates

Present to school students and encourage them to register. Consent questionnaire sent via email

- Data collection
  - Consent given
  - REDCap questionnaires completed online in own time
    - 24 hour dietary recalls during school time
    - Anthropometric measurements collected

Complete second 24 hour recall during a weekend close to initial collection or out of school time via phone or Zoom

Finish data collection

*Figure 4.1: Process of data collection*
4.3.1 Demographics, vegetarianism and health questionnaire

This questionnaire included a range of questions regarding demographics, vegetarianism, and health. It was administered after participants signed up using an online email link. This questionnaire was also used as a system of enrolment into the study. This used the same portal for participants to consent to the study as a whole, and to consent to blood collection, urine collection and accelerometry use. The participants were required to complete the online questionnaire in their own time. The questionnaire was administered on the online application REDCap. Contact information was collected, including age, contact details and ethnicity. Prioritised ethnicity was used as categorised in Table 4.2. Prioritised ethnic groups involve each person being allocated to a single ethnic group for analysis. The order of priority is as follows: Māori, Pacific, Asian, New Zealand European and Others (81). Health information was collected regarding the participants self-reported height and weight, health conditions, food allergies/intolerances, menstruation, blood loss and contraceptive use. There were four questions asking if the participants followed a vegetarian and vegan diet.

Table 4.2: Prioritised ethnicity categories

<table>
<thead>
<tr>
<th>Ethnicity category</th>
<th>Ethnicities within this category</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZEO (New Zealand European and Others)</td>
<td>New Zealand European, Ethiopian, Somali, Italian, American, Nicaraguan, Irish, Afrikaans, Dutch, German, South African</td>
</tr>
<tr>
<td>Māori</td>
<td>Māori</td>
</tr>
<tr>
<td>Pacific</td>
<td>Tokelau, Fijian, Cook Island, Samoan</td>
</tr>
<tr>
<td>Asian</td>
<td>Filipino, Japanese, Indian</td>
</tr>
</tbody>
</table>
4.3.2 Anthropometry
The anthropometric data collected that was used in this thesis was height and weight. These measurements were usually conducted during the same time slot as the first 24-hour dietary recall and were therefore not performed in the fasting condition. Height was measured to the nearest 0.1cm, with different centres using one of two portable stadiometers (seca 213, Hamburg, Germany; Wedderburn, Sydney, Australia). Weight was measured to the nearest 0.1 kg and was measured using one of four types of scales used in research centres (Medisana, PS 420, Neuss, Germany; Salter, 9037 BK3R, Kent, United Kingdom; seca, Alpha 770, Hamburg, Germany; Soehnle, Style Sense Comfort 400, Backnang, Germany) on a non-carpeted floor. Participants were asked to remove shoes and socks for both height and weight measurements. All measures were repeated twice. If the two measurements for each were not within 0.5 of their respective units, a third recording was required. The average was then taken of the measurements that were within 0.5. Equipment used for each participant was the same within each secondary school, however equipment was different across the different secondary schools. Quality control was conducted for this stage of data collection. The data collectors were involved in a three-day training session on anthropometry, reiterating the importance of accurate data collection.

4.3.3 Dietary habits questionnaire
4.3.3.1 Development and administration of the questionnaire
The DHQ was designed to collect information on eating habits and dietary behaviours associated with diet quality and nutrition-related health status. The questionnaire was based on the questionnaire used in the ANS 08/09 (35). This questionnaire was sourced from 1997 NNS (43), and questions in overseas studies, including the NHANES Diet and Behaviour Questionnaire (82), the National Diet Nutrition Survey (UK) Survey Habits Questionnaire (83), the Australian 1995 National Nutrition Survey food related questions (84), and the Australian Food and Nutrition Monitoring Unit short dietary questions (85, 86). The questionnaire was designed to include a time period which provided a good reflection of participants’ usual dietary habits, without being
too difficult to recall. Modifications were made to make the questionnaire more suitable for New Zealand female adolescents, and to update the questionnaire based on current food trends and availability. The questionnaire was also updated to capture food consumed by vegetarians, as this was one of the objectives of the larger study. These changes included the incorporation of questions on nut and legume consumption, vegetarian-specific products, and further detail added to questions surrounding snacking and SSBs.

Dietary habits were assessed via a questionnaire administered in REDCap. The online questionnaire was available for participants to complete in their own time after they had consented. The process took approximately 20-30 minutes. Fourteen food-based topics were included in the DHQ, with each section containing specific questions to that topic. Participants answered the questions by clicking on the response that most accurately represented their dietary habits. For example, the options for frequency of vegetable consumption were “Never I don’t eat vegetables; Less than one serving a week; 1 serving a week; 2-4 servings a week; 5-6 servings a week; 1 serving a day; 2 servings a day, 3 servings a day, More than 3 servings a day”. There were six questions on the type of milk, spreads or oils and bread consumed most often. Towards the end of the survey there was a section on supplements, where the participants could include more information on their possible supplement use. Participants were able to give further details about any aspect at the end of the questionnaire. Further details on the DHQ can be found in Appendix F.

4.4 Data Entry

The questionnaires were completed in the participants own time on their own devices, at home or school. Data from all online questionnaires were collected and managed using REDCap electronic data capture tools. REDCap is a secure, web-based application designed to support data capture for research studies. The REDCap software and results were managed by a group of research assistants. Due to the questionnaires being administered in the REDCap software, no data cleaning was required.
4.5 Statistical Analysis

The descriptive statistical analysis of the data was performed using Microsoft Excel, version 16.24 (19041401). Demographic statistics for participants, including descriptive analysis of age, ethnicity, BMI-for-age Z-score, BMI category and school decile were calculated using Microsoft Excel. Ethnicity was categorised into four groups. ‘Māori’, ‘Pacific Island’, ‘Asian’, ‘New Zealand European and Other’ (NZEO) using prioritised ethnicity as previously described in Section 4.3.1. New Zealand European (NZEO) included those who identified as New Zealand European, as well as other ethnicities that were too small for individual analysis. Body Mass Index (BMI) was calculated using the WHO BMI-for-age Z-score classification system (87). This system expresses the anthropometric value as a number of standard deviations or Z-scores below or above the median or mean value. The formula for calculating the BMI-for-age Z-score is: Z-score (or SD-score) = (observed value - median value of the reference population) / standard deviation value of reference population (87). The interpretation of cut-offs for 5-19 years according to WHO are thinness ≤-2SD, normal weight ≥-2 to 1SD, overweight >+1 to ≤2SD, which is equivalent to a BMI of 25kg/m² at 19 years, and obesity >+2SD, which is equivalent to 30kg/m² at 19 years (88). Deciles were categorised into low (1-3 rating), medium (4-7 rating) and high (8-10 rating) deciles. Figures and tables were calculated and created from spreadsheets created by the candidate, using pivot tables in Microsoft Excel. In questions in the DHQ where there were numerous answer options, some responses were grouped together for visual simplicity in the tables and figures. For example, for frequency of fruit consumption, ‘2 servings a day’; ‘3 servings a day’ and ‘More than 3 servings a day’ were grouped together. This is because the Ministry of Health guidelines recommend 2+ servings of fruit per day (89), therefore these answers were grouped together as it would demonstrate the participant was consuming the recommended intake per day. Snacking frequency questions were grouped together and separated into subgroups of discretionary foods. These groups are as follows; confectionery (lollies, sweets, chocolate, confectionery), sweet snacks (biscuits, cakes, slices,
muffins, sweet pastries, muesli bars), and savoury snacks (crisps, crackers).
5 Results

5.1 Participant demographics

Ninety-seven New Zealand secondary schools were eligible to take part in the SuNDiAL Project, of which 25 schools were selected for invitation, and were invited via email. Of the secondary schools invited, three schools declined, 12 schools did not respond, and two schools accepted but had no further response. Three convenient schools were contacted and chosen to be invited in person due to some of the selected schools declining. Finally, eight schools consented and were chosen for the study (Figure 5.1). Overall, 1882 students were eligible to participate. 806 students were present at the recruitment drives, which were either at an assembly or in private classrooms. A total of 263 students enrolled, of which 154 students completed consent. The remaining 109 students were eligible but did not complete enrolment.

As of 29th April 2019 (the cut-off point for this thesis), data from 145 participants had been collected, entered and cleaned. Of the 154 students who completed consent, 144 students completed the demographics, vegetarianism and health questionnaire, and 124 completed the DHQ (Figure 5.2).

The average age was 16.7 years (Table 5.). The majority of participants were New Zealand European or Other ethnicity (72.2%), with 20.1% identifying as Māori, 4.2% as Asian, and 3.5% as Pacific Islander. When compared to the New Zealand population, this sample had a lower proportion of Asian and Pacific Islanders (vs 11.8% and 7.4%, respectively), and a higher proportion of Māori (vs 14.9%) (90). The BMI-for-age Z-scores indicated that 35.1% of the sample was overweight or obese (n=46). The average decile of the participating secondary schools was 6 and ranged from 3 to 10. The participating secondary schools and their corresponding Ministry funding deciles, as of 2019, are listed in Table 5.1: Baseline participant demographic characteristics.

<table>
<thead>
<tr>
<th>Participant characteristic</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD) (n= 145)</td>
<td>16.7 (0.8)</td>
</tr>
<tr>
<td>15 years [n (%)]</td>
<td>15 (10.3)</td>
</tr>
<tr>
<td>16 years [n (%)]</td>
<td>42 (29.0)</td>
</tr>
<tr>
<td>17 years [n (%)]</td>
<td>61 (42.1)</td>
</tr>
<tr>
<td>18 years [n (%)]</td>
<td>27 (18.6)</td>
</tr>
<tr>
<td>Sex [n (%)]</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>145 (100.0)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>$n$</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>New Zealand European and others</td>
<td>104</td>
</tr>
<tr>
<td>Māori</td>
<td>29</td>
</tr>
<tr>
<td>Asian</td>
<td>6</td>
</tr>
<tr>
<td>Pacific</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overweight $[n (%)]$ ($n=130$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
</tr>
<tr>
<td>Normal range</td>
</tr>
<tr>
<td>Overweight</td>
</tr>
<tr>
<td>Obese</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Decile level of school attended $[n (%)]$ ($n=145$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (1-3)</td>
</tr>
<tr>
<td>Medium (4-7)</td>
</tr>
<tr>
<td>High (8-10)</td>
</tr>
</tbody>
</table>
Table 5.
Table 5.1: Baseline participant demographic characteristics

<table>
<thead>
<tr>
<th>Participant characteristic</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD) ((n=145))</td>
<td>16.7 (0.8)</td>
</tr>
<tr>
<td>15 years ([n (%)])</td>
<td>15 (10.3)</td>
</tr>
<tr>
<td>16 years ([n (%)])</td>
<td>42 (29.0)</td>
</tr>
<tr>
<td>17 years ([n (%)])</td>
<td>61 (42.1)</td>
</tr>
<tr>
<td>18 years ([n (%)])</td>
<td>27 (18.6)</td>
</tr>
<tr>
<td>Sex ([n (%)])</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>145 (100.0)</td>
</tr>
<tr>
<td>Ethnicity ([n (%)]) ((n=144))</td>
<td></td>
</tr>
<tr>
<td>New Zealand European and others</td>
<td>104 (72.2)</td>
</tr>
<tr>
<td>Māori</td>
<td>29 (20.1)</td>
</tr>
<tr>
<td>Asian</td>
<td>6 (4.2)</td>
</tr>
<tr>
<td>Pacific</td>
<td>5 (3.5)</td>
</tr>
<tr>
<td>Overweight ([n (%)]) ((n=130))</td>
<td></td>
</tr>
<tr>
<td>Underweight(^1)</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>Normal range(^2)</td>
<td>84 (64.6)</td>
</tr>
<tr>
<td>Overweight(^3)</td>
<td>33 (25.4)</td>
</tr>
<tr>
<td>Obese(^4)</td>
<td>12 (9.2)</td>
</tr>
<tr>
<td>Decile level of school attended ([n (%)]) ((n=145))</td>
<td></td>
</tr>
<tr>
<td>Low (1-3)</td>
<td>14 (9.7)</td>
</tr>
<tr>
<td>Medium (4-7)</td>
<td>85 (58.6)</td>
</tr>
<tr>
<td>High (8-10)</td>
<td>46 (31.7)</td>
</tr>
</tbody>
</table>

\(^1\) WHO cut-off score \(<-2\)

\(^2\) WHO cut-off z-score: \(\geq-2\) to 1

\(^3\) WHO cut-off z-score: 1 to \(\leq2\)

\(^4\) WHO cut-off z-score: \(>2\)

\(^5\) Ratings given to schools in New Zealand to determine government funding; deciles range from 1 (low) to high (10). The lower the decile, the more funding received.
<table>
<thead>
<tr>
<th>Secondary School</th>
<th>Decile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tauraroa Area School (Whangarei)</td>
<td>6</td>
</tr>
<tr>
<td>Mt. Maunganui College (Tauranga)</td>
<td>6</td>
</tr>
<tr>
<td>Spotswood College (New Plymouth)</td>
<td>5</td>
</tr>
<tr>
<td>St. Catherine’s College (Wellington)</td>
<td>6</td>
</tr>
<tr>
<td>Waimea College (Nelson)</td>
<td>8</td>
</tr>
<tr>
<td>Hornby High School (Christchurch)</td>
<td>3</td>
</tr>
<tr>
<td>Columba College (Dunedin)</td>
<td>10</td>
</tr>
<tr>
<td>Kaikorai Valley College (Dunedin)</td>
<td>5</td>
</tr>
</tbody>
</table>
Figure 5.1: Recruitment of schools into the SuNDiAL Project
Figure 5.2: Recruitment of participants into the SuNDiAL Project
5.2 Overview of dietary habits

The intake frequency of certain food groups and habits are displayed in Figure 5.3. Breakfast was consumed everyday by 42% of participants. Fruit was consumed everyday by 71% of participants, with 62% of participants consuming two or more servings per day. Vegetables were consumed everyday by 76% of participants, with 41% consuming three or more servings of vegetables per day. Sugar-sweetened beverages (SSBs) were consumed never or rarely by 60% of participants. Only 1% of participants reported consuming SSBs once a day or more. Nine percent of participants reported that they never consumed fast food, while 50% reported consuming fast food rarely or monthly, and 17% reported consuming it once per week. Snacking frequency was varied, with 14.0% reporting never/rarely consuming these foods, 25.0% reported consuming the listed snacks 1-3 times per month, and 26.0% reporting to consume these snacks 2-4 times per week. When separated by questions into the following three subgroups (Figure 5.4); confectionery, sweet snacks and savoury snacks; the results were similar to the overall snacking frequency figure. Confectionery was consumed less commonly than sweet snacks or savoury snacks, with 18.0% reporting consuming confectionery never or rarely, and 34.0% reported consuming the food group 1-3 times per month. Thirteen percent of participants reported never or rarely consuming sweet snacks and 10.0% of participants reported never or rarely consuming savoury snacks.

Further information on the varieties of common foods consumed are shown in Table 5.1. The majority of participants consumed bread (99.2%). Light grain bread was most commonly consumed (27.4%), with a similar proportion of participants consuming wholemeal (22.6%), white bread (21.8%) and heavy grain bread (18.5%). Cow’s milk was consumed most commonly (76.9%), with 22.3% consuming plant-based milks. Of those who consumed cow’s milk, 53.3% reported to consume whole or standard milk, 27.8% reported to consume reduced fat milk, 10.0% reported to consume skim or trim milk, and 8.9% reported to consume ‘other’ milks. Other milks reported included flavoured milk, A2 milk, raw milk and lactose free milk. Margarine was the most commonly used spread (41.3%), followed by butter (35.7%). The most...
commonly used fat or oil was vegetable oil (e.g. olive, canola, etc.) (73.0%). The second most commonly used fat was coconut (13.5%).

Red meat was the most commonly consumed meat or meat alternative, with 23.3% of participants consuming red meat once a day or more. This did not include processed meat, but included beef, lamb and venison. Processed meat was consumed 9.6% of participants once a day or more, and 2-6 times a week by 45.6% of participants. Poultry, including chicken, was consumed 2-4 times a week by 42.4% of participants, and 1-4 times a month by 25.6% of participants. Only 5.6% reported to eat poultry once a day or more. Fish and seafood were rarely eaten (38.4% and 76.0% reported to eat it never or rarely respectively). Legumes were consumed 1-3 times a month by 35.2% of participants, and never/rarely by 34.4% of participants (**Table 5.2**).
Figure 5.3: Intake frequency (%) of certain food groups, products and habits:

1 Vegetable consumption $n = 125$; Fruit consumption $n = 128$; Breakfast consumption $n = 125$; Snacking frequency (included discretionary snack foods) $n = 125$; Fast food consumption $n = 125$; Sugar-sweetened beverage consumption $n = 125$
The types of foods within these groups are as follows:
Confectionery: lollies, sweets, chocolate and confectionery
Sweet snacks: biscuits, cakes, slices, muffins, sweet pastries, muesli bars
Savoury snacks: chips (crisps), crackers

Confectionery: \( n = 125 \); Sweet snacks: \( n = 125 \); Savoury snacks: \( n = 125 \)
Table 5.1 Food types most commonly consumed by participants

<table>
<thead>
<tr>
<th>Food item</th>
<th>Percentage of participants (n = 144)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of bread</strong></td>
<td>(n=124)</td>
</tr>
<tr>
<td>None</td>
<td>0.8</td>
</tr>
<tr>
<td>White</td>
<td>21.8</td>
</tr>
<tr>
<td>Wholemeal (brown colour)</td>
<td>22.6</td>
</tr>
<tr>
<td>Light grain</td>
<td>27.4</td>
</tr>
<tr>
<td>Heavy grain</td>
<td>18.5</td>
</tr>
<tr>
<td>Other</td>
<td>8.9</td>
</tr>
<tr>
<td><strong>Type of milk</strong></td>
<td>(n=121)</td>
</tr>
<tr>
<td>None</td>
<td>0.8</td>
</tr>
<tr>
<td>Cow’s milk</td>
<td>76.9</td>
</tr>
<tr>
<td>Plant-based milk</td>
<td>22.3</td>
</tr>
<tr>
<td>Other</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Type of spread</strong></td>
<td>(n=126)</td>
</tr>
<tr>
<td>None</td>
<td>9.5</td>
</tr>
<tr>
<td>Butter</td>
<td>35.7</td>
</tr>
<tr>
<td>Margarine</td>
<td>41.3</td>
</tr>
<tr>
<td>Other</td>
<td>11.9</td>
</tr>
<tr>
<td>I don’t know</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Type of fat or oil</strong></td>
<td>(n=126)</td>
</tr>
<tr>
<td>None</td>
<td>0.8</td>
</tr>
<tr>
<td>Butter</td>
<td>7.9</td>
</tr>
<tr>
<td>Coconut oil</td>
<td>13.5</td>
</tr>
<tr>
<td>Margarine</td>
<td>0.8</td>
</tr>
<tr>
<td>Oil (e.g. Olive, Canola)</td>
<td>73.0</td>
</tr>
<tr>
<td>Dripping or Lard</td>
<td>0.8</td>
</tr>
<tr>
<td>I don’t know</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Table 5.2: Meat and meat alternatives types most commonly consumed by participants

<table>
<thead>
<tr>
<th>Food item</th>
<th>Percentage of participants (%) (n = 125)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Egg</strong></td>
<td></td>
</tr>
<tr>
<td>Once a day or more</td>
<td>7.2</td>
</tr>
<tr>
<td>5-6 times a week</td>
<td>4.8</td>
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<td>2-4 times a week</td>
<td>25.6</td>
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<td>1-4 times a month</td>
<td>45.6</td>
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<td>Never/rarely</td>
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<td><strong>Processed meat</strong></td>
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<tr>
<td>Once a day or more</td>
<td>9.6</td>
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<td>5-6 times a week</td>
<td>11.2</td>
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<td>2-4 times a week</td>
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<td>1-4 times a month</td>
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<td>Never/Rarely</td>
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<tr>
<td><strong>Red meat</strong></td>
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<td>Once a day or more</td>
<td>23.2</td>
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<td>5-6 times a week</td>
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<td>1-4 times a month</td>
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<td>Never/rarely</td>
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<td><strong>Pork</strong></td>
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<td>Once a day or more</td>
<td>0.8</td>
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<td>5-6 times a week</td>
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<td>2-4 times a week</td>
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<td>1-4 times a month</td>
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<td>Never/Rarely</td>
<td>38.4</td>
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<td>Poultry</td>
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<td><strong>Once a day or more</strong></td>
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<td><strong>Never/Rarely</strong></td>
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</table>
5.3 Breakfast consumption

Figure 5.5 shows the percentage of participants who regularly consumed breakfast i.e. ≥5 times a week, by age, ethnicity, and weight classification. Breakfast was consumed ≥5 times a week by 67% of 15-year-olds, 52% of 16-year-olds, 48% of 17-year-olds, and 65% of 18-year-olds. Thirty-four percent of Māori participants consumed breakfast ≥5 times a week, compared to 60% of NZEO participants, 80% of Pacific participants, and 83% of Asian participants. Sixty percent of those who were not overweight/obese reported consuming breakfast ≥5 times a week, compared to 48% of overweight and obese participants. Thirty-six percent of low decile participants reported to never/rarely consume breakfast, versus 8.9% of high decile participants. Forty-seven percent of high decile participants reported consuming breakfast daily, compared to 7.1% of low decile participants. However, 21.4% of low decile participants reported consuming breakfast six times a week (8.9% of high decile participants reported this) (Figure 5.6).
Figure 5.5: Percentage of participants in subgroups consuming breakfast ≥5 times a week by age, ethnicity and weight category.

1 15-year-olds n = 15; 16-year-olds n= 42;17-year-olds n= 61; 18-year-olds n=27

Asian n= 6, Māori n = 29; NZEO n = 104; Pacific n = 5

Not overweight n= 85; Overweight and obese n= 46
Figure 5.6: Frequency of breakfast consumption by socioeconomic status (decile)\(^1\)

\(^1\) Low decile \(n= 14\), Medium decile \(n= 85\), High decile \(n= 46\)
5.4 Socioeconomic status

Food habits and food consumption was analysed by decile. Given the low number of participants in the low decile group, comparisons should be interpreted with caution. Overall, there was evidence of a pattern of healthier habits or foods being consumed by participants from higher decile schools. Those from lower decile schools showed a pattern of an increased consumption of fast food and SSBs, and a lower consumption of fruit, vegetables and light/heavy grain bread compared to those in higher deciles. The results from the medium decile participants sat mostly in the middle of the low and high decile participants.

Fruit consumption in relation to decile is shown in Figure 5.7. Eighteen percent of low decile participants reported to never/rarely consume fruit, compared to 8.0% of medium decile participants and 0.0% of participants in high decile schools. In addition, 36.4% of low decile participants reported consuming two or more servings of fruit a day, compared to 56.0% of medium decile participants and 81.0% of participants from high decile schools. Regarding vegetable consumption, 9.1% those from low decile schools reported to never/rarely consume vegetables compared to 0.0% of both medium and high decile participants. In total, 27.3% of low decile participants reported consuming three or more servings of vegetables per day, compared to 38.7% of medium decile participants and 48.8% of high decile participants (Figure 5.8).

Heavy/light grain bread was consumed most of the time by 59.0% of high decile participants compared to 50.0% in low decile participants. Conversely, white bread was consumed most of the time by 30% in low decile participants and 17.9% in high decile participants (Figure 5.9). Fast food was never consumed by 0.0% of low decile participants compared to 8.8% of medium decile and 11.3% of high decile participants. Forty-six percent of low decile participants consumed fast food once a week or more compared to 22.5% of high decile participants (Figure 5.10). Fifty-nine percent of low decile participants reported never/rarely consuming SSBs, compared to 73.0% of medium participants and 68.8% of high decile participants. Eighteen percent of low decile participants
reported consuming SSBs 5-6 times per week, compared to 1.3% of high decile participants (Figure 5.11).
Figure 5.7: Fruit consumption by socioeconomic status (decile):

1 Low decile $n=11$, Medium decile $n=75$, High decile $n=42$
Figure 5.8: Vegetable consumption by socioeconomic status (decile)

1 Low decile n = 11, Medium decile n = 75, High decile n = 41
Figure 5.9: Bread type most commonly consumed by socioeconomic status (decile):

1 Low decile $n= 10$; Medium decile $n= 74$; High decile $n= 39$
Figure 5.10: Fast food consumption by socioeconomic status (decile):

1 Low decile n= 11; Medium decile n= 74; High decile n= 40
Figure 5.11: Sugar-sweetened beverage consumption by socioeconomic status (decile)

1 Low decile n = 11; Medium decile n = 74; High decile n = 40
6 Discussion and Conclusion

The present thesis provides an overview of dietary habits in female adolescents in New Zealand. In particular, breakfast consumption habits, and how using decile of the attending secondary school as a proxy of SES may influence dietary habits in this population group were examined. Breakfast consumption was regular, among most participants, with interesting differences in consumption within age, ethnicity and weight status categories. There were also some important differences by SES that warrant further investigation. This population group had a low frequency of breakfast, vegetables and fish compared to the Ministry of Health Food and Nutrition recommendations (89). Participants consumed a moderate intake of fruit, and a high intake of red meat. This data provides a valuable baseline for exploring dietary habits of adolescents in New Zealand. Data from this thesis should be interpreted with caution due to the small sample sizes for specific subgroups, such as ethnicity and school decile (as a proxy for SES). The size of the subgroups influences the precision of the estimates and the ability to draw firm conclusions (92). However, they provide interesting findings that need to be replicated in larger studies.

6.1 Overview of dietary habits and food groups

Fruit consumption (62.2% reported consuming two or more servings per day) was similar to that reported in ANS 08/09, which reported that 65.0% of females aged 15-18 years consumed two or more servings of fruit per day (5). Conversely, vegetable consumption was reasonably low when compared to the Ministry of Health guidelines, with 41% reporting consuming three or more servings of vegetables per day. This was lower than reported in ANS 08/09, where 61.5% of females aged 15-18 years reported consuming three or more servings per day (5). In the current study, 33.0% reported consuming SSBs two or more times per week, compared to 39.6% of females 15-18 years in ANS 08/09 (5). The reasoning behind the lower intake of SSBs in the present survey is unclear, but could be due to the success of public health interventions aimed at reducing the consumption of these
beverages, especially in schools (93-95). The DHQ in the present study and in ANS 08/09 did not specify serving size of SSBs, and thus it is possible that frequency of consumption may appear lower, but the amount consumed may be higher, given research suggesting portion size has increased over time (96). The differences of use of ‘times per week’ (used in the current study) and ‘days per week’ (ANS 08/09) could also mean that those from ANS 08/09 were consuming more SSBs within a day. Therefore, these comparisons must be interpreted with caution. Equally, participants in the present study may have under-reported, although it is unclear why under-reporting would be higher compared to similar studies in this age group (24, 30). Cows’ milk was the most commonly consumed (76.9%) milk type. Of those who consumed cows’ milk, whole or standard milk was most commonly consumed (53.3%), which is similar to ANS 08/09 (51.1%) (5). Twenty-two percent of participants in the current study reported to consume plant-based milks most of the time. It appears that the consumption of plant-based milks has increased over time (97). In ANS 08/09 soy milk was the only plant-based milk option in the DHQ, reflecting the limited availability of other plant-based milks, and only 3.9% of those aged 15-18 years reported consuming this milk type (5). Not all plant-based milks are fortified with nutrients such as calcium (97). Consumption of non-fortified milks may negatively influence nutrient adequacy (97), and so future research should investigate the percentage of adolescents consuming these unfortified milks, and the influence of diet. In ANS 08/09, coconut oil was not listed as a category of choice, reflecting its low availability and consumption at this time. In the current study, 13.5% reported to use it as their main source of fat or oil. Therefore, it appears that consumption of coconut oil has increased considerably since ANS 08/09, which is of concern (5). Coconut oil has been heavily marketed in recent years as a healthful option (98). This marketing is not supported by recent research which shows increases in LDL-C with regular coconut oil consumption compared to cis-unsaturated fats (99). Coconut oil is not recommended as a heart healthy oil by the Heart Foundation of NZ (100). Therefore, public health
initiatives should focus on promoting more healthful oils as the main source in households. It was encouraging that plant oils such as olive oil and canola were most commonly consumed (73.0%). The high intake of red meat (40.0% reported consuming ≥5 times per week), was interesting. In ANS 08/09, 11.5% of females aged 15-18 years reported consuming red meat five or more times a week. Higher red meat consumption in the present study is interesting given recent attention on planetary health, and the promotion of plant-based diets (101-103). This apparent higher consumption is a potential risk factor, as a high consumption of red meat and processed meat has been associated with an increased risk of several chronic diseases, including cardiovascular disease, colorectal cancer and type 2 diabetes (104, 105). Ten percent of participants reported consuming processed meat daily. Intakes of red meat and processed meat should be monitored in this population group.

Intakes of red meat and processed meat should be monitored in this population group. The distribution of responses to snacking frequency was wide. This variance in the data could be due to the variation of types of foods included in the snacking questions, such as including muesli bars with cakes, and crisps with crackers. Each type of snack or discretionary food has the potential to have different nutritional qualities. For example, a Griffin’s Meal Mates cracker contains 1.5g fat and 0.2g dietary fibre, whereas a Ryvita rye cracker contains 0.2g fat and 1.4g of dietary fibre (106). This means that their nutritional value between different foods within these categories is very different, and therefore data from this section of the questionnaire is difficult to interpret. Nevertheless, 20.0% of participants consumed discretionary snacks ≥5 times a week, while 40.0% reported consumption once per week or less. Snack foods can be highly processed, negatively contributing to diet quality (28), and so their intake should continue to be monitored in this age group.

6.2 Breakfast consumption
Regular breakfast consumption (≥5 times a week) in those aged 15 and 18-years was 67% and 63% respectively, while those aged 16 and 17-years was 52% and 48% respectively. The apparent drop in breakfast consumption in those aged 16 and 17-years could be related to the transition into a life-stage of increasing autonomy, and increasing choice over their dietary habits (20). Low breakfast
consumption in adolescence is a risk factor for high BMI, high waist circumference and cardiometabolic risks in adult life (12), as behaviours during adolescence are likely to influence long-term behaviours (20). The reason why breakfast consumption was higher at age 18 years is unclear. A prospective study examining breakfast consumption throughout the transition through adolescence would be useful confirm this finding. Breakfast consumption among Māori participants was apparently low (34% reported to consume breakfast regularly (≥5 times a week)), compared to NZEO (60%), Pacific (80%) and Asian (83%) participants. This finding is similar to ANS 08/09, which reported that Māori were less likely to eat breakfast daily compared to non-Māori, after adjusting for age (107). Future research should assess the reasons for skipping breakfast, specifically amongst Māori female adolescents. In the present study, 60% of those who were not overweight/obese reported consuming breakfast regularly (≥5 times a week), compared to 48% of those who were overweight/obese. This is consistent with international studies which have reported that breakfast skipping was related to a high BMI, despite breakfast eaters usually consuming more calories (52, 65, 66, 69, 71). Dieting and weight control behaviours have been associated with breakfast skipping, which suggests that a possible reason behind the overweight group skipping breakfast could be due to weight loss intentions (70). Promoting regular breakfast consumption or preventing these habits from continuing into adulthood could help address the obesity epidemic in New Zealand (36). A barrier to consuming breakfast that has been reported in the literature is understanding the importance of the meal (70). Public health initiatives regarding education of the importance of breakfast could aid in increasing breakfast consumption in New Zealand adolescents. It is of importance to identify adolescents who are more likely to skip breakfast to prevent complications associated with breakfast skipping including higher risk of cardiometabolic complications, lack of growth and poor cognitive function (11, 12).
6.3 Socioeconomic status

Data from the DHQ were analysed according to the participants’ school decile, which was used as a measure of SES. Adult Nutrition Survey 08/09 (ANS 08/09) reported that with increasing degrees of deprivation, consumption of breakfast, fruit and vegetables and light or heavy grain bread consumption decreased, while consumption of fast food, SSBs increased. Despite the surveys being 11 years apart, there are similar patterns common to both studies. In the current study, fruit consumption increased with increasing deciles, with 36.4% of participants in the low decile secondary schools reporting consumption of fruit two or more times per day, compared to the medium (56.0%) and high deciles (81.0%). Similar patterns were evident for vegetable consumption, albeit, with smaller differences between deciles.

The finding of a decreased consumption of light/heavy grain bread with increasing degrees of deprivation in ANS 08/09 was observed when comparing the low and high deciles in the current study, however those in the medium deciles reported consuming light/heavy grain bread less often (39.2%) than low decile participants (50.0%). This may be, however, due to 12.2% of medium deciles reporting they consume “Other” bread types, compared to 0.0% of low decile participants.

Fast food consumption was higher in low decile participants (45.5% reporting to consume once a week or more) compared to the medium and high decile participants. An increased consumption of fast food in adolescents has been linked to parents’ time and cost considerations, with fast food being perceived as cheap and convenient (108). Twenty-seven percent of low decile participants reported consuming SSBs two or more times per week, compared to only 4.1% of medium decile participants and 5.0% of high decile participants. This finding is similar to that of ANS 08/09, where 24.8% of females living in the most deprived areas reported to consume SSBs three or more times per week, compared to 13.9% of females living in the least deprived areas (5). This suggests there is still a difference in consumption when comparing consumption by SES, and reasons for this should be investigated further. Results regarding breakfast consumption in relation to SES were consistent with
patterns reported in previous literature (5, 50, 51). Thirty-six percent of those from low decile schools reported they never or rarely consume breakfast, compared to 16.5% and 8.9% from medium and high deciles respectively. Forty-seven percent of high decile participants reported consuming breakfast daily compared to 7.1% of low decile participants. It is important to identify barriers that could lead to disparities between participants with different SES. One barrier previously identified in the literature which could influence the consumption of breakfast in low SES adolescents is the cost of healthy food habits such as breakfast (20, 109-111).

6.4 **Strengths and limitations**

There are some important limitations which need to be considered when interpreting the results of this study. The total sample was not representative of the New Zealand female adolescent population which limits the generalisability of the results. Due to the total sample of the study \( n = 145 \), some subgroups were underrepresented, and therefore data from these groups must be interpreted with caution. When compared to the New Zealand population, this sample had a lower proportion of Asian and Pacific Islanders and a higher proportion of Māori (90). Small subgroups that were underrepresented include participants from low decile schools \( n = 14 \) and Pacific \( n = 5 \) and Asian participants \( n = 6 \). The small size of the subgroups influences the precision of the findings, prevents firm conclusions from being drawn and limits how the findings can extrapolated (92). The low decile subgroup was particularly small because there were no decile 1 or 2 schools. Another limitation is the accuracy of using secondary school decile as a measure of SES. Although school deciles indicate the extent the school draws from low SES communities (80), it is a broad measure of relative poverty and does not represent the nature of the whole school intake. This means that the decile rating only ranks in terms of the distribution of low SES families in the school roll and does not represent the degree to which it may or may not draw from medium or high SES families. Caution in the interpretation of this data is also needed, as cluster analysis was not used to analyse the decile data. A better measure of SES would be using NZDep data, providing a deprivation score of each
geographical meshblock in New Zealand (79), however due to the constraints of this project, secondary school decile was used as a substitution. Another limitation regarding the DHQ specifically is under-reporting or over-reporting.

This study had a number of strengths. The online self-administration of the demographic and dietary habits questionnaires meant that participants could complete the questionnaires in their own time, reducing participant burden. In addition, this could also make the participants feel more comfortable and therefore more likely to answer the questions more accurately or truthfully as under-reporting is a common occurrence in dietary studies of female adolescents (24, 30). The DHQ was updated prior to the study beginning, in order for the results to more specifically capture the current patterns in dietary habits of female adolescents, and this reflective of current food availability.

6.5 Conclusions
This study has addressed several gaps in the literature by investigating the dietary habits of female adolescents in New Zealand. It is important to continue research in this field, as dietary habits remain poor in a number of areas (5, 6, 8-10, 46). A national study such as this has not been completed in New Zealand since the ANS 08/09 reported on adolescents intake (5). Therefore, the results reported in this thesis are unique and can inform public health initiatives designed to improve the nutritional adequacy and health of New Zealand adolescents. Particular areas where direction is needed for further study include the determination of the frequency of red meat consumption in this population to confirm whether the frequency reported in this study is indeed reflective of the adolescent population in NZ. Further, it is important to confirm whether the low SSBs consumption observed in this cohort is an accurate reflection of this age group, and if so, what has produced this decline. Breakfast consumption habits of different subgroups of female adolescents require further investigating, along with identification of barriers to consumption of this important meal. Further investigation into socioeconomic status and its influence on dietary habits is advised. Addressing these gaps can aid in
the development of future interventions and public health initiatives, to address concerns for this developing generation.

7 Application of Research to Dietetic Practice

General application

The results of this study highlight areas where improvements can be made regarding healthy dietary habits in this vulnerable group of female adolescents. These include reiterating the importance of consumption of breakfast, fruit and vegetables in adolescence. In addition, education around the risks of coconut oil consumption and a high intake of red meat is required.

It is important for dietitians to have access to accurate, up to date, specific evidence to inform advice. The results of this study could be useful to inform future dietary guidelines that are better suited towards the way adolescents eat and could take a particular focus on the importance of breakfast consumption, fruit and vegetables.

The communities where health inequities are highly prevalent in New Zealand are Māori individuals and low SES families (decile 1-3). These communities tend to be overrepresented in poorer dietary habits (107), which is evident in the results of the current study. This data could be used to close the gap of certain health inequities for these communities, through specific policy changes and education efforts. This relates to one of the Ottawa Charter’s goals, building healthy public policy. Results from this study provides direction for nutrition interventions at both the individual and population level, which could direct public health initiatives to increase the regularity of appropriate, healthy dietary habits in female adolescents of New Zealand. In particular, consumption of breakfast, fruit and vegetables, and appropriate fat and bread recommendations, with a focus on low decile students who seem to be at risk of unhealthy dietary habits.
**Individual application**

This research project provided the researcher with opportunities to learn and develop essential skills, to put towards becoming an effective dietitian. These skills are outlined in the NZ Dietitians Board Registration Competency requirements, and include food, nutrition and health expertise, management and leadership, communication and collaboration, professionalism and scholarship. One of the key integrated themes in these standards is communication, which was required in many forms throughout this research project, including recruitment of schools and participants, interaction with fellow data collectors, study principal investigators, and academic supervisors. In particular, effective communication was critical to ensure the data collected was accurate and precise. A standard of professionalism was also required to conduct this research project, particularly regarding ethical and legal requirements, cultural professionalism and professionalism within the school. A focus for Dietitians NZ is cultural responsiveness. The ethnic diversity of the sample population meant the researcher was communicating with individuals who have a different background or perspective than themselves. This facilitated the researcher to develop continued competency to build and maintain a strong rapport with different cultures and life experiences. As discussed, the researchers’ involvement in this project has led to developing a greater understanding of the many essential skills of an accomplished dietitian. This will be applied to future practice and will contribute to the researcher’s lifelong learning, by continually aiming to critique their performance and pursuing paths for improving the standard of their practice.
8 References

71. Reeves S, Huber JW, Halsey LG, Horabady-Farahani Y, Ijadi M, Smith T. Experimental manipulation of breakfast in normal and overweight/obese participants is associated with changes to nutrient and energy intake consumption patterns. Physiol Behav. 2014;133:130-5.


100. Eyres L. Coconut Oil and the Heart: Evidence Paper. NZ Heart Foundation; 2014.


9 Appendices

Appendix A: Ethical Approval Letter
Appendix B: Māori Consultation Letter
Appendix C: School recruitment email
Appendix D: SuNDiAL website recruitment page
Appendix E: SuNDiAL Project Enrollment Questionnaire (Demographics, Vegetarianism and Health Questionnaire)
Appendix F: SuNDiAL Project Dietary Habits Questionnaire
Appendix A: Ethical Approval Letter
Dear Dr Haszard,

I am writing to let you know that, at its recent meeting, the Ethics Committee considered your proposal entitled "SuNDiAL Project 2019: Survey of Nutrition Dietary Assessment and Lifestyle Phase 1: Adolescent Females".

As a result of that consideration, the current status of your proposal is: Approved.

For your future reference, the Ethics Committee’s reference code for this project is: H19/004.

The comments and views expressed by the Ethics Committee concerning your proposal are as follows:

While approving the application, the Committee would be grateful if you would respond to the following:

**Information Sheet**

A typing error was noted on the Information Sheet, under the heading "Is there any risk of discomfort or harm from participation?", line 3, “some” should read “someone”.

**Consent Form**

Please amend the Consent Form to include an option for participants to indicate whether they would prefer for their blood samples to be disposed of using standard methods or with a Karakia.

Please provide the Committee with copies of the updated documents, if changes have been necessary.

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

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

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

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

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

gary.witte@otago.ac.nz

jo.farrondediaz@otago.ac.nz

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

The Human Ethics Committee (Health) asks for a Final Report to be provided upon completion of the study. The Final Report template can be found on the Human Ethics Web Page http://www.otago.ac.nz/council/committees/committees/HumanEthicsCommittees.html

Yours sincerely,

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

c.c. Assoc. Prof. L Houghton Department of Human Nutrition
Appendix B: Māori Consultation Letter
Monday, 17 December 2018

Dr Meredith Peddie
Department of Human Nutrition

Tēnā Koe Dr Meredith Peddie

The SuNDiAL Project 2019: Survey of Nutrition, Dietary Assessment and Lifestyle.

The Ngāi Tahu Research Consultation Committee (the Committee) met on Tuesday, 11 December 2018 to discuss your research proposition.

By way of introduction, this response from The Committee is provided as part of the Memorandum of Understanding between Te Rūnanga o Ngāi Tahu and the University. In the statement of principles of the memorandum it states "Ngāi Tahu acknowledges that the consultation process outlined in this policy provides no power of veto by Ngāi Tahu to research undertaken at the University of Otago". As such, this response is not "approval" or "mandate" for the research, rather it is a mandated response from a Ngāi Tahu appointed Committee. This process is part of a number of requirements for researchers to undertake and does not cover other issues relating to ethics, including methodology they are separate requirements with other Committees, for example the Human Ethics Committee, etc.

Within the context of the Policy for Research Consultation with Māori, the Committee base consultation on that defined by Justice McGechan:

"Consultation does not mean negotiation or agreement. It means: setting out a proposal not fully decided upon; adequately informing a party about relevant information upon which the proposal is based; listening to what the others have to say with an open mind (in that there is room to be persuaded against the proposal); undertaking that task in a genuine and not cosmetic manner. Reaching a decision that may or may not alter the original proposal."

The Committee considers the research to be of importance to Māori health.

As this study involves human participants, the Committee strongly encourages that ethnicity data be collected as part of the research project as a right to express their self-identity.

The Committee suggests researchers consider the Southern District Health Board’s Tikaka Best Practice document, in particular patient engagement. The document also covers the collection, storage and disposal of blood and tissue samples. This document is available on the Southern District Health Board website. The Committee also refers researchers to Te Mana Raraunga Māori Data Audit Tool, which gives an overview of key Māori Data Sovereignty terms and principles.

The Ngāi Tahu Research Consultation Committee has membership from:

Te Rūnanga o Otiouk Incorporated
Kāti Huirapa Rūnaka ki Puketariki
Te Rūnanga o Moeraki
We wish you every success in your research and the Committee also requests a copy of the research findings.

This letter of suggestion, recommendation and advice is current for an 18-month period from Tuesday, 11 December 2018 to 3 June 2020.

The recommendations and suggestions above are provided on your proposal submitted through the consultation website process. These recommendations and suggestions do not necessarily relate to ethical issues with the research, including methodology. Other Committees may also provide feedback in these areas.

Nāhaku noa, nā

Claire Porima
Kaiwhakahaere Pūtērē
Senior Project Manager
Office of Māori Development
Te Whare Wānanga o Ōāgo
Ph.: +64 3 479 7461
Email: claire.porima@otago.ac.nz
Web: www.otago.ac.nz
Appendix C: School recruitment email
Subject: Healthy Eating: What does this look like for girls at xxxx?

To the Senior Management/Leadership Team,

This year the Department of Human Nutrition & Dietetics at the University of Otago is conducting a research project called SuNDIAL (Survey of Nutrition, Dietary Assessment, and Lifestyles). SuNDIAL is a nationwide survey of girls aged 15-18 years, to be carried out in high schools around the country.

We are writing to invite your school to participate in this survey. Participation at a school levels involves allowing our research team to come into the school and collect information on the dietary intakes and lifestyle habits of girls who choose to participate. In return we will provide you with information about the dietary and lifestyle habits of New Zealand female adolescents. We will even provide you with a report tailored to show how your school compares to others across the country.

Research teams will be operating in your area in February to April.

To find out more about participation, please visit our website: www.otago.ac.nz/sundial

If you are interested in your school being involved please contact us at sundial@otago.ac.nz

If you would like to talk to one of our lead researchers, you are welcome to ring Dr Meredith Peddie on: (03) 479 8157. Or we can arrange to ring you at a time convenient to you.

We look forward working with you and the girls at xxxx this year.

Kind regards,
Tessa Scott
SuNDIAL Coordinator
Appendix D: SuNDiAL website recruitment page
Enrol in the SuNDiAL study

SuNDiAL participant request

Your full name

Your school

Your email address

Your age

If you are under 15, please provide a parent or caregiver's email who is able to give consent

I'm not a robot

Submit request
Appendix E: SuNDiAL Project Enrollment Questionnaire (Demographics, Vegetarianism and Health Questionnaire)
SuNDiAL 2019 Enrolment Questionnaire

Thank you for showing an interest in this project. Please read the information about SuNDiAL project carefully. This can be found on our website www.otago.ac.nz/sundial. Take time to think about it and talk with family or friends before you decide whether to take part or not. If you decide to take part we thank you. If you decide not to take part that won't disadvantage you and we thank you for considering it.

Who are we seeking to take part in the project?
We are looking for female high school students who are 15 to 18 years old. To be eligible to take part, your high school must have agreed to take part in the study, you must speak and understand English, and be able to complete the questionnaires.

If you take part, what will you be asked to do?
If you agree to take part in this study you will be asked to do three things:

1) Complete an online questionnaire with three parts to it: (i) health & demographics; (ii) why you choose the food you eat; and (iii) your dietary habits.

2) Attend a session at your school with our research team. This visit will take about 60 minutes and you will be asked to recall the food and drink you've consumed over the last day. You will also have your height, weight, and length of your lower arm measured. These measurements will be done twice to make sure they are as accurate as possible. This will be done in a private space and you may ask for the measurements if you want them.

3) In the next week or two we'll ring or video call you to do a second food and drink recall.

Any questions?

Contact Jill (ph 03 479 5683) or Meredith (ph 03 479 8157) or email us on: sundial@otago.ac.nz

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

Electronic consent
Click on the "agree" button below if:

You have read the information about the study
02/07/2019 12:59pm
www.projectredcap.org
You have had all your questions answered about the study and understand that you can ask for more information at any stage.

You know that when the project is completed all personal information that could be linked to you will be removed from the paper records and electronic files for the project, and that these will be placed in secure storage and kept for at least ten years.

You are a young woman who is 15 to 18 years old and isn't pregnant.

You know you can pull out of the study anytime before it finishes in October 2019.

If you don’t want to take part in the SuNDIAL project, please click on the “disagree” button.

☐ AGREE
☐ DISAGREE
Thank you for agreeing to taking part in the SuNDIAL project! If you are female, aged 15-18 years of age and not pregnant, please answer the following two questions:

<table>
<thead>
<tr>
<th>What age are you as of today?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 15</td>
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<td>□ 16</td>
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<tr>
<td>□ 17</td>
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<tr>
<td>□ 18</td>
</tr>
<tr>
<td>□ None of the above</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What high school do you attend?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Tauraroa Area School</td>
</tr>
<tr>
<td>□ Mt Maunganui College</td>
</tr>
<tr>
<td>□ Spotswod College</td>
</tr>
<tr>
<td>□ Wellington Girls College</td>
</tr>
<tr>
<td>□ Waimae College</td>
</tr>
<tr>
<td>□ Hornby High School</td>
</tr>
<tr>
<td>□ Columba College</td>
</tr>
<tr>
<td>□ Kaikora Valley College</td>
</tr>
<tr>
<td>□ Queens High School</td>
</tr>
<tr>
<td>□ Mt Aspiring College</td>
</tr>
<tr>
<td>□ None of the above</td>
</tr>
</tbody>
</table>
Thank you! You are eligible to take part in the SuNDIAL project!

There are three other parts to the SuNDIAL project that are optional. Please read the following information carefully before you decide whether to take part in these optional bits of the study. For each one of these that you do, you will receive a $5 gift voucher from New World or PaknSave.

If you agree to do these, but change your mind later, that’s OK - there is no disadvantage to not you if you decide not to do these.

Once all of the analysis has been completed the samples will be disposed of using standard biohazard protocols. On the consent form (below) you can tell us if you would like your blood sample disposed of with a Karakia (Māori Prayer).

Electronic consent

Click on the "AGREE" button below if:
- You have read the information on the website
- You want to take part in these parts of the study

If you don't want to take part in these parts of the study, please click on the "DISAGREE" button.

BLOOD SAMPLE:

We would like you to provide a blood sample (which would be collected by someone with extensive training in how to collect blood), but we understand that not everyone feels comfortable about this so it is entirely up to you if you do this. If you do provide a blood sample, we can tell you whether you’re iron deficient or not. You can still take part in the rest of the study even if you don't do this bit.

Click on the agree button below if:

You understand the risks of discomfort involved in providing a blood sample

☐ AGREE
☐ DISAGREE

Please click here if you want your samples disposed of with a Karakia (Māori Prayer)

☐ Yes
☐ No

URINE SAMPLE:

We would also like you to give a urine sample ("pee or wee") - which is easy for you collect yourself with the equipment we give you. You can still take part in the rest of the study even if you don't do this bit.

Click on the 'AGREE' button below if:

☐ AGREE
☐ DISAGREE
ACCELEROMETER:

We would also like you to wear a small red box called an accelerometer on an elastic belt 24 hours a day for seven days. This will tell us how much time you spend sitting down, moving around, and sleeping. If you choose to wear the accelerometer you will be asked to complete a little diary about the times your took the device off, and what time you went to bed each night on the days that you wear it.

One of our research team will return to your school the week after this visit to collect the accelerometer. You can still take part in the rest of the study even if you don’t do this bit.

☐ AGREE
☐ DISAGREE
<table>
<thead>
<tr>
<th><strong>Contact Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is your name?</strong></td>
</tr>
<tr>
<td><strong>What is your date of birth?</strong></td>
</tr>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Phone number (mobile would be best - so we can text you reminders)</strong></td>
</tr>
<tr>
<td><strong>What is your home address?</strong></td>
</tr>
<tr>
<td>(This will be the address where we will send your voucher)</td>
</tr>
</tbody>
</table>
| **Do you live at this address during school term?**  | 〇 Yes  
 〇 No  |
| **Do you live in a boarding house during school term?**  | 〇 Yes  
 〇 No  |
| (Don't include private boarding) |
| **Please put the name and/or address of the boarding house**  | (number & street, suburb, city, postcode) |
| **What is the address that you live at during school term?**  | (number & street, suburb, city, postcode) |
Health Information
If you know your height, please write it here: ____________________________

What unit is this measurement in?  
☐ centimetres  
☐ metres  
☐ feet and inches

If you know your weight (in kg) please write it here: ____________________________
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you been diagnosed with diabetes?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>If so, which type?</td>
<td>Type 1 diabetes, Type 2 diabetes, Don't know</td>
</tr>
<tr>
<td>Do you avoid eating gluten?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Have you been diagnosed with either coeliac disease or gluten intolerance?</td>
<td>Yes - coeliac disease, Yes - gluten intolerant, No diagnosis but suspected intolerance or coeliac, No</td>
</tr>
<tr>
<td>Have you been diagnosed with a food allergy or intolerance? (not gluten)</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Which foods are you allergic or intolerant to?</td>
<td>Eggs, Dairy, Nuts, Shellfish, Other</td>
</tr>
<tr>
<td>Other: please specify</td>
<td></td>
</tr>
<tr>
<td>Are you vegetarian or vegan?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Which foods do you eat? (Select as many as apply)</td>
<td>Egg, Milk (not plant milk like soy milk), Fish or seafood, Chicken or poultry, Meat/red meat occasionally, None of the above</td>
</tr>
<tr>
<td>Are you vegan?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>How long have you been following this way of eating?</td>
<td>Less than a month, Between 1 and 6 months, Between 6 months and 1 year, Between 1 and 2 years, More than 2 years, My whole life</td>
</tr>
</tbody>
</table>
The following questions are a bit sensitive, but it is necessary for us to ask them because they can help us understand what nutrients are important for the health of young women your age.
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| How old were you when you had your first period?                        | ☐ 11 years or younger  
 ☐ 12-14 years  
 ☐ 15 years or older  
 ☐ I haven't had a period yet |
| How long do you usually have from the start of one period to the start of the next? | ☐ Less than a week  
 ☐ 1-2 weeks  
 ☐ 3-4 weeks  
 ☐ 4-5 weeks  
 ☐ More than 5 weeks  
 ☐ I haven't had a period for 3 months  
 ☐ The timing of my periods is not regular |
| How many days does your period usually last? (count your light days as well as your heavy ones) | ☐ Less than 4 days  
 ☐ 4-6 days  
 ☐ 7-9 days  
 ☐ 10 days or more |
| Are your periods so heavy that they make it hard for you to go to school? | ☐ Yes - often  
 ☐ Yes - sometimes  
 ☐ No |
| Have you donated blood?                                                 | ☐ Yes  
 ☐ No |
| When did you last donate blood?                                         | ☐ In the last 4 months  
 ☐ Between 4 and 12 months ago  
 ☐ More than a year ago |
| Have you had a nosebleed in the last year?                              | ☐ Yes  
 ☐ No |
| Do you have nosebleeds regularly?                                       | ☐ Yes  
 ☐ No |
| Over the last year, on average how often did you get nose bleeds?       | ☐ More than once a week  
 ☐ Once a week  
 ☐ Every couple of weeks  
 ☐ Once a month  
 ☐ Every few months  
 ☐ Every 6 months  
 ☐ Once a year  
 ☐ Less than once a year |
| Do you use any of the following contraceptives:                          | ☐ No - I don't use those contraceptives  
 ☐ Yes - I use one of those contraceptives |
| - Oral contraceptive (eg 'the pill' or 'the mini-pill')                 |                                                                                   |
| - Depo Provera injection                                                |                                                                                   |
| - Implant (eg Jadelle)                                                  |                                                                                   |
| - Hormonal IUD (eg Mirena)                                              |                                                                                   |
Other information

Which ethnic group do you belong to? (Mark those that apply)
- New Zealand European
- Māori
- Samoan
- Cook Island Māori
- Tongan
- Niuean
- Chinese
- Indian
- Other such as Dutch, Japanese, Tokelauan, please state...

Other: please state

Please let us know which type of gift card you would prefer:
- New World
- PaknSave

Thank you for enrolling in the SuNDIAL project!

What happens next?

We are now going to ask you to complete a questionnaire about why you eat the food you do. If you want to complete it at a later time, please click the Save and Return button at the bottom of this page (don’t forget to make a note of your code so that you can return to this survey). Or, click the “Submit” button to continue.

You will also get an email and/or text to tell you when you can visit the SuNDIAL clinic at your school to complete the other measurements.
Appendix F: SuNDiAL Project Dietary Habits Questionnaire
## Dietary Habits Questionnaire

### Fruit

On average how many servings of fruit - fresh, frozen, canned or stewed - do you eat per day or per week? Do not include fruit juice or dried fruit.

A serving is the same as a medium piece of fruit like an apple or two small pieces of fruit like two apricots, or half a cup of stewed or canned fruit.

<table>
<thead>
<tr>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never I don't eat fruit</td>
</tr>
<tr>
<td>Less than 1 serving a week</td>
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<tr>
<td>1 serving a week</td>
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<tr>
<td>2-4 servings a week</td>
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<tr>
<td>5-6 servings a week</td>
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<tr>
<td>1 serving a day</td>
</tr>
<tr>
<td>2 servings a day</td>
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<tr>
<td>3 servings a day</td>
</tr>
<tr>
<td>More than 3 servings a day</td>
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</tbody>
</table>
Vegetables

On average how many servings of vegetables - fresh, frozen or canned - do you eat per day or per week? Do not include vegetable juices.

A serving is the same as one potato, half a cup of peas or a cup of salad.

- Never I don't eat vegetables
- Less than 1 serving a week
- 1 serving a week
- 2-4 servings a week
- 5-6 servings a week
- 1 serving a day
- 2 servings a day
- 3 servings a day
- More than 3 servings a day
**Bread**

On average how often do you eat bread?

Include slices of bread, rolls, bagels, wraps, and gluten-free bread.

- Never I don't eat bread
- Less than once a week
- Once a week
- 2-4 times a week
- 5-6 times a week
- Once a day
- Twice a day
- 3 times a day
- More than 3 times a day

What type of bread, rolls or toast do you eat most of the time?

- White
- Wholemeal (brown colour)
- Light grain - has some grains but soft to eat (e.g., honey grain)
- Heavy grain - has some grains and a bit chewier (e.g., Vogels)
- Other (please specify)

If Other, please specify:
**Milk**

How often do you have milk (cow's milk or plant milk)?

- I do not have any milk
- Rarely
- Monthly
- 2-3 times a month
- Once a week
- 2-4 times a week
- 5-6 times a week
- Once a day
- More than once a day

What type of milk do you use the most of?

- None
- Cow's milk
- Plant-based milk (eg soy, rice, almond, coconut)
- Other (such as goat or sheep milk)

What kind of milk do you usually have?

- Whole or standard milk (Dark blue or silver)
- Reduced fat (light blue)
- Skim or trim (green or yellow)
- Other (please specify)

If Other, please specify:

________________________

What kind of milk do you usually have?

- Regular
- Lite
- Sweetened or flavoured
Spreads and Oils

What type of spread do you use the most of?

- None
- Butter (including semi soft)
- Margarine (eg Canola, Sunflower, Olive oil based, or table spread)
- Other (eg avocado, cream cheese), please specify
- I don’t know

If other, please specify:

What type of fat or oil is used most often in cooking in your household?

- None
- Butter
- Coconut oil
- Margarine
- Oil (eg Olive, Canola, or one in a bottle)
- Dripping or Lard
- I don’t know
**Nuts**

**How often do you eat the following types of nuts? (Include nuts in cooked foods, bars, cereals etc but don’t include peanut butter or other nut butters)**

<table>
<thead>
<tr>
<th></th>
<th>More than once a day</th>
<th>Once a day</th>
<th>5-6 times a week</th>
<th>2-4 times a week</th>
<th>Once a week</th>
<th>2-3 times a month</th>
<th>Monthly</th>
<th>Rarely</th>
<th>I do not eat these</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds</td>
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<td>Brazil</td>
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<td>Cashew</td>
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<tr>
<td>Hazelnut</td>
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<td>Macadamia</td>
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<td>Peanut</td>
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<td>Pecan</td>
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<td>Pine nut</td>
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<td>Pistachio</td>
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<td>Walnut</td>
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<td>Other</td>
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<tr>
<td>Nut Butter</td>
<td>More than once a day</td>
<td>Once a week</td>
<td>2-4 times a week</td>
<td>Once a month</td>
<td>2-3 times a month</td>
<td>Monthly</td>
<td>Rarely</td>
<td>I don't eat this type of nut butter</td>
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<td>Almond butter</td>
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<tr>
<td>Cashew butter</td>
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<tr>
<td>Hazelnut butter</td>
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<td>Peanut butter</td>
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<tr>
<td>Walnut butter</td>
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<tr>
<td>Other</td>
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</tr>
</tbody>
</table>
## Meat, Dairy and Eggs

<table>
<thead>
<tr>
<th>How often do you eat each of the following foods:</th>
<th>More than once a day</th>
<th>Once a day</th>
<th>5-6 times a week</th>
<th>2-4 times a week</th>
<th>Once a week</th>
<th>2-3 times a month</th>
<th>Monthly</th>
<th>Rarely</th>
<th>I do not eat this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Cow's milk</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Dairy products excluding milk (eg cheese, yoghurt - don’t include plant based)</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Processed meat (eg ham, bacon, sausages, luncheon, canned corned beef, pastrami, salami)</td>
<td>○</td>
<td>○</td>
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<td>○</td>
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<td>○</td>
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<tr>
<td>Other red meat (including beef, lamb, venison etc don’t include processed meat)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Pork</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Poultry (including chicken, turkey etc)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Fish</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
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<tr>
<td>Other seafood/shellfish (eg prawns, squid, crab)</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Legumes</td>
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<td>How often do you eat lentils, chickpeas, kidney beans or baked beans? (Don’t include peas or peanuts)</td>
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<tr>
<td>☐ I do not eat legumes</td>
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<td>☐ Rarely</td>
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<td>☐ 2-3 times a month</td>
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<td>☐ 2-4 times a week</td>
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<td>☐ 5-6 times a week</td>
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<td>☐ Once a day</td>
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<td>☐ More than once a day</td>
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</table>
### Other Foods

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<thead>
<tr>
<th>Question</th>
<th>Options</th>
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<tbody>
<tr>
<td>How often do you eat tofu, tempeh and tofu products?</td>
<td>- I do not eat these</td>
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<td></td>
<td>- Rarely</td>
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<td>- Monthly</td>
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<td>- 2-3 times a month</td>
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<td>- Once a week</td>
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<td>- 2-4 times a week</td>
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<td>- 5-6 times a week</td>
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<td>- Once a day</td>
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<td>- More than once a day</td>
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<tr>
<td>How often do you eat vegetarian ingredients (like quorn, nut meat,</td>
<td>- I do not eat these</td>
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<td>vegetarian mince) that are used in other dishes?</td>
<td>- Rarely</td>
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<td>- Monthly</td>
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<td>- 2-3 times a month</td>
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<td>- Once a day</td>
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<td>- More than once a day</td>
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<tr>
<td>How often do you eat vegetarian sausages, nuggets, patties etc?</td>
<td>- I do not eat vegetarian meat alternatives</td>
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<td></td>
<td>- Rarely</td>
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<td>- Monthly</td>
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<td>- 2-3 times a month</td>
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<td>- 5-6 times a week</td>
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<td>- Once a day</td>
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<td>- More than once a day</td>
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<tr>
<td>How often do you eat vegetarian &quot;meat alternatives&quot; (like chicken-free</td>
<td>- I do not eat these</td>
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<tr>
<td>chicken, vegetarian chicken schnitzel, meat-free bacon rashers etc)?</td>
<td>- Rarely</td>
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<td>- Monthly</td>
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<td></td>
<td>- 2-3 times a month</td>
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<td>- Once a day</td>
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<td>- More than once a day</td>
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</tbody>
</table>
### Sweet Drinks

**How often do you drink diet or drinks labelled "sugar-free"?**
- ☐ I do not drink diet or sugar-free drinks
- ☐ Rarely
- ☐ Monthly
- ☐ 2-3 times a month
- ☐ Once a week
- ☐ 2-4 times a week
- ☐ 5-6 times a week
- ☐ Once a day
- ☐ More than once a day

**How often do you drink fizzy drinks? Don't include diet varieties. (eg Coca-cola, Pepsi, lemonade)**
- ☐ I do not drink fizzy drinks
- ☐ Rarely
- ☐ Monthly
- ☐ 2-3 times a month
- ☐ Once a week
- ☐ 2-4 times a week
- ☐ 5-6 times a week
- ☐ Once a day
- ☐ More than once a day

**How often do you drink fruit juices, drinks or cordials? (eg Just Juice, Fresh-up, Keri, Golden Circle, Ribena, Charlie's, Raro). Don't include diabetic, diet or sugar-free varieties.**
- ☐ I do not drink juice or cordial
- ☐ Rarely
- ☐ Monthly
- ☐ 2-3 times a month
- ☐ Once a week
- ☐ 2-4 times a week
- ☐ 5-6 times a week
- ☐ Once a day
- ☐ More than once a day

**How often do you drink energy drinks? (eg V, Lift plus, Red Bull, Powerade)**
- ☐ I do not drink energy drinks
- ☐ Rarely
- ☐ Monthly
- ☐ 2-3 times a month
- ☐ Once a week
- ☐ 2-4 times a week
- ☐ 5-6 times a week
- ☐ Once a day
- ☐ More than once a day
### Snacks

How often do you eat lollies, sweets, chocolate or confectionary?

- I do not eat these
- Rarely
- Monthly
- 2-3 times a month
- Once a week
- 2-4 times a week
- 5-6 times a week
- Once a day
- More than once a day

How often do you eat biscuits, cakes, slices, muffins, sweet pastries or muesli bars?

Include nut and other sweet snack bars.

- I do not eat these
- Rarely
- Monthly
- 2-3 times a month
- Once a week
- 2-4 times a week
- 5-6 times a week
- Once a day
- More than once a day

How often do you eat savoury snacks such as chips (crisps not hot chips) and crackers?

- I do not eat these
- Rarely
- Monthly
- 2-3 times a month
- Once a week
- 2-4 times a week
- 5-6 times a week
- Once a day
- More than once a day
### Fast Food

How often do you eat fast food or takeaways from places like McDonalds, KFC, Burger King, Pizza shops or fish and chip shops?

- [ ] I do not eat fast food
- [ ] Rarely
- [ ] Monthly
- [ ] 2-3 times a month
- [ ] Once a week
- [ ] 2-4 times a week
- [ ] 5-6 times a week
- [ ] Once a day
- [ ] More than once a day

---

How often do you eat pies and other hot food that you buy ready-to-eat?

- [ ] I do not eat these
- [ ] Rarely
- [ ] Monthly
- [ ] 2-3 times a month
- [ ] Once a week
- [ ] 2-4 times a week
- [ ] 5-6 times a week
- [ ] Once a day
- [ ] More than once a day
## Breakfast Consumption

How many days in an average week do you have something to eat for breakfast?

- [ ] I don't usually have breakfast
- [ ] 1 day a week
- [ ] 2 days a week
- [ ] 3 days a week
- [ ] 4 days a week
- [ ] 5 days a week
- [ ] 6 days a week
- [ ] 7 days a week
## Supplement Use

Did you take any supplements during the last year?  
- Yes  
- No

What type of supplement was it? (Select as many as apply)
- □ Multivitamin and/or multimineral
- □ Single vitamin or mineral
- □ Oil
- □ Bran
- □ Lecithin
- □ LSA
- □ Kelp
- □ Spirulina
- □ Glucosamine and/or chondroitin
- □ Echinacea
- □ Ginkgo
- □ Hypericum (St John's Wort)
- □ Sports supplement
- □ Other (please specify)

Multivitamin and/or multimineral: How long did you take the supplement in the last 12 months?  
- □ Daily  
- □ More than once a week  
- □ Once per week  
- □ Monthly  
- □ Regularly but for a limited time  
- □ Not very often

Multivitamin and/or multimineral:
If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Multivitamin and/or multimineral:
If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

Single vitamin or mineral: Please tell us what vitamin or mineral it was.

Single vitamin or mineral: How long did you take the supplement in the last 12 months?  
- □ Daily  
- □ More than once a week  
- □ Once per week  
- □ Monthly  
- □ Regularly but for a limited time  
- □ Not very often

Single vitamin or mineral:
If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.
Single vitamin or mineral:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

Please specify the type of oil:

Oil: How long did you take the supplement in the last 12 months?

- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

Oil:

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Oil:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

Bran: How long did you take the supplement in the last 12 months?

- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

Bran:

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Bran:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.
**Confidential**

<table>
<thead>
<tr>
<th>Lecithin: How long did you take the supplement in the last 12 months?</th>
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<tbody>
<tr>
<td>○ Daily</td>
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<td>○ More than once a week</td>
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<tr>
<td>○ Once per week</td>
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<tr>
<td>○ Monthly</td>
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<tr>
<td>○ Regularly but for a limited time</td>
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<tr>
<td>○ Not very often</td>
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<tr>
<th>Lecithin: If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.</th>
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<td>_________________________________________________________________________</td>
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<tr>
<th>Lecithin: If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time). When taking a photo (or two), please make visible the brand and the list of contents.</th>
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<td>_________________________________________________________________________</td>
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<tr>
<th>LSA: How long did you take the supplement in the last 12 months?</th>
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<td>○ Daily</td>
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<td>○ More than once a week</td>
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<td>○ Once per week</td>
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<td>○ Monthly</td>
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<tr>
<td>○ Regularly but for a limited time</td>
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<tr>
<td>○ Not very often</td>
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<tr>
<th>LSA: If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.</th>
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<th>LSA: If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time). When taking a photo (or two), please make visible the brand and the list of contents.</th>
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<tr>
<th>Kelp: How long did you take the supplement in the last 12 months?</th>
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<td>○ Daily</td>
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<td>○ More than once a week</td>
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<td>○ Once per week</td>
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<tr>
<td>○ Monthly</td>
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<tr>
<td>○ Regularly but for a limited time</td>
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<tr>
<td>○ Not very often</td>
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<tr>
<th>Kelp: If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.</th>
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Kelp:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

<table>
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<tr>
<th>Question</th>
<th>Options</th>
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<tbody>
<tr>
<td>Spirulina: How long did you take the supplement in the last 12 months?</td>
<td>Daily</td>
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</table>

Spirulina:

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Spirulina:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

<table>
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<tr>
<th>Question</th>
<th>Options</th>
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<tbody>
<tr>
<td>Glucosamine and/or chondroitin: How long did you take the supplement in the last 12 months?</td>
<td>Daily</td>
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</table>

Glucosamine and/or chondroitin:

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Glucosamine and/or chondroitin:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.
Echinacea: How long did you take the supplement in the last 12 months?
- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Echinacea:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

Ginkgo: How long did you take the supplement in the last 12 months?
- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Ginkgo:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

Hypericum (St John's Wort): How long did you take the supplement in the last 12 months?
- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.
Hypericum (St John’s Wort):

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

Sports supplement: How long did you take the supplement in the last 12 months?

- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

Sports supplement:

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Sports supplement:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.

If Other, please specify:

Other: How long did you take the supplement in the last 12 months?

- Daily
- More than once a week
- Once per week
- Monthly
- Regularly but for a limited time
- Not very often

Other:

If you know the brand name and/or the product name please write them here. Please provide as much information about the product as possible.

Other:

If you are able to take a photo of your supplement packaging, please do so and upload here (you can complete the questionnaire and come back to upload a photo at a later time).

When taking a photo (or two), please make visible the brand and the list of contents.
**Do you have any comments about this survey?**

Please add any comments you may have about this questionnaire here:

______________________________