Validation of a Newly Developed Eating Habits Questionnaire for New Zealand Women

A thesis presented for the partial fulfilment of the requirements for the

Degree of

Master of Science

In

Human Nutrition

At Massey University, Auckland

New Zealand

Sarah Catharina Philipsen

2015

Abstract

Background: Eating habits can be defined as behavioural eating patterns that become an automatic response after repeat performances. Poor eating habits are a contributing factor to obesity, a major health concern worldwide and in New Zealand (NZ). Young women particularly, are at risk of developing poor eating habits as they make lifestyle changes, often unhealthy, following greater independence. Once habits are formed, they can continue throughout adulthood, often resulting in poor health outcomes. In order to determine and change eating habits, it is important that appropriately validated tools, of which there are none in NZ, are available to assess eating habits.

Aim: To develop and validate an eating habits questionnaire (EHQ), which assesses the usual eating habits of NZ women, including habitual intake, types of foods consumed, food combinations and the timing of meals and snacks.

Methods: An online self-administered EHQ was developed and validated against a 4-day weighed food record (WFR) in women aged 16-45 years (n=108), living in Auckland, NZ. The EHQ focused on eating habits linked with obesity and excess body fat including behaviours associated with healthy/unhealthy eating, social occasions, the time distribution of meals and snacks and typical foods consumed for these eating occasions. Validity was assessed between the EHQ and WFR using cross-classification analysis, and the weighted kappa statistic (Kw).

Results: Agreement from cross-classification between the EHQ and WFR ranged from 60.2% to 87.0% for snack foods; reached 91.0% for beverages between meals; was >50% for the behaviours of eating fried foods and takeaways, with Kw ranging from 0.21 to 0.33; and was >50% for low fat milk, meat and cheese. Agreement between the EHQ and WFR for the top five foods consumed for main meals ranged from 54.6% to 93.4% and for snacks ranged from 52.8% to 92.6%. Common foods consumed for breakfast were dairy, grains and basic sandwich; for lunch were non-starchy vegetables (NSV), meat and bread; and for dinner were NSV, meat and grains. Typical snack foods were fruit, tea and coffee, dairy, grains, baking and chocolate, with snacks most

common between lunch and dinner. Agreement between the EHQ and WFR ranged from 51.8% to 94.4% for the top two food combinations consumed for main meals, and from 83.3% to 99.0% for food combinations consumed for snacks. Typical food combinations reflected those food items consumed for main meals. Common food combinations for breakfast were ‘dairy + grains’, ‘dairy + grain + fruit’ and ‘bread-based foods’; for lunch were ‘bread-based foods’, ‘leftover combinations’ and ‘takeaway combinations’; and for dinner were ‘meat + grain + NSV’, ‘meat + SV + NSV’ and ‘takeaway combinations’. ‘Dairy + grains’ were the only food combination commonly eaten as a snack.

Conclusion: The EHQ is a valid tool for assessing the usual eating habits that potentially contribute to obesity and excess body fatness in 16-45 year old NZ women. Further research is warranted to investigate the eating habits of a larger group of women to identify areas where nutrition education could be targeted as well as associations with health and chronic disease.

Acknowledgements

There are a number of people who I would like to acknowledge, as without their support this research would not have been possible.

Firstly I would like to thank my supervisors Associate Professor Rozanne Kruger and Dr Kathryn Beck for their invaluable support, encouragement, advice and attention to detail throughout the whole process and writing of this thesis.

Thank you to AJ Hepburn and Zara Houston for all your help in entering the food records into FoodWorks and to AJ who additionally helped with coding of the EHQ. Also to Chelsea Symons for her help in coding the EHQ.

I would like to acknowledge everyone who helped with the EXPLORE study, especially Wendy O'Brien and Shakeela Jayasinghe for all their hard work in recruiting and co-ordinating the participants. Also to Beatrix Jones for her advice on statistical analysis.

Thank you to all the women who volunteered for this study. Your time and effort is very much appreciated.

Finally I would like to thank my family and friends for all their support and encouragement. Also to my classmates for their moral support and advice.

Table of Contents

List of Figures

List of Tables

Abbreviations

ANS	2008/09 New Zealand Adult Nutrition Survey
AMDR	Acceptable Macronutrient Distribution Range
BF	Body Fat
BMI	Body Mass Index
B-EAT	Breakfast Eating Assessment Tool
CDL	Chronic Diseases of Lifestyle
CHO	Carbohydrate
CI	Confidence Interval
CVD	Cardiovascular Disease
DHQ	Dietary Habits Questionnaire
D-EAT	Dinner Eating Assessment Tool
EBPQ	Eating Behaviour Pattern Questionnaire
EHQ	Eating Habits Questionnaire
EO	Eating Occasion
ESQ	Eating Styles Questionnaire
EXPLORE	EXamining the Predictors Linking Obesity Related Elements
FDDR	Four Day Diet Record
FFQ	Food Frequency Questionnaire
FH	Food Habits
FR	Food Record

HNRU	Human Nutrition Research Unit
HUB	Healthy and Unhealthy eating Behaviours
ID	Identification Number
Kw	Weighted Kappa Statistic
L-EAT	Lunch Eating Assessment Tool
L-FAT	A Low Fat Alternatives Tool
NHANES	National Health and Nutrition Examination Survey
NNS	1997 National Nutrition Survey
NSV	Non-Starchy Vegetables
NZE	New Zealand European
NZHS	New Zealand Health Survey
NZ	New Zealand
n/a	Not Applicable
OREB	Obesity Related Eating Behaviours
PRO	Protein
SD	Standard Deviation
SES	Socioeconomic Status
SSB	Sugar Sweetened Beverages
STFHQ	SisterTalk Food Habits Questionnaire
SV	Starchy Vegetables
S-EAT	Snack Eating Assessment Tool

T2DM	Type 2 Diabetes Mellitus
UK	United Kingdom
USA	United States of America
WC	Waist Circumference
WEST	WEight STatus
WFR	Weighed Food Record
WHO	World Health Organisation
WHR	Waist to Hip Ratio
yrs	Years
%BF	Percentage body fat
χ^2	Chi-squared

List of Appendices

Chapter 1: Introduction

1.1 Background

Poor eating habits are a contributing factor to a lower diet quality and reduced health outcomes. Having an irregular meal pattern, skipping meals (Kerver, Yang, Obayashi, Bianchi, & Song, 2006), consuming beverages that are high in sugar (Balcells et al., 2011), frequently eating takeaways (Wu & Sturm, 2013), and consuming high fat foods (e.g. for milk and meat) (Peterson, Sigman-Grant, Eissenstat, & Kris-Etherton, 1999) are examples of poor eating habits. Eating habits can be defined as behavioural patterns that become an automatic response after repeat performances (Hunt, Matarazzo, Weiss, & Gentry, 1979). They are triggered by situational cues including the environment, people or previous activities (Hunt et al., 1979; Neal, Wood, & Quinn, 2006). Eating habits can be influenced by a variety of factors including environmental conditions, food availability, culture, religion, ethnicity, education, socioeconomic status and psychological needs (Kuhnlein & Receveur, 1996; Lowenberg, Todhunter, Wilson, Savage, & Lubawski, 1974).

One of the consequences of poor eating habits is obesity and increased body fatness (Gunes, Bekiroglu, Imeryuz, & Agirbasli, 2012; Oliveros, Somers, Sochor, Goel, & Lopez-Jimenez, 2014; Zazpe et al., 2011). Being obese or having excess body fat is a major health concern worldwide, as it is a risk factor for diseases such as type 2 diabetes mellitus, hypertension and dyslipidaemia (Steyn, Fourie, & Temple, 2006). One group particularly at risk of gaining excess body fat is young adults who are transitioning from adolescence to adulthood. During this period young adults gain greater independence and may as a result develop unhealthy eating habits that can continue throughout adulthood, which can contribute to weight gain (Demory-Luce et al., 2004; Nikolaou, Hankey, & Lean, 2015). Young women in particular have in some studies been shown to have poorer eating habits (e.g. increased takeaways and sugary beverages, and fewer fruits and vegetables) than young males (Demory-Luce et al., 2004; Larson et al., 2008; Lytle et al., 2002).

Worldwide the prevalence of women who are overweight has increased at an alarming rate, rising from 29.8% in 1980 to 38.0% in 2013 (Ng et al., 2014). In New Zealand (NZ) overweight and obesity rates of women mirror the increasing rates worldwide. The latest 2008/09 NZ Adult Nutrition Survey (ANS) alarmingly found 32.8% of women were overweight and 27.8% were obese (University of Otago & Ministry of Health, 2011a). Rates were similar in national health surveys, most recently in 2013/14 where 29.9% of adults ≥15 years were obese (Ministry of Health, 2014).

Due to the worryingly high obesity rates, for which eating habits are a contributing factor, it is crucial that appropriate dietary assessment methods are available that can accurately assess key eating habits. Having accurate assessment methods is important, as this will help identify eating habits that can be targeted, such as for nutrition education. Traditionally nutrition studies have focused on assessing the intake of individual nutrients, foods or food groups which does not always take into account eating habits such as meal patterns (Moeller et al., 2007). Findings suggest consumers tend to eat foods in different combinations and often in a particular pattern or have a habitual intake, which is likely to reflect their culture (Martinez-Gonzalez & Martin-Calvo, 2013; Oltersdorf, Schlettwein-Gsell, & Winkler, 1999). In addition food intake tends to vary throughout the day, yet few studies have investigated this (Gibney & Wolever, 1997; Holmback et al., 2003; Oltersdorf et al., 1999).

Dietary assessment methods that are currently available to assess eating habits include the diet history (e.g. consist of several components including an interview on usual eating patterns and a questionnaire on the frequency specific foods are consumed; sometimes includes a 24-hour recall and 3-day food record) and dietary screeners (e.g. screening dietary intake for specific foods and/or nutrients such as fat, fibre or fruit and vegetable intake). Methods available to assess dietary intake are the 24-hour recall, food frequency questionnaire (FFQ) and the estimated and weighed food record (FR), where the weighed FR is considered the ‘gold standard’ for dietary assessment (R. S. Gibson, 2005a; Thompson & Subar, 2013). Many studies that have investigated the association between diet and chronic disease have used FFQs to assess

usual intake (Kristal & Potter, 2006). Although FFQs can provide valuable information about dietary intake, they can be too complex or time consuming for intervention studies (Risica et al., 2007), the clinical setting or for health education purposes (Yatsuya et al., 2003). In these settings qualitative methods, such as eating habits questionnaires (EHQ) are more desirable. They are perceived to be quicker and cheaper to complete and analyse than quantitative methods (Yaroch, Resnicow, & Khan, 2000), can be used to focus on one aspect of the diet, such as fat intake (Thompson & Byers, 1994) and assess usual habits, which can be easier to remember (Yaroch et al., 2000).

In order to accurately assess eating habits, such as from EHQs, it is essential that methods are validated to ensure they measure what they are intended to measure (R. S. Gibson, 2005b) and that relationships between diet and disease are not obscured (Nelson, 1997). As no individual dietary assessment method is completely valid, only relative validity can be measured (Nelson, 1997) and therefore the reference method should have independent error sources (e.g. relying on memory) (Willett, 1998). Each new version of a questionnaire should be validated, as even small changes can affect the results (Cade, Thompson, Burley, & Warm, 2002). Questionnaires should also be validated before they are used in different population groups (e.g. ethnicity, age, culture), as these groups may have differing eating habits (Cade et al., 2002).

1.2 Statement of the problem

Currently there are few validated methods available in NZ that are able to quickly assess eating habits using a qualitative technique. Both the 1997 National Nutrition Survey (NNS) (Ministry of Health, 1999) and ANS (University of Otago & Ministry of Health, 2011a) used a 24-hour recall and FFQ to assess dietary intake. These can be useful to assess actual nutrient intakes, however they cannot be used to assess eating habits. In addition a 24-hour recall and FFQ can place a large burden on both participants and researchers, as they can be time consuming and labour intensive (R. S. Gibson, 2005a; Thompson & Subar, 2013).

To assess eating habits, the ANS (University of Otago & Ministry of Health, 2011a) used a dietary habits questionnaire that was cognitively tested in a small group to assess understanding of questions, but was not specifically validated. The NNS (Ministry of Health, 1999) assessed a few aspects of eating habits at the end of the FFQ. These questionnaires however only assessed eating habits in general and did not focus on those specifically related to obesity and body fatness. Moreover the nutrition surveys did not assess how food intake varies across the day, possibly due to appropriate tools not being available at the time.

To our knowledge only one study conducted in families has assessed food intake across the day in NZ (Health Sponsorship Council, 2007). However face-to-face interviews were used to assess eating habits, which can be time consuming and are not appropriate for larger studies. Furthermore this study had a qualitative design, and did not measure food intake directly.

Another gap is that in NZ eating habits are not assessed very frequently, only when the national surveys are done. The most recent national nutrition survey was conducted in 2008/09 (University of Otago & Ministry of Health, 2011a) and prior to that in 1997 (Ministry of Health, 1999). Given that eating habits can change over time (Oltersdorf et al., 1999; Zizza, Siega-Riz, & Popkin, 2001) they should be assessed more frequently than every decade.

Thus there is a need for a qualitative tool that measures key eating habits that could potentially contribute to obesity and body fatness in NZ women. This tool should be validated, inexpensive, quick to complete and not labour intensive.

1.3 Purpose of the study

To fill this research gap, this study will develop and validate an eating habits questionnaire in NZ women that focuses on habits associated with obesity and body fatness. These include questions on perceptions of weight status, general eating habits associated with healthy/unhealthy eating, low fat alternatives, social occasions, time distribution of meals and snacks and typical foods consumed for meals and snacks.

This research forms part of the larger women's EXPLORE (EXamining the Predictors Linking Obesity Related Elements) study, which looks at a variety of factors associated with women's health, particularly those that contribute to obesity and excess body fat (Kruger et al., 2015).

In the future it is hoped that the questionnaire developed and validated in this study will be used to assess the eating habits of larger groups of NZ women to further understand key habits that contribute to unhealthy eating habits impacting on the high rates of obesity and excess body fatness.

1.4 Aim

To validate a newly developed eating habits questionnaire, which assesses the usual dietary habits of New Zealand women aged 16-45 years living in Auckland, New Zealand.

1.4.1 Objectives

- To develop an eating habits questionnaire for use in New Zealand women aged 16-45 years.
- To investigate the ability of the eating habits questionnaire to reflect usual dietary habits.
- To investigate the ability of the eating habits questionnaire to determine distribution of food intake across the day.
- To investigate the ability of the eating habits questionnaire to determine combinations of foods eaten at each meal.

1.5 Thesis Structure

This thesis will be structured as six chapters. The first chapter, the introduction, shows the importance of conducting this study. In the second chapter available literature is reviewed. The literature review defines what eating habits are, how they contribute to diet quality and aspects of health, determinants of eating

habits (explained through the ecological model) how eating habits are assessed and validated and includes relevant research studies to identify gaps in the literature. Chapter three explains the methods used in conducting the study. The results of the study are described in chapter four. A discussion of the results is provided in chapter five. Finally a summary of the study, along with strengths, limitations and future recommendations as well as application of the ecological model is provided in chapter six.

1.6 Researchers' Contributions

Table 1.1 Researchers' Contributions to the study

Author	**Contribution to the study**
Sarah Philipsen	Designed research, conducted literature review, collected and analysed data, conducted statistical analysis, interpreted results, and main author of thesis manuscript.
Associate Professor Rozanne Kruger	Academic supervisor, applied for ethics, designed research, provided analytical support and reviewed the thesis manuscript.
Dr Kathryn Beck	Academic co-supervisor, designed research, provided analytical support and reviewed the thesis manuscript.
AJ Hepburn	Assisted with entering the food records into FoodWorks and coding and validation of the eating habits questionnaire.
Zara Houston	Assisted with entering the food records into FoodWorks.
Chelsea Symons	Assisted with coding and validation of the eating habits questionnaire.
Wendy O'Brien	Assisted in recruitment and co-ordination of participants.
Shakeela Jayasinghe	Assisted in recruitment and co-ordination of participants.
Beatrix Jones	Assisted with statistical analysis.

Chapter 2: Literature Review

2.1 Eating habits defined

Eating habits are behavioural patterns that become an automatic response after repeat performances (Hunt et al., 1979). They are triggered by situational cues such as the environment we live in, people that influence our lives and previous activities, such as social interactions or activities (Hunt et al., 1979; Neal et al., 2006). Habits tend to require little information for decisions to be made, such that someone's intentions are a poor predictor of their behaviour (van't Riet, Sijtsema, Dagevos, & De Bruijn, 2011). Factors that influence eating habits include environmental conditions, food availability, culture, religion, ethnicity, education, socioeconomic status and psychological needs such as life stage (Kuhnlein & Receveur, 1996; Lowenberg et al., 1974). Along with the timing of food intake, including meals and snacks, eating habits consider other dietary practices such as social occasions and how food is stored, prepared, eaten and disposed of (Oltersdorf et al., 1999).

Eating habits can be assessed from eating habit questionnaires (EHQ). These are useful when only one aspect of the diet (e.g. fruit and vegetable or fibre intake) is investigated (Thompson & Byers, 1994), when qualitative information is required (e.g. usual dietary practices, eating behaviours) (Thompson & Byers, 1994), or in interventions where specific dietary behaviours are targeted (e.g. fat intake) (Kristal, Beresford, & Lazovich, 1994). They are perceived to be quicker and cheaper to complete and analyse than other more traditional dietary assessment methods (Yaroch et al., 2000) and can be used to assess intake over various time periods (e.g. past month or year) (Thompson & Subar, 2013). In addition usual habits may be more accurate and easier to remember (Yaroch et al., 2000). There is potential to use EHQ in clinical settings or in health promotion and education, where they can be used as a crude measure to assess individuals at greater risk for different factors, such as consuming high fat foods (Thompson & Byers, 1994).

Traditionally nutrition studies have focused on the intake of individual nutrients, foods or food groups and how these relate to risk factors or disease (e.g. obesity or cardiovascular disease) (Moeller et al., 2007). Consumers however eat foods in different combinations rather than individual foods and nutrients, and often in a particular pattern or have consistently habitual intakes, and thus eating habits and patterns should also be focused on (Martinez-Gonzalez & Martin-Calvo, 2013; Oltersdorf et al., 1999). Other reasons why examining eating habits and patterns may be more appropriate include: foods are eaten as meals, which contain many nutrients that interact with one another (Moeller et al., 2007; Newby & Tucker, 2004); eating habits are a marker of dietary quality (Kerver et al., 2006; University of Otago & Ministry of Health, 2011a); individual nutrient effects may be too small to measure but cumulative effects from dietary patterns may be large enough to detect (Hu, 2002; Moeller et al., 2007); the analysis of large numbers of nutrients and food groups may be significant by chance (Hu, 2002; Moeller et al., 2007); and dietary patterns may confound the effect of individual nutrients (Hu, 2002; Moeller et al., 2007). Therefore eating habits and dietary patterns are more in line with usual food consumption.

2.2 Eating habits linked with diet quality and poor health outcomes

There are many different factors to consider when addressing the eating habits that contribute to diet quality and ultimately being overweight and/or obese. These include regularity of meal consumption (Kerver et al., 2006), beverage consumption and choices (e.g. sugar sweetened beverages) (Balcells et al., 2011), fast food consumption and choices (Wu & Sturm, 2013), and poor eating behaviours such as high fat foods versus low fat alternatives (Peterson et al., 1999). It is only when these habits are analysed together that a clear picture about eating habits can be formed.

2.2.1 Meal patterns

Although much information is available on average daily nutrient intakes in many different populations, little has been studied on eating patterns or eating habits, such as meals and snacks (Gibney & Wolever, 1997; Holmback et al.,

2003; McNaughton, 2012). As the temporal distribution of food intake varies by country, culture and over time (de Castro, Bellisle, Feunekes, Dalix, & DeGraaf, 1997; Oltersdorf et al., 1999), food intake should be investigated for specific population groups and cannot necessarily be extrapolated to other populations. For example, the Spanish have fairly defined main meal peaks for lunch and dinner, whereas the British eat their main meals throughout the day with less defined peaks. The Spanish also tend to eat later in the day than in British populations (Díaz-Méndez & Callejo, 2014).

Consuming breakfast, lunch and dinner has been associated with a better diet quality (Kerver et al., 2006; O'Neil et al., 2014; Storey et al., 2009). Snack consumption is also associated with an improved diet quality, although excess snacking on poor quality foods can contribute to weight gain (Miller, Benelam, Stanner, & Buttriss, 2013). The results of worldwide studies of eating habits for breakfast, lunch and dinner are shown in Table 2.1, with those from NZ health promotion research in Table 2.2. Worldwide snack intakes are summarised in Table 2.3.

Table 2.1 Common foods eaten by adults for breakfast, lunch and dinner worldwide

Reference and country	Study population	Method	Breakfast	Lunch	Dinner	General intake*
Nicklas, Myers, Reger, Beech, and Berenson (1998) United States of America (USA)	Adults aged 19-28 yrs (n=504)	24-hour diet recall	• Meat (sausages, bacon, salami) • Bread • Eggs • Milk (whole and low fat) • Ready to eat cereal • Biscuits • Fruit juice and drinks • Coffee • Oatmeal	n/a	n/a	n/a
Kearney, Hulshof, and Gibney (2001) The Netherlands	Non-institutionalised, aged 1-97 yrs (n=6,000)	2-day food record	• Bread • Savoury sandwich filling • Sugar, sweets, sweet fillings and sauces	• Bread • Savoury sandwich filling • Cheese • Eggs	• Potatoes • Legumes • Vegetables • Ready made dishes • Meat, meat products, poultry, fish • Soup	n/a
Bellisle et al. (2003)† France	Adults aged 17-58 yrs (n=54)	7-day food record	n/a	n/a	n/a	• Meat • Fish • Dairy • Cheese • Fruit • Rice • Potatoes

Reference and country	Study population	Method	Breakfast	Lunch	Dinner	General intake*
Cho, Dietrich, Brown, Clark, and Block (2003) USA	Adults aged ≥18 yrs from NHANES III (n=16,452)	24-hour diet recall	• Ready to eat cereal (17.1%)‡ • Bread (yeast breads, crackers, pasta, grain mixed dishes) (15.9%) • Quick bread (cake, cookies, pies, pancakes, waffles, French toast) (11.9%) • Meat and eggs (meat, poultry, eggs, legumes, nuts and seeds) (10.9%) • Cooked cereal (cooked cereals and rice) (4.8%) • Dairy products (milk & milk products) (4.6%) • Fruit and vegetables (fruit, vegetables, fruit or vegetable juice) (4.48%) • Fats and sweets (fat, oils, sweets, candy) (4.23%) • Breakfast skippers (no food or beverages, excluding water) (20.1%)	n/a	n/a	n/a
Rousset, Mirand, Brandolini, Martin, and Boirie (2003)§ France	Adults aged 20-30 yrs (n=155) & 65-75 yrs (n=137)	Questionnaire that focused on protein-rich foods consumed at each meal was completed on 7 consecutive days	• Dairy products • Starchy foods (bread, rusks, breakfast cereal, biscuits, pasta, rice, peas, corn, potato, lentils, beans, soy)	• Starchy foods (bread, rusks, breakfast cereal, biscuits, pasta, rice, peas, corn, potato, lentils, beans, soy) • Meat products and fish	• Ready made meals (pizza, quiche, couscous, paella, pot-au-feu (French beef stew), blanquette (French veal ragout)) • Egg	n/a

Reference and country	Study population	Method	Breakfast	Lunch	Dinner	General intake*
Burke, McCarthy, O'Dwyer, and Gibney (2005)¶ Ireland	Adults aged 18-64 yrs (n=958)	7-day food record	• Cereals (bread (white and wholemeal), breakfast cereal, cake, pizza, pita bread) • Dairy (milk (full and reduced fat), cheese, yoghurt, cream and ice cream)	• Cereals (bread (white and wholemeal), breakfast cereal, cake, pizza, pita bread) • Dairy (milk (full and reduced fat), cheese, yoghurt, cream and ice cream) • Cheese and yoghurt • Rice and pasta	• Cereals (bread (white and wholemeal), breakfast cereal, cake, pizza, pita bread) • Dairy (milk (full and reduced fat), cheese, yoghurt, cream and ice cream) • Cheese and yoghurt • Rice and pasta	n/a
Ovaskainen et al. (2006) Finland	Women aged 25-64 yrs (n=1095)	48-hour diet recall	n/a	n/a	n/a	• Meat and fish dishes • Bread • Milk products • Potatoes and cooked vegetables
Van Den Boom et al. (2006)** Spain	Individuals aged 2-24 yrs (n=2852)	24-hour recall and FFQ	• Ready-to-eat cereal consumption associated with greater fruit and dairy (milk and yoghurt) intake	n/a	n/a	n/a
de Castro (2009) USA	Adults, mean age 34.2 (SD 6.2) yrs (n=1,009)	7-day food record	• Milk • Bread • Tea and coffee • Cereal • Fruit juice • Pastry • Fruit	• Bread • Condiments • Other vegetables • Beef • Water • Tea and coffee • Soda	• Other vegetables • Condiments • Bread • Beef • Water • Milk • Soda	n/a
Jaeger, Marshall, and Dawson (2009) Spain	Adults aged 25-49 yrs (n=831)	24-hour diet recall with a focus on meals	• Cereal • Sweet bread or morning bakery foods • Hot drinks	• Hot meat • Hot carbohydrate • Vegetables	• Hot meat • Hot carbohydrate • Vegetables	n/a

FFQ: Food frequency questionnaire; NHANES: National Health and Nutrition Examination Survey; NZ: New Zealand; n/a: not applicable; SD: standard deviation; United States of America: USA; yrs: years

*: When main meal periods were not differentiated between; †: Foods consumed for different main meals were not distinguished between; ‡: Percentage of consumers in each group; §: Focused on protein consumption; Common foods are provided for the meal period younger women consumed the greatest percentage of protein; ¶: Focused on intake of cereal and dairy products; **: Grouped individuals according to intake of ready-to-eat cereals

Table 2.2 Food intake throughout the day and week in New Zealand families from health promotion research (Health Sponsorship Council, 2007)

Day	Breakfast	Lunch	Dinner	Snacks
Weekday	• Cereal and milk • Toast • Tea and coffee • Pie • Fruit • Leftovers	• Leftovers • Packed lunch (e.g. sandwiches, fruit, yoghurt, vegetables (e.g. carrot sticks or grated carrot, tomato, sprouts and may be part of a sandwich)) • Bought lunch such as from a café, bakery or takeaways (e.g. KFC, pies, Subway, hot chips, Thai food) • Sandwich or snack (e.g. bread and banana) with tea or coffee	• Home cooked meals (e.g. may contain meat, potatoes, rice, pasta) • Home assembled meals - packaged or convenience foods and likely include vegetables • Takeaways (e.g. fried or fatty foods such as fish and chips, burgers, KFC and McDonalds) • Vegetables were mostly consumed for dinner	• Fruit (often as part of a packed lunch or for dessert) • Vegetables • Treat foods - chocolate, lollies, biscuits, chips, soft drink • Soft drinks – great variation between families, from being the main beverage between meals to being consumed occasionally

Weekends	• Cereal and milk
	• Toast
	• Tea and coffee
	• Pancakes
	• Eggs on toast
	• May go out for breakfast/brunch (e.g. McDonalds, at a café, local bakery, mall food-court)
		• More treat foods e.g. soft drinks, sweet foods, takeaways
		• May be similar to rest of week
		• May be replaced by brunch
		• Vegetables may be included as part of lunch, although was more common in summer when salad vegetables were more in season
		• Saturday
		  ○ Leftovers
		  ○ What was in fridge/cupboard (e.g. bread with ham, salad, baked beans, eggs)
		  ○ Going out
		  ○ Takeaways
		  ○ Special bread
		• Sunday
		  ○ Variation of Saturday lunch
		  ○ May consist of what was available in the fridge or cupboard
		  ○ Takeaways
		  ○ Often a cooked meal e.g. roast and pudding
		  ○ Pākehā - roast with dessert
		  ○ Māori - roast with dessert, barbeque
		  ○ Pacific - traditional foods (lots of carbohydrate and meat with few vegetables)
			• May be similar to weekdays
			• May consist of smaller and simpler meals (e.g. instant noodles, eggs on toast, macaroni cheese, toasted sandwiches), especially if a large lunch had been eaten, such as on Sundays
			• May lack vegetables (apart from potato)
			• More takeaways than weekdays
				• Fruit (often for dessert, or an 'any-time' snack), although less consumed than weekdays
				• Vegetables
				• Treat foods particularly consumed after dinner (e.g. chocolate, lollies, biscuits, chips, soft drink)
				• Don't differentiate between weekdays and weekends

2.2.1.1 Breakfast

Breakfast consumption has many benefits such as greater mental alertness, a feeling of fullness and sustained energy levels (Benton & Parker, 1998; Holt, Delargy, Lawton, & Blundell, 1999). Perceived benefits include increased concentration and attention span (Reddan, Wahlstrom, & Reicks, 2002). Reasons for poor breakfast habits or not eating breakfast include no time, not being hungry and not feeling like breakfast (Reddan et al., 2002; Shaw, 1998). Other less common reasons include not liking the food available and wanting to lose weight (Shaw, 1998). Although daily energy intake tends to be higher in breakfast consumers, it had been found that women who eat breakfast are less likely to be overweight (Song, Chun, Obayashi, Cho, & Chung, 2005). Skipping breakfast has also been associated with poorer eating habits, including snacking during the rest of the day (Mullie et al., 2006; Sjöberg, Hallberg, Höglund, & Huithén, 2003) and eating later in the day (Berg et al., 2009).

Many studies have focused on comparing breakfast skippers with those who eat breakfast (S. A. Gibson & Gunn, 2011; Nicklas et al., 1998; Shaw, 1998). The proportion of people who skip breakfast varies greatly worldwide, from 1.7% in Croatia to 30% in Brazil (Mullan & Monika, 2010), with differences due to factors such as culture, ethnicity, education and socioeconomic status (Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003; Moy et al., 2009). In NZ 69.1% of women ate breakfast daily in the 2008/09 Adult Nutrition Survey (ANS), with 13% having it zero to two times a week (University of Otago & Ministry of Health, 2011a). Although comparing breakfast skippers with consumers is important, the types of foods consumed and the nutritional quality should also be assessed (McCrory & Campbell, 2011). Indeed, overall dietary quality tends to be improved with regular breakfast consumption (Timlin & Pereira, 2007). Skipping breakfast has also been associated with an increased risk of obesity (Goto, Kiyohara, & Kawamura, 2010; Timlin & Pereira, 2007; Van Der Heijden, Hu, Rimm, & Van Dam, 2007)

Various studies have found breakfast cereals and bread are commonly consumed for breakfast (Burke et al., 2005; Cho et al., 2003; de Castro, 2009;

Jaeger et al., 2009; Kearney et al., 2001; Nicklas et al., 1998; Van Den Boom et al., 2006), as shown in Table 2.1. Other common foods include meat (Bellisle et al., 2003; Cho et al., 2003; Nicklas et al., 1998) and eggs (Cho et al., 2003; Nicklas et al., 1998). A study of Spanish 2-24 year olds found greater consumption of ready-to-eat cereal was associated with a higher intake of fruit and dairy from milk and yoghurt in females (Van Den Boom et al., 2006). This is not surprising, as ready-to-eat cereals are often consumed with milk or yoghurt. Similar to other studies Bellisle et al. (2003) found the consumption of dairy and fruit was higher for main meals, although they did not distinguish between breakfast, lunch and dinner. Ovaskainen et al. (2006) also found bread and milk products contributed large amounts of daily energy intake to main meals, although they did not look at breakfast separately.

One qualitative study conducted in NZ on parents and caregivers for health promotion and social marketing purposes found on weekdays breakfast tended to be eaten more quickly than at weekends, with common foods including breakfast cereal, toast and fruit (Health Sponsorship Council, 2007). At weekends a greater range of foods were eaten (e.g. cooked foods such as eggs or pancakes) and breakfast and lunch may be replaced by brunch.

2.2.1.2 Lunch

Several studies have investigated foods commonly consumed for lunch, or in the afternoon (Burke et al., 2005; de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001; Rousset et al., 2003) (see Table 2.1). Common foods consumed include bread (Burke et al., 2005; de Castro, 2009; Kearney et al., 2001; Rousset et al., 2003), meat (de Castro, 2009; Jaeger et al., 2009; Rousset et al., 2003), vegetables (de Castro, 2009; Jaeger et al., 2009), carbohydrates such as rice and pasta (Burke et al., 2005; Jaeger et al., 2009) and dairy products (e.g. cheese) (Burke et al., 2005; Kearney et al., 2001). Similar to other studies, Bellisle et al. (2003) found meat, fish and rice were commonly consumed by French adults for main meals, although they did not specifically mention foods more common for lunch. Another study found meat and fish dishes, bread, milk products, potatoes and cooked vegetables contributed the most energy to main meals, although they also did not look at lunch separately (Ovaskainen et al.,

2006). In Irish adults Burke et al. (2005), who focused on cereal and dairy consumption, showed foods consumed for lunch were similar to breakfast, although cheese and yoghurt intake was highest at lunch, with a smaller intake for rice and pasta. In the United States of America (USA) de Castro (2009) found consuming tea, coffee and water in the afternoon was associated with lower overall daily intake; and consuming beef, condiments and soda was associated with greater overall daily energy intake. One study investigated how protein-rich foods vary throughout the day in younger (20-30 yrs) and older (65-75 yrs) French adults (Rousset et al., 2003). In the younger women more protein was obtained from meat products, fish and starchy foods at lunch than at dinner.

In NZ the Health Sponsorship Council (2007) found a variety of lunches were eaten on weekdays such as sandwiches, leftovers or a bought lunch from a café (see Table 2.2). On weekends this could be similar to weekdays or might differ depending on the routine, such as having lunch out. Sunday lunches were often a social occasion and may be the main cooked meal of the day, with a smaller meal eaten in the evening.

2.2.1.3 Dinner

Various studies have investigated foods commonly consumed for dinner or in the evening in adults (Burke et al., 2005; de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001; Rousset et al., 2003). Common foods consumed included meat (de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001), vegetables (de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001), ready made dishes (Kearney et al., 2001; Rousset et al., 2003) and carbohydrates such as rice, pasta, bread, potatoes and legumes (Burke et al., 2005; Jaeger et al., 2009). In American adults foods consumed in the evening was similar to the afternoon (de Castro, 2009). Burke et al. (2005) found in Irish adults that, in contrast to lunch, pasta and rice intake was highest during the early evening, with a smaller intake for cheese and yoghurt. Similar to lunch, Jaeger et al. (2009) found hot meat, carbohydrates and vegetables were commonly consumed for dinner. In young French women, Rousset et al. (2003) found more protein was obtained from ready made meals (e.g. pizza, quiche, paella) and eggs at dinner

than at lunch. Two studies looked at main meals overall rather than differentiating between breakfast, lunch and dinner (Bellisle et al., 2003; Ovaskainen et al., 2006). Common foods that were consumed for main meals in these studies were similar to foods eaten for dinner in other studies previously mentioned. In French adults these were meat, fish, rice and potatoes (Bellisle et al., 2003); and in Finnish adults these were meat and fish dishes, bread, milk products, potatoes and cooked vegetables (Ovaskainen et al., 2006).

The one study that was identified in NZ found the majority of the time dinner was the main meal of the day for parents and caregivers, and involved meals cooked from scratch, packaged food, convenience foods or takeaways (Health Sponsorship Council, 2007). However results are not directly comparable with food intake data, as this study used a qualitative design.

2.2.1.4 Snacks

Studies that investigated common snack foods are presented in Table 2.3.

Table 2.3 Common snack foods eaten worldwide

Reference and country	**Study population**	**Method**	**Snacks**

Basdevant, Craplet, and Guy-Grand (1993)
 	
France
	Women >18 yrs (n=273), obese	Diet history	• Morning
			  ○ SSB
			  ○ Cheese, pork or beef
			• Afternoon
			  ○ Bread with cheese, meat, jam or chocolate
			  ○ Cookies, pastry, viennoiserie (sweet meats)
			• Evening
			  ○ Sweets, jam, sugar, honey
			  ○ Fruit
			  ○ Chocolate
			  ○ Ice cream or dessert
			  ○ Dairy products

Kearney et al. (2001) The Netherlands	Non-institutionalised individuals aged 1-97 yrs (n=6,000)	2-day food record	• Fruit

Reference and country	Study population	Method	Snacks
Zizza et al. (2001) USA	Adults aged 19-29 yrs from national surveys (n=8,493 which consisted of 4,472 from 1977-78; 2,373 from 1989-91; and 1,648 from 1994-96	24-hour recall and 2-day food record (1977-78 and 1989-91) or 2 non-consecutive 24-hour recalls (1994-96)	• Dessert - gelatin desserts, ice cream, apple pie, cookies, cakes • SSB - regular and diet varieties, and fruit drinks • Alcohol - beer, liquor, wine • Milk - skim and whole fat • Salty snacks - potato chips, saltines, puffed rice cakes, air popped popcorn
Bellisle et al. (2003) France	Adults aged 17-58 yrs (n=54)	7-day food record	• Sweets • Cereal bars • Biscuits • SSB
Rousset et al. (2003) France	Adults aged 20-30 yrs (n=155) & 65-75 yrs (n=137)	Questionnaire that focused on protein-rich foods consumed at each meal was completed on 7 consecutive days	• Dairy products (e.g. milk, yoghurt, hard and soft cheese)
Burke et al. (2005)* Ireland	Adults aged 18-64 yrs (n=958)	7-day food record	• Cakes – cakes, pastries, buns, scones, biscuits
Ovaskainen et al. (2006) Finland	Women aged 25-64 yrs (n=1,095)	48-hour dietary interview	• Tea and coffee • Milk products • Bread • Fruit and fresh vegetables • Sweet bakery goods • Sweets and chocolate
Duffey, Pereira, and Popkin (2013)† Brazil	Individuals ≥10 yrs (n=34,003)	2-day non-consecutive food record	Most popular snacks for 19-39 yrs (n=13,849): • Sweetened tea and coffee • SSB • Sweets and desserts • Fruit • Fried or baked dough with meat, cheese or vegetables

S. Gibson and Shirreffs (2013)
 	
UK
	Adults aged 19-64 yrs (n=1724)	7-day weighed food record, with a focus on beverage consumption	Beverage consumption peaked at the following periods:
			• Morning
			  ○ Hot beverages and milk
			• Evening
			  ○ Alcohol

SSB: Sugar Sweetened Beverages; UK: United Kingdom; USA: United States of America
*: Focused on cereal and dairy products; †: Common snacks are only shown for the 19-39 age group

Several studies found popular snack foods were fruit (Basdevant et al., 1993; Duffey et al., 2013; Kearney et al., 2001; Ovaskainen et al., 2006); sugar-sweetened beverages (SSB) (Basdevant et al., 1993; Bellisle et al., 2003; Duffey et al., 2013; Zizza et al., 2001); dairy products (Basdevant et al., 1993; Ovaskainen et al., 2006; Rousset et al., 2003; Zizza et al., 2001); tea and

coffee (Duffey et al., 2013; Ovaskainen et al., 2006); and bakery items, sweets, dessert or chocolate (Basdevant et al., 1993; Bellisle et al., 2003; Burke et al., 2005; Duffey et al., 2013; Ovaskainen et al., 2006; Zizza et al., 2001). Snacking throughout the day has also been found for fruit (Kearney et al., 2001), cake (Burke et al., 2005) and dairy products (Rousset et al., 2003). Basdevant et al. (1993) investigated snack foods commonly consumed throughout the day in French women. In the morning cheese, pork, beef and SSB were common; in the afternoon, bread with cheese, meat, jam or chocolate and cookies or pastry was common; and in the evening sweets, fruit, chocolate, ice cream or dessert and dairy products were common. Various beverages are consumed at different times of the day, such as hot beverages (tea and coffee) and milk largely consumed in the morning, and alcohol in the evening in British adults (S. Gibson & Shirreffs, 2013). A qualitative study conducted in NZ, for social marketing purposes, also found parents and caregivers mainly snacked after dinner on treat foods such as chocolate, lollies, biscuits and chips (Health Sponsorship Council, 2007).

Certain time periods also appear to be more popular for snacks, as several studies have found snacks are more commonly consumed in the afternoon and early evening (Basdevant et al., 1993; Duffey et al., 2013; Ovaskainen et al., 2006). Although these studies provide information on popular snacks, these snacks do not necessairly contribute the most energy, as seen in young Brazilians where sweetened tea and coffee were most common, yet sweets and desserts contributed the most energy (Duffey et al., 2013). Ovaskainen et al. (2006) similarly found tea and coffee were the most common snack items, yet other snack foods contributed more energy (e.g. sweet bakery foods, bread, milk products, sweets and chocolate). In young American adults there has been a change in snack foods consumed over time, with salty snacks, alcoholic beverages and SSB contributing more energy, and desserts and milk contributing less energy to snack intake (Zizza et al., 2001).

Due to the limited information on the distribution of food intake in pre-menopausal women, further studies are required specific to this population group and in different cultures within NZ.

2.2.1.5 Distribution of food intake across the week

Several studies have investigated how food intake varies throughout the week (Burke et al., 2005; S. Gibson & Shirreffs, 2013; Jaeger et al., 2009; Jula, Seppänen, & Alanen, 1999; O'Dwyer, McCarthy, Burke, & Gibney, 2005). In Irish adults intake of white bread, total cereal, full-fat milk and total dairy was lower at the weekend (Burke et al., 2005). O'Dwyer et al. (2005) found in the same group of women that common sources of fat throughout the week were chips, fresh meat and cream, ice cream and desserts. Different foods were commonly eaten on weekdays (butter, biscuits, cakes, pastries, meat dishes and whole milk) and at weekends (meat products, vegetables and vegetable dishes, savoury snacks and fruit, juices and nuts). In Finns, Jula et al. (1999) found the intake of meat and meat products was greatest on Saturday. In Spanish adults the proportion of meals containing yoghurt, fruit, water and hot drinks was higher on weekdays whilst hot carbohydrate dishes and alcohol intake was higher on weekends (Jaeger et al., 2009). Beverage intakes also varied across the week, where more alcohol was consumed on Friday and Saturday by British adults (S. Gibson & Shirreffs, 2013).

2.2.2 Distribution of energy and macronutrients throughout the day

Although many studies have investigated daily average intakes of individual nutrients, limited information is available on the temporal distribution of nutrients (Gibney & Wolever, 1997; Holmback et al., 2003). The nutrient composition and thus macronutrient composition of both meals and snacks should be investigated, as these are likely to be physiologically important (Gatenby, 1997). For example some aspects of physiology show a circadian rhythm where they change throughout the day (e.g. hormonal responses to food, gastric emptying and intestinal blood flow) (Dattilo, Crispim, Zimberg, Tufik, & de Mello, 2011; Holmback et al., 2003).

2.2.2.1 Recommendations for daily macronutrient composition

In NZ, the Acceptable Macronutrient Distribution Range (AMDR) is an estimate of the macronutrients required as a percentage contribution of energy for individuals (NHMRC, 2006). Intakes in these ranges allow adequate intakes of

all other nutrients, while maximising general health outcomes (NHMRC, 2006). When the intake of one macronutrient is altered, the others must be adjusted to compensate, otherwise total energy may be reduced or increased. The AMDRs for NZ are shown in Table 2.4.

Table 2.4 Acceptable Macronutrient Distribution Ranges (NHMRC, 2006)

Macronutrient	AMDR*
Carbohydrate	45-65%
Protein	15-25%
Fat	20-35%
Saturated fat and trans fat	≤10%

*AMDR: Acceptable Macronutrient Distribution Range

While the AMDR suggests the proportion of energy each macronutrient should provide to daily energy intake, there are no international recommendations for how energy or macronutrients should be distributed throughout the day, or the time of day food should be eaten (Almoosawi, Winter, Prynne, Hardy, & Stephen, 2012; Fayet, Mortensen, & Baghurst, 2012). Sweden (Barbieri & Lindvall, 2003) and the United Kingdom (Food Standards Agency, 2007) provide recommendations on the temporal distribution of energy (Table 2.5) with suggested energy intakes ranging from 20-35% of energy for all meals. Alcohol consumption does not alter the distribution of energy. These countries also recommend that two to three snacks should be consumed daily, utilising 20% of daily energy intake, with 7-10% of energy consumed for each snack.

Table 2.5 Country guidelines for energy distribution at meals and snacks

Reference	Country	Breakfast	Lunch	Dinner	Snacks
Barbieri and Lindvall (2003)	Sweden	20-25%*	25-35%	25-35%	20%
Food Standards Agency (2007)	United Kingdom	20%	30%	30%	20%

*Percentage of daily energy intake

2.2.2.2 Distribution of energy and macronutrients in pre-menopausal women

Meal and snack patterns are a marker of diet quality (Kerver et al., 2006) and may contribute to excess body weight (Mesas, Munoz-Pareja, Lopez-Garcia, & Rodriguez-Artalejo, 2012). As previously mentioned there are no international guidelines on how energy and macronutrients should be distributed throughout

the day (Almoosawi et al., 2012). A limited number of studies have investigated the temporal distribution of energy and macronutrients in pre-menopausal women, although none were conducted in NZ women. Results from the identified studies are discussed below.

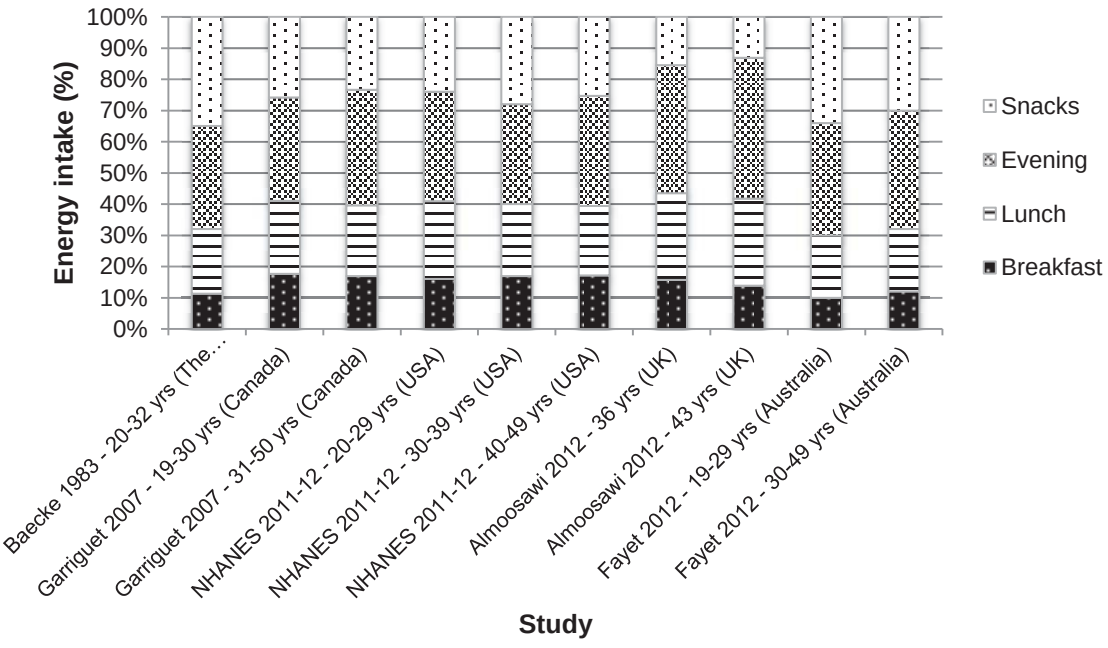
In most studies energy intake increased throughout the day for main meals, with the least energy consumed for breakfast and the most for dinner (Almoosawi et al., 2012; de Castro, 1987; Fayet et al., 2012; United States Department of Agriculture, 2014c) (see Table 2.6 and Figure 2.1). In contrast to this, energy intake for Malaysian women has been shown to be more evenly distributed throughout the day (Zalilah et al., 2008).

Table 2.6 Studies investigating the distribution of energy and macronutrients in pre-menopausal women

Reference and Country	Aim	Method	Subjects	Main results
de Castro (1987) USA	Circadian rhythms of meal patterns and macronutrient intake	9-day food record	Female undergraduate students aged 18-41 years (n=30)	• Less food eaten in the morning which was mainly carbohydrate • Energy intake increased over the day for main meals
Zalilah et al. (2008) Malaysia	Investigate the percentage of daily energy intake from meals and the afternoon snack in Malaysian adults	24-hour recall from the NNS	Women aged 18-59 yrs (n=3415)	Median energy intakes are shown for each meal for ages 18-49 yrs: • Morning: 29.4-30.1%% • Lunch: 30.8-31.5% • Afternoon tea: 30.6-34.8% • Dinner: 16.7-18.7%
Dattilo et al. (2011) Brazil	Meal distribution and its relation to body composition	3-day estimated food record	Healthy, sedentary women aged 20-45 yrs (n=28)	• Energy intake higher in the afternoon and night than morning • Carbohydrate intake higher in the afternoon than morning • Protein intake higher in the afternoon than at night • Fat intake higher in afternoon and night than morning
Almoosawi et al. (2012) UK	Distribution of energy and macronutrients across the day and over time in a birth cohort	5-day estimated food records	Women from a birth cohort (n=691) Data was obtained at ages 36, 43 and 56 yrs	• From 36 to 43 years the percentage of energy from protein, carbohydrate and fat obtained from breakfast decreased with a resultant increase in the evening meal • Protein, carbohydrate and fat intake as a percentage of energy increased over the day for main meals

Reference and Country	Aim	Method	Subjects	Main results
Fayet et al. (2012) Australia	Distribution of energy in relation to age, gender and BMI from a NNS	24-hour recall from the 1995 NNS	Females aged 19-49 yrs (n=5570)	• Energy intake peaked during breakfast (0600-0900), lunch (1200-1400) and dinner (1700-2030) • Smaller peaks for snacks between 0900-1200, 1400-1700 and 2030 onwards • The most energy was obtained from dinner • As age increased more energy was obtained from main meals and less from snacks
Leblanc et al. (2012)	Association between eating patterns, dietary intake and eating behaviours	3-day weighed food record	Pre-menopausal overweight and obese women aged 28-51 yrs (n=143)	• Proportion of energy consumed at breakfast was negatively associated with total energy, protein and fat intake • Proportion of energy from snacks and snacks consumed after 5pm was positively associated with energy, carbohydrate and fat intake

NNS: National Nutrition Survey; UK: United Kingdom; USA: United States of America; yrs: years



UK: United Kingdom; USA: United States of America

Figure 2.1 Distribution of energy intake in pre-menopausal women (adapted from (Almoosawi et al., 2012; Baecke, Vanstaveren, & Burema, 1983; Fayet et al., 2012; Garriguet, 2007; United States Department of Agriculture, 2014a, 2014b, 2014d, 2014e))

Several studies have investigated macronutrient intakes for meal and snack periods as a proportion of the total intake for that specific macronutrient (Almoosawi et al., 2012; United States Department of Agriculture, 2014a, 2014b, 2014d, 2014e). Carbohydrate intakes are presented in Figure 2.2, protein intakes in Figure 2.3 and fat intakes in Figure 2.4.

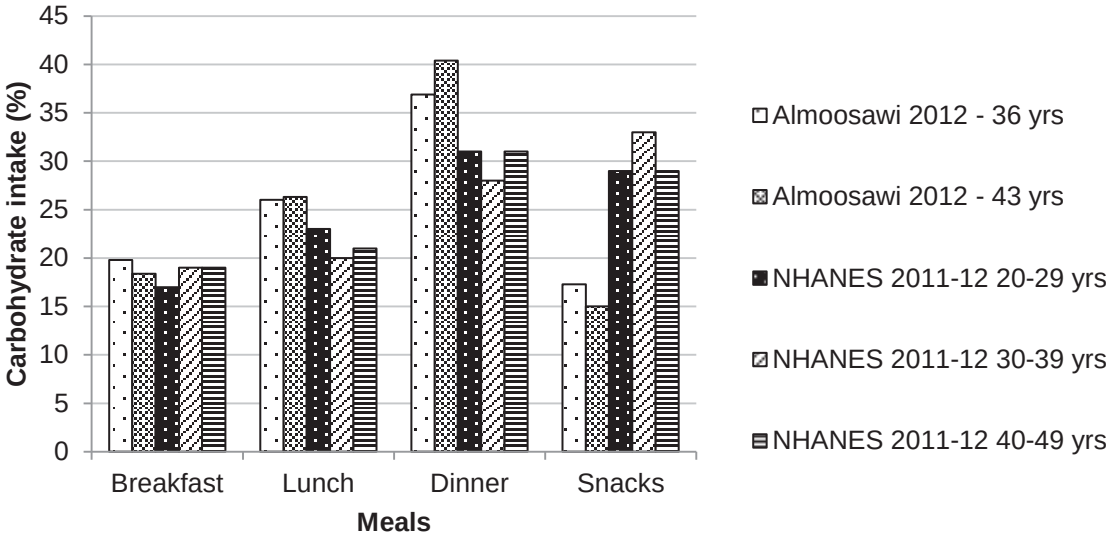


Figure 2.2 Distribution of carbohydrate intake in pre-menopausal women (adapted from (Almoosawi et al., 2012; United States Department of Agriculture, 2014a, 2014b, 2014d, 2014e))

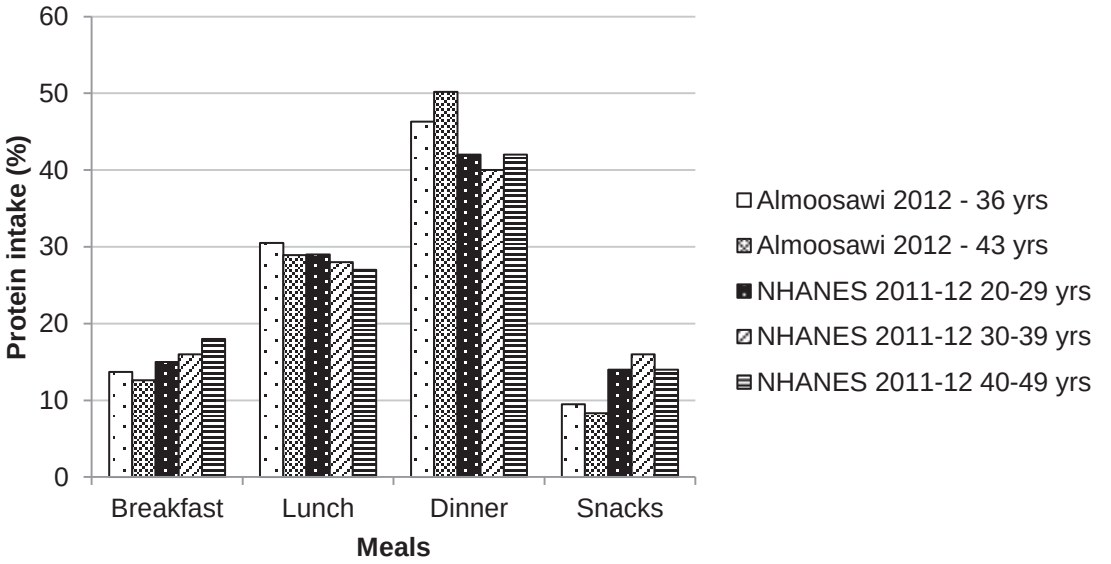


Figure 2.3 Distribution of protein intake in pre-menopausal women (adapted from (Almoosawi et al., 2012; United States Department of Agriculture, 2014a, 2014b, 2014d, 2014e))

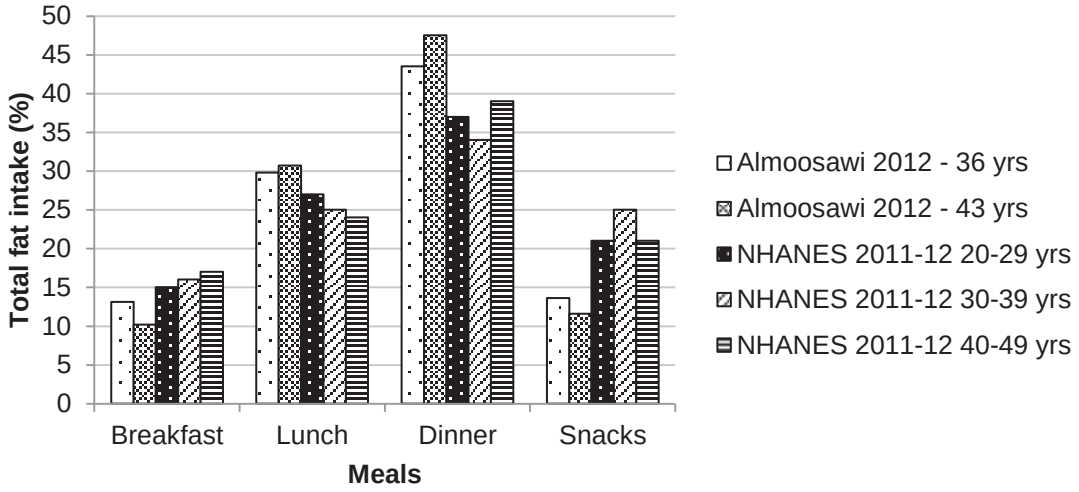


Figure 2.4 Distribution of total fat intake in pre-menopausal women (adapted from (Almoosawi et al., 2012; United States Department of Agriculture, 2014a, 2014b, 2014d, 2014e))

Similar to energy intakes, carbohydrate, protein and fat intakes were lowest at breakfast and highest at dinnertime. Another study similarly found fat intake was higher in the afternoon and night than morning, carbohydrate intake was higher in the afternoon than morning and protein intake was greater in the evening (Dattilo et al., 2011) (see Table 2.6). Leblanc et al. (2012) also found an inverse association between energy from breakfast and total energy, protein and fat intake. Several studies have also found energy intake from snacks was greater than energy intakes from breakfast and lunch (Baecke et al., 1983; Fayet et al., 2012; Garriguet, 2007; United States Department of Agriculture, 2014e), with snacks consumed in the afternoon tending to contribute the most energy (Almoosawi et al., 2012; Fayet et al., 2012; Zalilah et al., 2008).

No studies were identified in pre-menopausal women that investigated how energy and macronutrient distribution vary throughout the day on weekdays compared to weekends.

2.2.3 General eating habits

In addition to meal patterns, the assessment of eating habits also considers other habits including beverage and fast food consumption and low fat alternative food choices. These have been investigated internationally and in

NZ from the NNS and ANS, with results discussed below. Key results from the NZ NNS and ANS are summarised in Table 2.7.

Table 2.7 Eating habits of New Zealand women from the NNS and ANS

	National Nutrition Survey		
Habit Question	**1997 NNS**	**2008/09 ANS**	**Notes**
Energy intake	7701 kJ Major sources: • Bread (12.0%) • Potatoes, kumara and taro (7.0%) • Fruit (6.0%) • Milk (6.0%) • Butter and margarine (6.0%) • Grains and pasta (3.0%)	7448 kJ Major sources: • Bread 10.6%) • Potatoes, kumara and taro (6.3%) • Fruit (6.3%) • Milk (5.2%) • Butter and margarine (3.0%) • Grains and pasta (6.6%)	Sources are shown as the percentage contribution to total energy; assessed using 24-hour recall
Carbohydrate intake	47.0% Major sources: • Bread (21.0%) • Fruit (10.0%) • Non-alcoholic (10.0%) beverages • Potatoes, kumara and taro (9.0%) • Sugar and sweets (8.0%) • Grains and pasta (5.0%)	47.1% Major sources: • Bread (16.5%) • Fruit (10.4%) • Non-alcoholic beverages (8.3%) • Potatoes, kumara and taro (8.2%) • Sugar and sweets (6.9%) • Grains and pasta (8.9%)	Percentage contribution to total energy; sources are shown as the percentage contribution to total carbohydrate; assessed using 24-hour recall
Protein intake	16.0% Major sources: • Beef and veal (12.0%) • Bread (11.0%) • Milk (11.0%) • Poultry (8.0%) • Fish and seafood (7.0%) • Grains and pasta (3.0%)	16.5% Major sources: • Beef and veal (7.3%) • Bread (10.7%) • Milk (9.4%) • Poultry (8.8%) • Fish and seafood (6.3%) • Grains and pasta (6.6%)	Percentage contribution to total energy; sources are shown as the percentage contribution to total protein; assessed using 24-hour recall
Fat intake	35.0% Major sources: • Butter and margarine (16.0%) • Cakes and muffins (7.0%) • Potatoes, kumara and taro (6.0%) • Milk (6.0%) • Beef and veal (5.0%) • Poultry (4.0%)	33.8% Major sources: • Butter and margarine (9.0%) • Cakes and muffins (4.9%) • Potatoes, kumara and taro (6.0%) • Milk (5.1%) • Beef and veal (3.7%) • Poultry (5.5%)	Percentage contribution to total energy; sources are shown as the percentage contribution to total fat; assessed using 24-hour recall
Alcohol intake	3.0%	3.2%	Percentage contribution to total energy; Mean intake; assessed using 24-hour recall
Saturated fat intake	15.0%	13.1%	Percentage contribution to total energy; assessed using 24-hour recall
How many days weekly do you eat Breakfast?		7 days: 69.1% 3-6 days: 17.9% 0-2 days: 13.0%	Assessed using DHQ
What type of bread, rolls or toast do you eat most of?		Light grain: 52.2% White: 26.1% Heavy grain: 13.7% High fibre white: 4.3% Other: 3.5%	Assessed using DHQ

	National Nutrition Survey		
Habit Question	**1997 NNS**	**2008/09 ANS**	**Notes**
What type of milk do you use most of?	Standard: 54% Trim: 27%	Reduced fat: 20.2% Skim or trim: 31.7% Whole: 38.4% Soy: 3.4% None: 5.0%	Assessed using DHQ
How often do you have red meat?	At least once a week: 51%	Never/not in past 4 weeks: 6.6% <1 per weekly: 5.3% 1-2 times weekly: 31.1% 3-4 times weekly: 43.8% 5+ times weekly: 13.2%	For 1997 the result shown is for beef/veal; Assessed using DHQ
How often do you have chicken?	At least once a week: 44%	Never/not in past 4 weeks: 5.8% <1 time weekly: 8.3% 1-2 times weekly: 55.1% 3-4 times weekly: 26.1% 5+ times weekly: 4.7%	Assessed using DHQ
How often do you remove excess fat from meat?	Always and often: 72% Occasionally: 27% Never: 5%	Regularly and always: 67.4% Sometimes: 14.6% Never and rarely: 18.0%	Assessed using DHQ
How often do you remove the skin from chicken?	Always and often: 49% Occasionally: 28% Never: 23%	Regularly and Always: 53.5% Sometimes: 15.1% Never and rarely: 31.4%	Assessed using DHQ
What type of butter or margarine do you use the most of?	Butter: 47% Polyunsaturated margarines: 47% Butter and margarine blend: 11% Praise/Olivio: 11% Low salt margarine: 8% Reduced fat margarine: 3%	Full fat margarine: 33.8% Light margarine: 30.5% Butter: 20.1% None: 7.7% Plant sterol: 4.5% Butter blend: 3.5%	In 1997 answers are provided for the 90% of women who used a spread on their bread and crackers; Assessed using DHQ
What type of fat or oil do you use most often when cooking?	Other oils (e.g. sunflower, corn oil, safflower): 50%/46% Olive/canola oil: 38%/36% Butter: 18%/15% Lard: 15%/18% Margarine: 10%/5%	Oil: 90.1% No oil or fat: 2.7% Margarine: 2.1%	Assessed using DHQ; In 1997 70% of women had meat or chicken and 68% of women had vegetables fried or roasted in fat or oil, results are shown for these women respectively
How often do you choose low or reduced-fat varieties of food instead of the standard variety?		Regularly and Always: 43.4% Sometimes: 26.3% Never and rarely: 30.3%	Assessed using DHQ
How often do you eat fast food or takeaways from places like McDonalds, KFC, Burger King, pizza shops or fish and chip shops?	Meat pies, sausage rolls and other savoury pastries: 15% Hamburgers: 11% Pizza: 7%	Never or less than once a week: 71.9% 1-2 times weekly: 24.3% 3-4 times weekly: 2.9% 5+ times weekly: 0.9%	In 1997 values are shown for specific fast foods that were consumed at least once a week; Assessed using FFQ in 1997; Assessed using DHQ in 2008/09
How often do you eat hot chips, French fries, wedges, or kumara chips?	At least once per week: 42%	Never or less than once a week: 64.9% 1-2 times weekly: 30.8% 3-4 times weekly: 3.6% 5+ times weekly: 0.7%	Assessed using FFQ in 1997; Assessed using DHQ in 2008/09
How often do you drink fruit juices and drinks?	Regularly for fruit juice: 25% Regularly for fruit drinks: 3%	Never or less than once a week: 46.9% 1-2 times weekly: 18.7% 3-4 times weekly: 13.6% 5+ times weekly: 20.9%	Regularly in 1997 = 3 or more times weekly; responses were not provided separately for fruit juice and drinks in 2008/09; Assessed using FFQ in 1997; Assessed using DHQ in 2008/09
How often do you drink soft drinks?	Regularly: 18%	Never or less than once a week: 65.3% 1-2 times weekly: 17.3% 3-4 times weekly: 8.2% 5+ times weekly: 9.2%	Regularly in 1997 = 3 or more times weekly; Assessed using FFQ in 1997; Assessed using DHQ in 2008/09; Included energy drinks in 2008/09
How often do you eat lollies, sweets, chocolate and confectionary?	At least once a week: Chocolate: 33% Other confectionary: 33%	Never or less than once a week: 37.1% 1-2 times weekly: 30.5% 3-4 times weekly: 16.7% 5+ times weekly: 15.6%	Assessed using FFQ in 1997; Assessed using DHQ in 2008/09

	National Nutrition Survey		
Habit Question	**1997 NNS**	**2008/09 ANS**	**Notes**
How would you describe your eating pattern?	Regular (i.e. include animal products): 93% Avoid meats except chicken: 3% Lacto-ovo-vegetarian: 1% Vegan: 1% Other: 2%		Assessed using DHQ
Are you trying at present to make any changes to your choice of foods?	Yes: 41% Fruit: 15% Vegetables: 18% High fat foods: 27%		Food examples provided are the foods that those who answered yes are trying to change, mainly in a positive way

Adapted from: (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a)
ANS: 2008/09 New Zealand Adult Nutrition Survey; DHQ: Dietary habits questionnaire; FFQ: Food frequency questionnaire; NNS: 1997 National Nutrition Survey

2.2.3.1 Beverage consumption

Beverages are vital for fluid intake, with water being the most important fluid. In NZ the adequate intake from water for women is 2.8 L from both food and beverages and 2.1 L (approximately 8 cups) from fluids only, including water, milk and other drinks (NHMRC, 2006). Consumption of other beverages such as sugar sweetened beverages (SSB), fruit drinks and fruit juice is increasing and possibly replacing more nutritious beverages such as milk (Harnack, Stang, & Story, 1999). Non-diet carbonated beverages, fruit drinks and iced tea are included under SSB (Malik, Schulze, & Hu, 2006) and are a major dietary source of added sugar (Guthrie & Morton, 2000). Non-alcoholic beverages, including juice, cordial, soft drinks, sports drinks and energy drinks, contributed 15.9% of total sugar intake to the diets of NZ women in 2008/09 (University of Otago & Ministry of Health, 2011a).

Worldwide, energy intakes from fruit juice and energy drinks have increased over the last 25 years, and are similar to NZ intakes (S. Gibson, Gunn, & Maughan, 2012). The energy obtained from SSB and the percentage of people who consume them has also increased in recent years, and appears to contribute to weight gain (Enns, Goldman, & Cook, 1997; Ludwig, Peterson, & Gortmaker, 2001; Vartanian, Schwartz, & Brownell, 2007). In NZ the NNS and ANS showed in women fruit juice and fruit drink consumption on ≥3 days weekly increased from 25.0% and 3.0% respectively in 1997 (Ministry of Health, 1999), to 34.5% for both in 2008/09 (University of Otago & Ministry of Health, 2011a). The intake of SSB in women in 1997 on ≥3 days weekly was similar to the intake of soft drinks and energy drinks in 2008/09 at 18.0% and 17.4%

respectively. Diet drinks were not included under SSB, although 10.0% of women consumed diet drinks in 1997. In the 1997 NNS water, tea and coffee were major beverage choices consumed by 85.0%, 65.0% and 58.0% of women respectively ≥3 times weekly (Ministry of Health, 1999), however these were not distinguished between in the ANS (University of Otago & Ministry of Health, 2011a). Another NZ study found similar results to the NNS and ANS that 18.6% of parents and caregivers consumed SSB on ≥3 days weekly (Kruse, 2013b). In contrast, on ≥3 days weekly, the intake of fruit juice was only slightly lower than the NNS (25.0%) at 23.5% and the intake of juice (from concentrate, powder or cordial) was much greater than the NNS (3.0%) at 16.2%. However when fruit juice and juice were combined (49.7%) intakes were greater than the NNS (28.0%) and ANS (34.9%) (Kruse, 2013a).

In NZ it is recommended that to reduce long-term health risks women should consume no more than two standard drinks a day, or ten per week, with at least two alcohol free days per week (Ministry of Health, 2015). A standard drink is defined as one that contains 10g of pure alcohol (Ministry of Health, 2015). A recent NZ health survey in 2013/14 found 80% of adults had consumed alcohol in the past 12 months (Ministry of Health, 2014). Hazardous drinking, where drinking may harm the drinker's physical or metal health, or effect the social health of others, was also found in 11% of women (Ministry of Health, 2014). Alcohol consumption has been found to be higher during social occasions, which are more common on weekends (Health Sponsorship Council, 2007). The NNS and ANS also found alcohol contributed approximately 3% of energy to the diet of NZ women (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a).

2.2.3.2 Fast Food Consumption

Foods from fast food restaurants tend to be of poor nutritional quality as they contain large amounts of energy and fat (Wu & Sturm, 2013). However, fast food is consumed regularly and common reasons for eating it include being quick, easy, inexpensive and tasting good (Rydell et al., 2008). In many cross sectional (Bowman & Vinyard, 2004; Mesas et al., 2012) and longitudinal studies (Duffey, Gordon-Larsen, Jacobs Jr, Williams, & Popkin, 2007; Pereira et

al., 2005) fast food consumption in adults is associated with excess weight. Fast foods can contribute to obesity and poor diet quality through increased portion sizes, energy density and a high total fat content (Stender, Dyerberg, & Astrup, 2007).

The NNS showed the proportion of NZ women that consumed hamburgers and pizza one or more times a week was 11% and 7% respectively (Ministry of Health, 1999). Consumption of meat pies, sausage rolls and other savoury pastries was slightly higher with 15% of all women having these at least once a week. In the ANS the number of women that consumed fast food and takeaways one or more times a week increased to 28.1% (University of Otago & Ministry of Health, 2011a). This included foods from stores such as Burger King, KFC, McDonalds, fish and chip shops and pizza stores. A recent study also alarmingly found annual per capita fast food sales increased by 10% in NZ from 1999 to 2008 (De Vogli, Kouvonen, & Gimeno, 2014).

2.2.3.3 Low fat alternatives

Using lower fat products has been associated with lower intakes of energy, fat, saturated fat and cholesterol (Peterson et al., 1999), and a higher sugar intake (Baghurst, Baghurst, & Record, 1994). Consumers are becoming increasingly aware of fat intake and the risks associated with consuming too much (Nowak & Speare, 1996; Worsley & Scott, 2000). Reasons for choosing low fat foods include reducing fat intakes for health and weight control and possibly improving the nutritional profile of the diet (Bellisle, Rollandcachera, Deheeger, Preziosi, & Hercberg, 1994; International Food Information Council, 1995).

In the ANS 43.4% of NZ women regularly or always chose low or reduced fat foods (University of Otago & Ministry of Health, 2011a). In the NNS 41.0% of women were trying to make changes to their diet, mostly by reducing their consumption of high fat foods, or by changing the type of fat eaten (27.0%) (Ministry of Health, 1999). These rates differ worldwide, for example in France only 24.0% of adults consume low fat foods (Bellisle et al., 1994). Another more recent French study also found many women never consume low fat products, such as cheese, yoghurt and cream (50.1%) and skimmed milk (86.6%)

(Bellisle et al., 2001). Possible reasons for these differences include cultural choice (e.g. French cuisine) (de Castro et al., 1997), food availability, which may change over time (Bellisle et al., 2001) or individual dietary health strategies (e.g. health or body weight concerns) (Hill, Knox, Hamilton, Parr, & Stringer, 2002).

One major food for which low fat alternatives are often chosen is milk. From 1997 to 2008/09 almost twice the number of NZ women chose lower fat milk options. In 1997, 27.0% used trim milk (Ministry of Health, 1999), which increased to 51.9% of women who used reduced fat, skim or trim milk most of the time in 2008/09 (University of Otago & Ministry of Health, 2011a). Other studies that investigated lower fat milk products, include a nationally representative sample of Americans where 38.4% of women always consumed skim or 1.0% fat milk (Capps, Cleveland, & Park, 2002). Another study found in American women ≥20 years the consumption of skim milk increased from 5.2% to 14.4% and whole milk consumption decreased from 25.2% to 14.7% in 1977/78 to 1994/95 respectively (Enns et al., 1997). An Australian study found a large proportion of women ≤50 years consume whole milk (57%) and 46% of women consume other milk types such as reduced fat/high calcium, high calcium/skim and skim (Cashel, Crawford, & Deakin, 2000). In women wanting to lose weight milk was the most common low fat product and was consumed by 62.7% of women (Wierzbicka & Dqbrowska, 2009). In a national sample of French women, Bellisle et al. (2001) found milk products were the most common low fat food consumed exclusively. This included 'skimmed and partially skimmed' (14.5%), 'partly skimmed' (11.4%) and 'skimmed milk' (5.1%). Semi-skimmed milk is also consumed by a large number of people in Britain (63%) (Buttriss, 2002) and Northern Ireland (72.0%) (Stewart-Knox, Hamilton, Parr, & Bunting, 2005).

Margarine is another food for which low fat alternatives are commonly consumed. Of the 90% of NZ women in 1997 who used a spread on their bread or crackers, the same proportion used butter and polyunsaturated margarine (47%), whereas only 3.0% used reduced fat margarine most of the time (Ministry of Health, 1999). In 2008/09 more women (30.5%) chose a light or

reduced fat margarine and fewer chose full fat margarine (33.8%) and butter (20.1%) most of the time (University of Otago & Ministry of Health, 2011a). In 2008/09 the vast majority of women (90.1%) also used oil in their cooking most of the time, rather than other types of fat such as butter and margarine. A study in Northern Ireland, found a similar proportion of consumers chose low fat spreads (55.0%) (Stewart-Knox et al., 2005).

Meat consumption and preparation is another behaviour associated with low fat food choices. Slightly fewer NZ women regularly removed excess fat from meat in 2008/09 (67.4%) compared to 1997 (72.0%). In contrast slightly more women regularly removed the skin from chicken in 1997 (49.0%) than in 2008/09 (53.5%). These behaviours were also common in American women, where 52.1% always removed the skin from chicken and 76.5% always trimmed excess fat from meat (Capps et al., 2002). In Northern Ireland, 60.0% of consumers frequently chose lean mince and 56.3% wanted to reduce their consumption of visible meat fat (Stewart-Knox et al., 2005). Although the practices of trimming excess fat from meat and skin from chicken have been investigated in various studies, not everyone consumes meat in their diet. Rates of vegetarians differ greatly worldwide from 3% in Australians up to 40% in Indian populations (European Vegetarian Union, 2007). Reasons for becoming a vegetarian include animal welfare, environmental issues, health or culture (Beardsworth & Keil, 1991; Fox & Ward, 2008; Leitzmann, 2014), with females more likely to become a vegetarian (Beardsworth & Bryman, 1999; R. White & Frank, 1994). The NNS found in 1997 a small proportion of women avoided meat except chicken (3%), were lacto-ovo-vegetarian (1%) or consumed other diets (2%), rather than a regular diet (93%) (Ministry of Health, 1999). The ANS did not specifically ask about the consumption of vegetarian meals, however red meat was never or not consumed in the past four weeks by 6.6% of women, and chicken by 5.8% of women (University of Otago & Ministry of Health, 2011a).

Although not investigated in the NZ NNS and ANS, the consumption of low fat alternatives investigated in other surveys has included low fat cheese, low energy salad dressing and ice cream alternatives such as sorbet. A national

sample in French women found cheese, yoghurt and cream were consumed by a large number of women occasionally (30.9%), with light fat, such as oil, butter, margarine and salad dressing being the second most popular low fat foods consumed occasionally (26.5%) (Bellisle et al., 2001). Wierzbicka and Dqbrowska (2009) found in women wishing to lose weight that cottage cheese was the second most common low fat product consumed. Another study of American adults found always consuming low fat cheese (16.2%), ice cream alternatives (e.g. sorbet) (19.8%), low energy salad dressing (33.0%) and choosing fruit for dessert (16.2%) by women were not as common as other low fat behaviours (Capps et al., 2002).

2.2.4 Fruit and vegetable intake

There is a large variation worldwide in fruit and vegetable intakes. The World Health Organization (WHO) found the prevalence of women who do not meet fruit and vegetable recommendations (minimum of five servings of fruit and vegetables daily) ranged from 38.0% in Ghana to 99.3% in Pakistan (Hall, Moore, Harper, & Lynch, 2009). In NZ it is recommended that ≥2 servings of fruit and ≥3 servings of vegetables are eaten daily (Ministry of Health, 2003). In NZ both the NNS and ANS found a similar proportion of women met the vegetable recommendations (73.0%) (see Figure 2.5) (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a). From 1997 to 2008/09 there was an increase in women who met the recommendations for fruit, from 56.1% to 65.8% respectively.

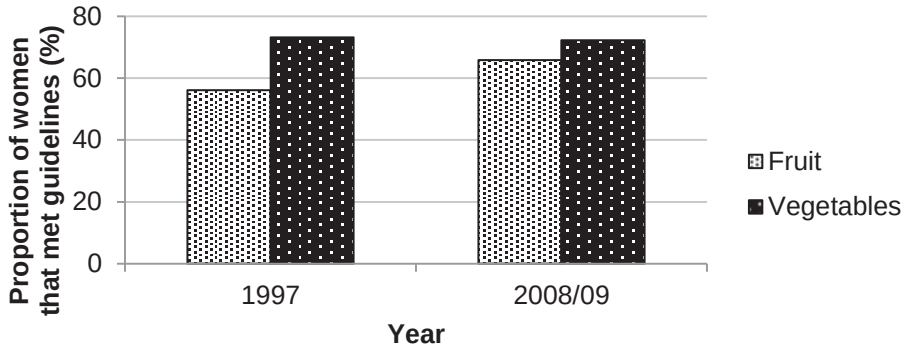


Figure 2.5 Proportion of New Zealand women that met the fruit and vegetable guidelines from the NNS and ANS (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a)

Results from the New Zealand Health Survey (NZHS) have found more women met the recommendations for vegetable intake than fruit intake across all years, with the lowest vegetable intakes in the most recent survey in 2013/14 (67%). The proportion of women that met the guidelines for fruit intake in 2002/03, 2011/12 and 2012/13 was similar at approximately 64%, with slightly more women meeting these guidelines in 2006/07 (68%) and fewer women meeting them in the most recent survey in 2013/14 (62%) (see Figure 2.6) (Ministry of Health, 2004a, 2008b, 2012, 2013, 2014). Ashfield-Watt (2006) also found New Zealanders consumed approximately 4 servings of fruit and vegetables daily.

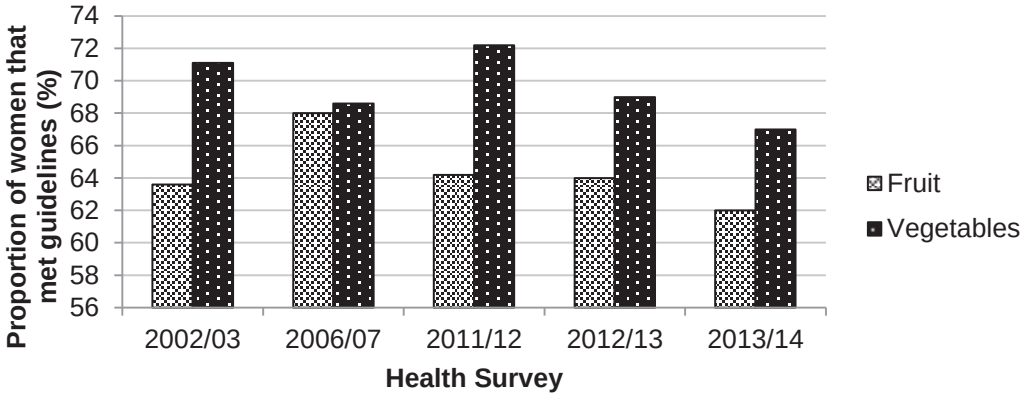


Figure 2.6 Proportion of New Zealand women that met the fruit and vegetable guidelines from Health Surveys (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a)

2.2.4.1 Social occasions

Social occasions in NZ, such as a gathering with friends and family, tend to have a more relaxed atmosphere and are more likely to be at the weekend. Foods tend to be less healthy and may include more expensive ingredients, dishes that take longer to prepare and/or dessert. Beverages often include alcohol and SSB. Portion sizes tend to be larger with more time spent eating and enjoying food (Health Sponsorship Council, 2007).

2.3 Determinants of eating habits

A number of factors influence eating habits, which can be explained using the ecological model. Ecology refers to the relationship between individuals and their environment (Stokols, 1992). Social ecology goes further to include the social, institutional and cultural settings of these people-environment relationships (Stokols, 1992). Ecological models can be distinguished from other models as they use a multi-level approach, rather than focusing on one or two levels. A multi-level approach means all the elements can work together and have an influence across all levels of the model (Glanz, Rimer, & Viswanath, 2008; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Typically ecological models have four levels that are linked together. These are society, community, social environment and individual factors, as shown in Figure 2.7 (Bronfenbrenner, 2009).

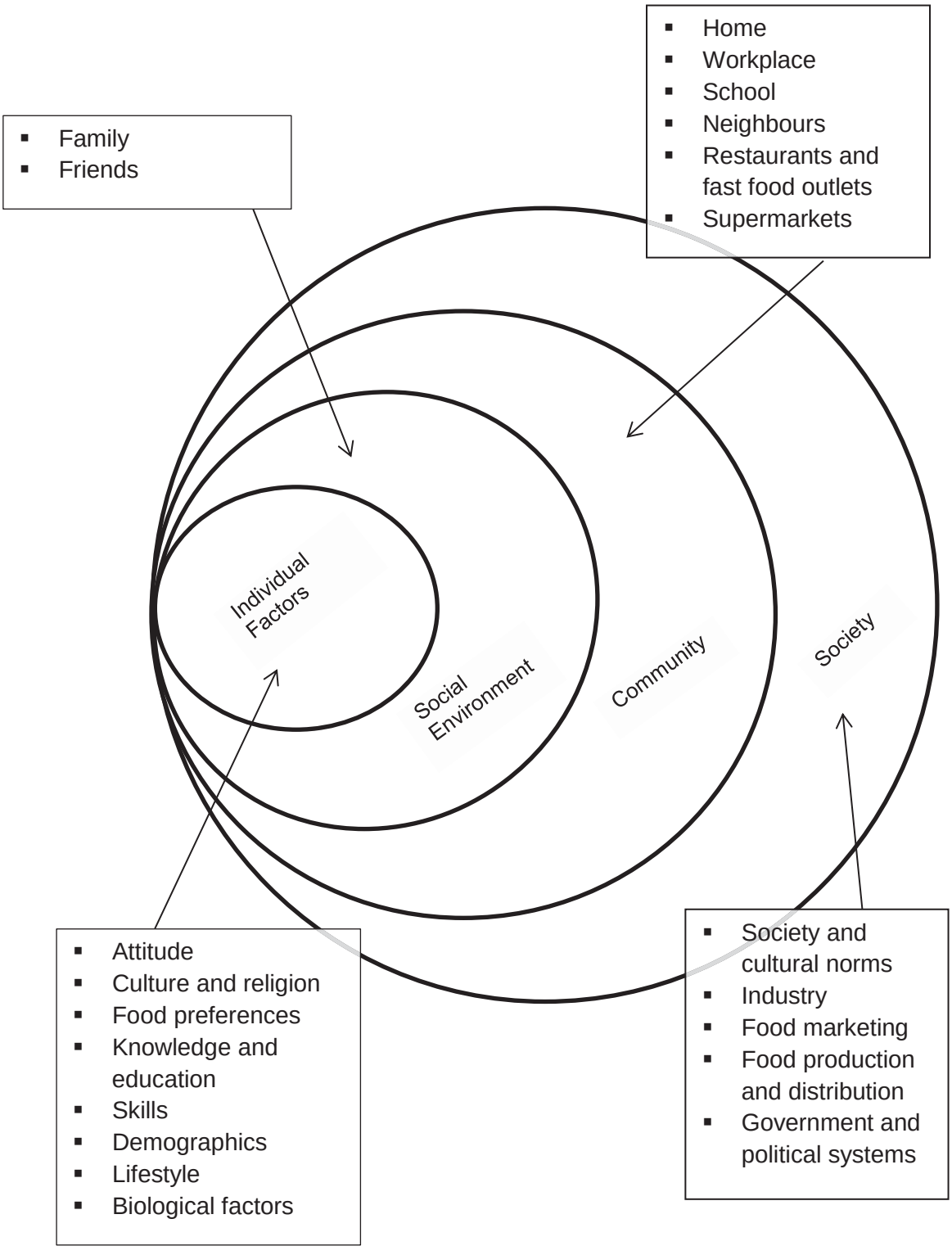


Figure 2.7 Ecological Model showing the factors that influence an individual's eating habits (adapted from (Story et al., 2008))

2.3.1 Society

At the most distant level, society influences an individual's eating habits such as through societal and cultural norms, the food industry, food marketing, production and distribution, and government and political systems (Story et al., 2008). Legislation guides the systems put in place by society and businesses, and these have an impact on eating habits.

Societal and cultural norms consist of traditional ideas and their associated values within a society. They include people's beliefs on how they should act in certain situations. Culture changes over time, but is shaped by previous generations and may differ by ethnicity, nationality, geographic location or the historical time period (Jahoda, 2012). In NZ, cultural differences in eating habits are seen with Māori and Pacific people having a greater focus on sharing food than Pākehā/NZ European (Health Sponsorship Council, 2007). Across these ethnicities Sunday lunch is often consumed with family and friends. For Pākehā the meal may consist of a roast with vegetables, gravy and dessert. Pacific people often consume more traditional foods (e.g. taro and boil-up), which are frequently based on meat and carbohydrates, and not many vegetables. Younger Pacific people may have healthier eating habits than their parents, such as eating more vegetables (Health Sponsorship Council, 2007).

In the **food industry** the major goal is to make a profit, which often clashes with the promotion of healthy eating (Power, 2005). **Food marketers** promote foods through advertising and promotions to create product awareness (Chandon & Wansink, 2012). Often this marketing will be targeted towards vulnerable individuals, such as children, who can actively influence what their parents purchase (Raine, 2005). Globally and in NZ many foods advertised are nutrient poor, such as being high in fat and sugar (e.g. cakes, biscuits, lollies and fast foods) (Kelly et al., 2010; Wilson, Signal, Nicholls, & Thomson, 2006). Exposure to these advertisements can increase the consumption of nutrient poor foods and thus impact negatively on eating habits (Scully et al., 2012). Although the vast majority of advertising promotes unhealthy eating habits (Maher, Wilson, Signal, & Thomson, 2006), initiatives such as front of pack nutrition labels can help promote healthy eating (J. White & Signal, 2012). While healthy eating

initiatives may help improve eating habits, the food industry is more likely to implement strategies where they benefit themselves, such as those that will increase profit (Raine, 2005).

Food production and distribution influence eating habits by impacting on food availability and thus food choice. Production includes the agriculture and fishing sectors, and food distribution includes transport, importation and trade arrangements (Sacks, Swinburn, & Lawrence, 2008). For example, in NZ healthier foods tend to be more available in urban than rural areas. Healthier foods such as those lower in fat, salt and sugar (e.g. wholemeal bread and lean meat) are also more expensive than unhealthier foods that tend to be higher in fat, salt and sugar (e.g. white bread and regular meat) (J. Wang et al., 2010).

Governments have a role in protecting the health of individuals (Kaiser & Lien, 2006). They provide guidelines and dietary recommendations on healthy eating (Mikkelsen, 2005) and may pass laws and regulations to help achieve this (Kaiser & Lien, 2006). Although the government has a role in looking after the health of its citizens, this is often shared with other stakeholders such as the food industry, private health organisations and non-government organisations (Kaiser & Lien, 2006). For example the NZ government regulates ingredient lists, declarations of nutrients and health claims on food products. More work is required however in areas such as implementing a plan to help prevent obesity and reducing the salt, sugar and saturated fat composition of food (Vandevijvere, Dominick, & Devi, 2015).

2.3.2 Community

The community includes locations such as the home, workplace, schools, supermarkets, restaurants, fast food outlets and the neighbourhood in general. Food availability and accessibility at these locations contribute to the opportunities or barriers that in turn influence food choices and eating habits. Eating habits at **home** are influenced by food availability from places such as the supermarket, food shopping frequency and foods purchased and prepared by the food shopper, preparer or caregivers (Glanz, Sallis, Saelens, & Frank, 2005). In NZ major foods purchased from the supermarket, which will ultimately

influence eating habits in the home, include milk, white bread, SSB and butter (Hamilton, Mhurchu, & Priest, 2007). In **workplaces** a major determinant of eating habits is food availability, with healthier options not always available in areas such as the cafeteria (Pridgeon & Whitehead, 2013). In NZ lunch may be brought from home, or purchased at work or places nearby, such as a café, bakery or fast food store (Health Sponsorship Council, 2007).

In NZ **fast food outlets** are more accessible in the most deprived areas, with less travel distance required (Pearce, Blakely, Witten, & Bartie, 2007). The availability of foods at fast food restaurants can influence eating habits. Many fast food restaurants in NZ however provide limited healthy food choices and one study found only around a fifth of food choices at major fast food restaurants were healthier options. Healthier options included salads, smaller or healthier burgers, wraps and low fat smoothies and tended to be cheaper or a similar price to regular options (Chand, Eyles, & Mhurchu, 2012). Healthier food stores such as locally operated stores (e.g. convenience stores) are also more prevalent in the most deprived areas than **supermarkets** (Pearce et al., 2007). Better access to healthier stores (e.g. supermarkets) however does not necessarily lead to greater consumption of healthier foods such as fruit and vegetables (Pearce, Hiscock, Blakely, & Witten, 2008).

2.3.3 Social environment

In the social environment, family, friends and others in the community influence eating habits for example through social norms (e.g. social standards around food), acting as role models (e.g. family and friends) and providing support (e.g. from family and friends). The social environment has a strong influence, as it is important to people to feel a sense of belonging through relationships and groups (Fiske, 2009).

Social norms are the practices and expectations that help to guide eating behaviours in social situations. These are the social standards around food, such as what, when, where and how much food it is appropriate to eat (De Ridder, De Vet, Stok, Adriaanse, & De Wit, 2013). How individuals view these eating habits and the social norms of others around them helps shape their own

eating habits (Ball, Jeffery, Abbott, McNaughton, & Crawford, 2010; Robinson, Blissett, & Higgs, 2013).

Role models may influence eating habits. People who are close to one another, such as family and friends, seem to influence each others eating habits the most (Robinson, Thomas, Aveyard, & Higgs, 2014). **Support** in social environments has a positive influence on eating habits. Women who have more social support from their family are more likely to eat fruit and vegetables and less likely to eat fast food (Williams, Thornton, & Crawford, 2012). Women on a weight loss diet may also find support from friends and family to be a positive influence on their eating habits (Hammarstrom, Wiklund, Lindahl, Larsson, & Ahlgren, 2014). Peer group pressure can impact negatively on young women's eating habits such as through increased alcohol (Kuntsche, Knibbe, Gmel, & Engels, 2005) and takeaway food consumption (Fortin & Yazbeck, 2015).

2.3.4 Individual factors

At the individual level, factors that influence eating habits include attitude, behaviour, culture and religion, food preferences, knowledge and education, lifestyle, biological factors and demographics, which are discussed below. These factors are important for the decisions behind daily eating habits along with an individual's motivations, expectations and self-efficacy.

Attitudes can be identified as feelings, beliefs and intentions that are associated with food (Axelson, 1986). These can include attitudes towards nutrition, health, convenience, creativeness, economics, familiarity, meal planning and preparation (Axelson, 1986; Axelson & Penfield, 1983). Together these contribute to an individual's attitude towards eating. For example more women tend to follow the nutritional guidelines for a healthy diet than men (Wardle et al., 2004). Attitude and behaviour may best be altered when individuals are ready for a change, however these are very difficult to change and it takes time (Cooper & Croyle, 1984).

Culture is a society's way of life (Axelson, 1986), and describes what, when and how foods are eaten (D. Lee, 1957). The characteristics of a culture are passed down between generations, but individuals have slightly different

viewpoints due to factors such as gender and age (Axelson, 1986). For example in NZ motives for purchasing foods include sensory appeal, price, convenience and health aspects (Prescott, Young, O'Neill, Yau, & Stevens, 2002).

Religions may influence eating habits by reference to aspects of health or diet in holy texts (Shatenstein & Ghadirian, 1998). Religion was assessed most recently in NZ in the 2013 census. Half of the population (50.8%) followed no religion or did not specify their religion, and 43.5% identified as Christian. Other religions included Hindu (2.02%), Buddhism (1.31%) and Islam (1.04%) (Statistics New Zealand, 2013b). Many Hindus and Buddhists are vegetarian (Szucs, Geers, Jezierski, Sossidou, & Broom, 2012). In Islam food is classified as halal (lawful food) or haram (unlawful food), where certain foods such as pork are considered unclean and are therefore not eaten (Raman, 2014). Certain religions also have fasting periods, such as in Islam where Ramadan is a 28 to 30 day fasting period where food and beverages are not consumed during daylight hours (Trepanowski & Bloomer, 2010).

Food preferences are an indication of how much a food is liked or disliked (Einstein & Hornstei, 1970). These are largely influenced by individual choices, but also influenced by physiology, environmental cues and social and cultural norms (Raine, 2005). Individual choices are closely related to a person's gender, age and weight (Logue & Smith, 1986). Environmental cues that influence food intake can be the actions and presence of others (Herman, Roth, & Polivy, 2003; Prinsen, de Ridder, & de Vet, 2013), time of the day, the location and the smell and sight of food (Rogers, 1999). For example in NZ the sensory appeal of food is an important motive when purchasing food (Prescott et al., 2002). In NZ food preferences also differ between ethnicities (Health Sponsorship Council, 2007). For example, for Sunday lunch Māori people may have a roast with pudding, or a barbeque, whereas Pacific people tend to have more traditional foods (e.g. taro, green bananas, curry, boil-up) that often contain few vegetables (Health Sponsorship Council, 2007).

An individual's **nutrition knowledge** could also have a positive influence on their eating habits (Spronk, Kullen, Burdon, & O'Connor, 2014; Wardle, Parmenter, & Waller, 2000). Despite this knowledge, these practices are not necessarily applied (Ucar, Ozdogan, & Ozcelik, 2012). Formal **education** is a determinant of eating habits (Axelson, 1986) with poorer habits seen in less educated people, such as eating fewer fruit and vegetables (Axelsen, Danielsson, Norberg, & Sjoberg, 2012). Those in poverty also tend to have less access to education, which can ultimately impact on an individuals knowledge and therefore future (McKinney, 2014).

Demographics such as income contribute to someone's eating habits. For example, when income increases a lower percentage of income may be spent on food. Therefore less importance may be placed on the amount spent on food, even though more money may be spent on food overall (Axelson, 1986). This may alter the types of foods eaten, and therefore someone's eating habits.

Lifestyle can impact on eating habits and those with a more unbalanced diet tend to be unhealthy in other areas of their life (Conti et al., 2004). These areas can include smoking, having a sedentary lifestyle and being overweight or obese (Bottoni, Cannella, & Del Balzo, 1997). Those who live in poverty or lower socioeconomic areas also tend to have poorer eating habits, such as eating more fast foods and drinking more SSB (Utter et al., 2011).

Biological factors that influence eating habits include genetics, physiological state, age, gender and ethnicity. Genetics have an influence, such as through coding for substances like hormones that contribute to hunger and satiety (de Krom, Bauer, Collier, Adan, & la Fleur, 2009). Changes in physiological state also contribute to food choices for example during pregnancy when there are increased nutrient requirements, such as from iron and iodine (Williamson, 2006). As young women age, dietary quality may be reduced due to changes in dietary intake from greater independence (e.g. consuming more fast foods) (Nielsen, Siega-Riz, & Popkin, 2002; Taylor, Evers, & McKenna, 2005). Gender differences are seen in terms of food choice, with females tending to choose healthier foods (e.g. more fruit and vegetables) (Bogue, Coleman, & Sorenson,

2005). People who identify with the same ethnicity tend to share similar beliefs and behaviours, which help to shape their identity (Wetter et al., 2001). Although an important determinant of eating habits, many biological factors (e.g. genetics, age, gender and ethnicity) are unable to be changed by the individual.

There are clearly many different factors that influence an individual's eating habits. The ecological model uses a multilevel approach to help describe how society, the community, the social environment and individual factors influence eating habits, specifically in young NZ women. These will be further applied in the conclusion (section 6.4) of this thesis.

2.4 Health outcomes of eating habits

Poor eating habits are a contributing factor to obesity and increased body fatness, which is a major health concern worldwide (Gunes et al., 2012; Oliveros et al., 2014; Zazpe et al., 2011). Health risks of obesity and body fatness include diabetes, hypertension, stroke and metabolic dysregulation (Nguyen & El-Serag, 2010; Oliveros et al., 2014). The definition, prevalence and risk factors for obesity and body fatness are discussed below.

2.4.1 Definitions

Obesity is defined by the WHO as an excessive accumulation of fat in adipose tissue, which impacts negatively on health (World Health Organization, 2000). Body Mass Index (BMI) is typically used to classify someone as being underweight, normal weight, overweight or obese. It is a measurement of weight adjusted for height and is calculated by dividing weight in kilograms by height in meters squared to provide a final measurement in kg/m^2 (World Health Organization, 2000). The cut-off points commonly used for BMI are shown in Table 2.8. Although these BMI cut-off points do not differ between males and females, differences are seen between ethnic groups (Ministry of Health, 2008a).

Table 2.8 Classification of excess fat using BMI, waist circumference and waist to hip ratio

Classification	BMI (kg/m^2)		Waist circumference (cm)	Waist to hip ratio
	European/Other and Asian	**Māori and Pacific**		
Underweight	<18.5	<18.5		
Normal weight	18.5-24.9	18.5-25.9		
Overweight	25-29.9	26.0-31.9	Women: ≥80 Men: ≥88	Women: ≥0.85 Men: ≥1.0
Obese	≥30	≥32		

Adapted from (Ministry of Health, 2008a; World Health Organization, 2000)

While BMI is useful in providing a crude measurement of obesity, it does not distinguish between fat and lean mass or abdominal fat (World Health Organization, 2000). For example, individuals with a high proportion of lean mass, such as elite athletes, may be classed as having a high BMI (Torstveit & Sundgot-Borgen, 2012). Abdominal fat, which is associated with increased risk factors for chronic disease compared to fat at the hip, may also go unnoticed in some individuals (World Health Organization, 2000). Abdominal fat can be assessed by measuring the waist circumference or the waist to hip ratio (WHR). Excess abdominal fat is associated with a waist circumference (WC) ≥80 cm in women and a WHR ≥0.85; and for men a WC ≥88 and WHR ≥1.0 (see Table 2.8). Measuring waist circumference alone may provide a more practical measure of abdominal fat than the WHR (World Health Organization, 2000). An additional measurement that can be useful is percentage body fat (%BF). There is currently no agreement on what level of body fatness constitutes a higher metabolic risk, although suggested cut-off levels range from 30 to 37% in women, and 20 to 25% in men (Oliveros et al., 2014).

2.4.2 Prevalence

Worldwide there is a trend for increasing rates of overweight and obesity. From 1980 to 2013, more women become overweight with an increase from 29.8% to 38.0% (Ng et al., 2014). In contrast, no countries had a significant reduction in obesity rates (Ng et al., 2014). One study alarmingly predicted that by 2030, 86.3% of American adults would be overweight or obese and over half (51.1%) would be obese (Y. Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

Gender disparities are also present, with more women being obese and more men being overweight in developed countries (Kanter & Caballero, 2012; Ng et al., 2014).

The most recent NZ nutrition survey conducted in 2008/09 showed 32.8% of women were overweight and 27.8% were obese (University of Otago & Ministry of Health, 2011a). Prior to data collection for this survey, there were an estimated 1,718,800 women in NZ aged ≥15 years. This equates to over one million overweight and obese women, with 563,766 overweight and 477,826 obese (Statistics New Zealand, 2007). Prior to that the NNS showed a similar proportion of women were overweight (30.1%), while fewer were obese (19.2%) (Ministry of Health, 1999) in 1997. There is a tendency for obesity in childhood and adolescence to track into adulthood (Guo & Chumlea, 1999). This trend appears consistent in young NZ women, with increased levels of obesity in older age groups (13.6% at 15-18 years, 25.1% at 19-30 years and 27.9% at 31-50 years) (University of Otago & Ministry of Health, 2011a). Declines in obesity rates are only seen after the age of 65 years (Ministry of Health, 2014). Health surveys in NZ are conducted annually and show similar rates to the nutrition surveys, most recently in 2013/14, 29.9% of adults ≥15 years old were obese (Ministry of Health, 2014). Between 1977 and 2003 a similar proportion of women were overweight (26.1% and 27.7% respectively), but levels of obesity rose from 10.8% to 22.1% (Ministry of Health, 2004b). This is alarming, as the combined rates of overweight and obesity in women increased from 36.9% in 1977 to 49.9% in 2003. In addition women are getting more obese, as extreme obesity increased from 1.2 to 3.0% from 1977 to 2003 (Ministry of Health, 2004b).

2.4.3 Risk factors for obesity and body fatness

Obesity essentially results when the amount of energy consumed is greater than that used for physical activity and metabolic processes (Morrill & Chinn, 2004). A wide variety of risk factors contribute to obesity and body fatness, as shown in Figure 2.8. Key risk factors for obesity include dietary intake, which is driven by particular eating habits, and being in an at-risk group (e.g. young women). These key risk factors are discussed in further detail below.

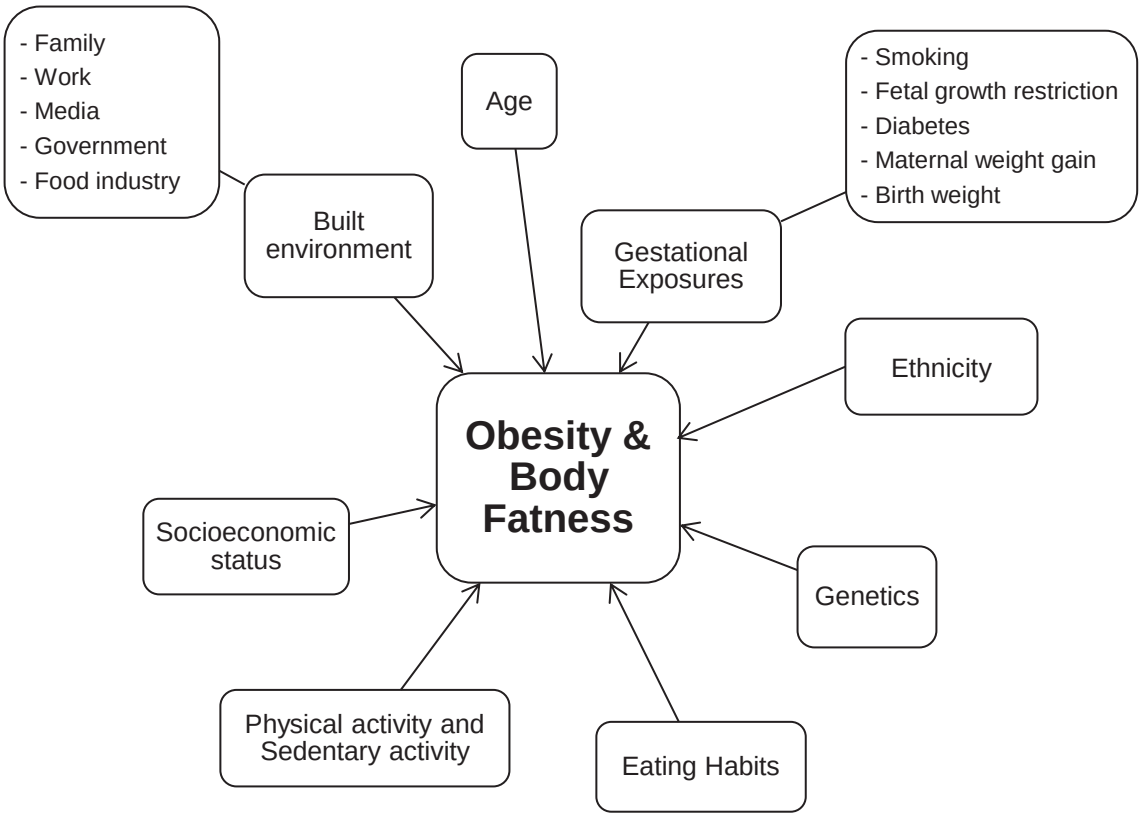


Figure 2.8 Risk factors for obesity and body fatness (adapted from (Brisbois, Farmer, & McCargar, 2012; Lobstein & Leach, 2007; Ranjani et al., 2014))

2.4.3.1 Eating habits associated with obesity and body fatness

Although there are many risk factors for increasing obesity rates, dietary intake is a key determinant. Eating habits that are associated with obesity have been discussed previously. These include meal patterns (section 2.2.1) such as food intake at breakfast, lunch, dinner and snacks, and more general eating habits (section 2.2.3) including the consumption of beverages, fast foods, low fat foods and fruit and vegetables.

Another key eating habit that contributes to obesity is the consumption of energy dense and processed foods, which are widely available in the local environment (Nguyen & El-Serag, 2010). Energy dense foods (e.g. takeaways and SSB) tend to be high in fat, salt and sugar and are highly palatable thus contributing to overconsumption (Branca, Nikogosian, & Lobstein, 2007; Haslam & James, 2005; World Health Organization, 2000). They also contain

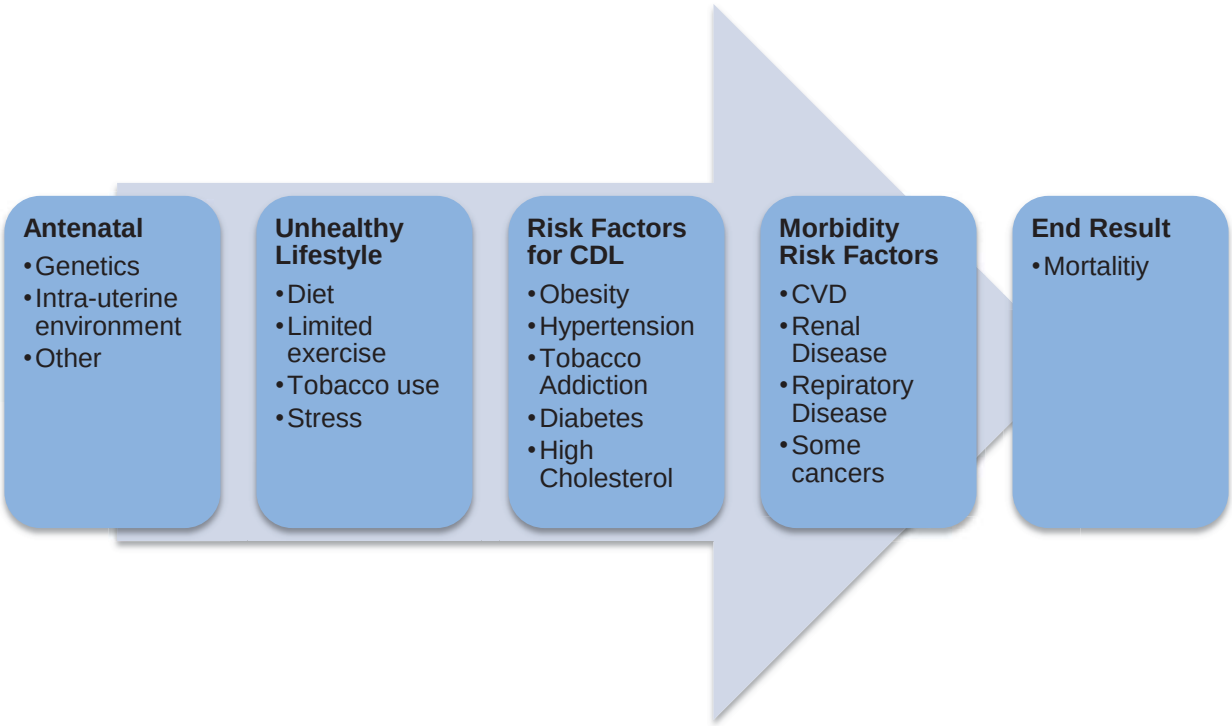
little fibre, which causes them to be less satiating and thus further contributing to overconsumption of energy dense foods, which may lead to obesity (Branca et al., 2007; Haslam & James, 2005). Meal patterns, such as skipping meals (e.g. breakfast) and increased snacking on energy dense foods, especially in the evening is another habit that has been associated with obesity (Goto et al., 2010; Timlin & Pereira, 2007; Van Der Heijden et al., 2007)). Outside influences can also contribute to obesity rates, such as through price and food accessibility (Branca et al., 2007; Nguyen & El-Serag, 2010). For example energy dense foods tend to be cheaper than healthier foods, such as fruit and vegetables (Drewnowski, 2010), with energy dense foods being more widely available in more deprived areas (Pearce et al., 2007).

2.4.3.2 Groups at risk of obesity

Various groups in the NZ population are more at risk of obesity and having a higher %BF than others. These include children (Utter, Scragg, Schaaf, Fitzgerald, & Wilson, 2007), adolescents (Utter et al., 2010), ethnic groups such as the NZ Māori and Pacific populations (Duncan, Schofield, Duncan, Kolt, & Rush, 2004), those with a low socioeconomic status (P. Brown, Guy, & Broad, 2005; Utter et al., 2010) and the less educated (Molarius, Seidell, Sans, Tuomilehto, & Kuulasmaa, 2000). A group who are particularly at risk of obesity and increased body fatness are adolescents and young adults. These individuals are at a stage in their lives where they develop greater independence (Keskitalo et al., 2008). Lifestyle changes, including unhealthy ones, can continue into adulthood and contribute to weight gain (Demory-Luce et al., 2004; Nikolaou et al., 2015). Young women have been shown to have a poorer dietary intake than young males in some studies (Demory-Luce et al., 2004; Larson et al., 2008; Lytle et al., 2002). Contributing lifestyle changes include altered eating habits such as a greater consumption of fast foods and sugary beverages and fewer fruit and vegetables consumed (Demory-Luce et al., 2004; Larson et al., 2008). Other lifestyle changes include starting work, getting married and having children (W. J. Brown & Trost, 2003).

2.4.4 Consequences of obesity and body fatness

Chronic diseases of lifestyle (CDL) are a collection of diseases with similar risk factors. These diseases result from exposure over a long period to factors such as an unhealthy diet, limited exercise, smoking and stress. Obesity is a major risk factor, along with high blood pressure and cholesterol, diabetes and tobacco addiction. Morbidity risk factors of CDL include cancer, cardiovascular, respiratory and renal diseases, which may ultimately lead to death (Steyn et al., 2006). The process for CDL is shown in Figure 2.9.



CDL: Chronic diseases of lifestyle; CVD: Cardiovascular disease

Figure 2.9 Development of Chronic Diseases of Lifestyle (adapted from (Steyn et al., 2006))

Along with being a risk factor for CDL by itself, obesity is associated with other CDL risk factors such as type 2 diabetes mellitus (T2DM), hypertension and dyslipidaemia. Other possible consequences of obesity include osteoarthritis, sleep apnoea, psychological problems such as disordered eating (Steyn et al., 2006), reproductive abnormalities (Haslam & James, 2005), a lower quality of life (Ucan & Ovayolu, 2010) and a lower life expectancy (Peeters et al., 2003).

2.5 Assessment and validation of eating habits

2.5.1 Dietary assessment techniques

There are many different methods available to measure eating habits and dietary intake. Methods available to assess eating habits include the diet history and dietary screeners, such as for fat, fibre or fruit and vegetable intake. Dietary intake can be assessed using a 24-hour recall, food record (FR) or food frequency questionnaires (FFQ). Other methods available include isotope and biochemical analysis such as doubly labelled water and urinary nitrogen excretion, which are essential to ensure dietary reference methods are accurate (Nelson, 1997). It is vital dietary assessment is done accurately and the choice of method used often depends on the study methods and skills and resources available (Nelson & Bingham, 1997). Table 2.9 describes the methods available to assess dietary intake and eating habits along with their advantages and disadvantages.

Table 2.9 Common techniques used to assess eating habits and dietary intake (adapted from (Biro, Hulshof, Ovesen, & Amorim, 2002; R. S. Gibson, 2005a; R. D. Lee & Nieman, 2010; Thompson & Subar, 2013))

Technique	Method	Advantages	Disadvantages
Eating Habits			
Diet history	• Assesses an individual's diet over an extended time period (e.g. month or year) • Involves three steps: 1. Interview on usual eating pattern for both meals and snacks. Description of foods, frequency and portion sizes in household measures 2. Questionnaire on frequency of consumption of specific foods (i.e. FFQ). Acts as a cross check for step 1. May also include a 24-hour recall 3. 3-day estimated food record (often omitted)	• Assesses usual intake and meal patterns • Detects seasonal change • Data about all nutrients obtained • Can assess preparation methods • Meal based approach may be easier to remember • Open ended responses	• Time demanding and labour intensive • Requires trained interviewer • Difficult and expensive to code • Aspects rely on memory • May overestimate nutrient intake • Many different adaptations of the original diet history make comparisons between studies difficult • High respondent burden • Meal based approach not useful for those with a grazing pattern • More accurate for regular habits • Underreporting and overreporting
Dietary screeners	• Used in situations where a certain aspect of the diet needs to be assessed, or quantitative information not required • Can be simplified or focused FFQs • Different types: 1. Fruit and vegetable screeners 2. Fat screeners 3. Multifactor instruments (e.g. assessment of fruit and vegetables, dietary fibre and fat intake)	• Useful in clinical settings or for health promotion and education • Can focus on one aspect of the diet or a certain behaviour • Inexpensive • Quick to complete • Self administered • Food intake not altered • Open ended responses • Can be adjusted depending on the information required	• May lack sensitivity to detect any changes in intervention studies • Looks at a single nutrient rather than the whole diet • Cannot measure population intakes • Needs to be validated in each different population group • Reliant on memory • May require a trained interviewer • Many only provide qualitative information
Dietary intake			
Food record	• Participant records all food and beverages consumed, usually for a period of 1 to 7 days • All food and beverages recorded at time of consumption • Brands and food preparation included • Either weighed or estimated to give amount of food consumed	• Detailed information provided on food intake • Assesses usual intake • Not reliant on memory • Multiple days are more representative of usual intake • Weighed food record is the 'gold standard' for dietary assessment • Open ended responses • Foods recorded as they are eaten	• Large respondent burden • Literacy skills required • Diet may be altered or influenced by the recording process (e.g. type of food and portion size) • Time demanding • Analysis is labour intensive • Underreporting and overreporting, especially if foods are not recorded immediately • In the weighed food record foods eaten away from home may not be weighed (e.g. at a restaurant) • Multiple days across the week required to assess usual intake • Response rate may be low in large national surveys • Motivated and cooperative individuals may not be representative of the general population

Technique	Method	Advantages	Disadvantages

24-hour food recall	• Participant recalls in detail all food and drink consumed during a specified time period (usually 24-hours)
	• Administered by a trained interviewer who records all food and drink and helps with memory recall
	• A multiple-pass method is often employed, which contains the following components:
	  ○ A complete list of foods and beverages consumed is obtained initially
	  ○ A detailed description of foods and beverages is attained, including the time it was eaten, portion size (often estimated using household measures), preparation techniques, cooking methods and brands
	  ○ A final review is conducted to ensure all foods and beverages have been recorded accurately
		• Quick to complete (15-20 minutes)
		• Inexpensive
		• Easy to administer
		• Low respondent burden
		• Does not alter usual diet
		• Detailed information on foods consumed
		• Can estimate nutrient intakes of groups
		• Open ended responses
		• Can be used in both literate and illiterate participants
			• Underreporting and overreporting
			• Reliance on memory
			• Usual intake unable to be assessed from intake of one day
			• Foods may be omitted, especially sauces, dressings and beverages
			• Serving size may be inaccurate
			• Data entry is labour intensive
			• Trained interviewers required

Food frequency questionnaire (FFQ)	• Questionnaire used to assess energy or nutrient intake • Food options are major sources of energy or the nutrient being looked at • Used to assess how frequently a food is usually eaten in a day, week, month or year • Portion sizes generally given for each food choice	• Self administered • Can be computer administered • Inexpensive • Modest demand on participants • May be more representative of usual intake than a few days from a food record • Can rank individuals by high and low intakes • Appropriate for large population surveys • Can estimate portion sizes • Can focus on certain food or nutrient intakes, or the whole diet • Foods listed act as a memory prompt	• May not be representative of usual foods or portion sizes • Participants must be able to describe their diet • Reliance on memory • Not open ended questions • Estimation of food intake can be inaccurate due to poor estimates of portions • Underreporting and overreporting • Intake can be compromised when several foods listed under the same item

FFQ: Food frequency questionnaire

Ideally dietary assessment methods should be affordable, have little labour and respondent burden, be simple to use and accurately reflect dietary behaviour (Kohlmeier, 1994; Nelson, 1997), although methods are often a compromise between these factors (Nelson, 1997). The assessment of usual intake often assumes individuals have regular dietary habits and thus results are likely to be more accurate for these individuals (Nelson & Bingham, 1997).

Dietary assessment methods are prone to misreporting (underreporting and overreporting). Underreporting is more common for snacks (Bellisle, McDevitt, & Prentice, 1997; Poppitt, Swann, Black, & Prentice, 1998), beverages, especially alcohol (Nelson & Bingham, 1997) and for certain groups such as overweight individuals (Gibney & Wolever, 1997) and females (Briefel, Sempos, McDowell, Chien, & Alaimo, 1997). Reasons for underreporting may include not wishing to reveal certain foods (e.g. alcohol and sweets), wanting to report an ideal diet believed to be consumed but which is only consumed occasionally, or ease of reporting (Nelson & Bingham, 1997). Overreporting is much less prevalent (dos Santos, Pascoal, Fisberg, Cintra, & Martini, 2010) with healthier foods such as fruit and vegetables more likely to be overreported (R. S. Gibson, 2005a). Overreporting is also more common in longer FFQs (Thompson & Subar, 2013).

Before a reliable estimate of usual intake is attained, it is important to know the length of time dietary data should be measured (Thompson & Byers, 1994). For accuracy, data should be collected across the entire week, as eating habits vary between weekdays and weekends (Thompson & Byers, 1994). Fewer days are required for group intakes compared to individual intakes (Basiotis, Welsh, Cronin, Kelsay, & Mertz, 1987). One study found to estimate the average intake in groups three days of dietary intake from food records are required for energy, four days for carbohydrate and protein and six days for fat intake (Basiotis et al., 1987). It has also been suggested that to assess the usual individual intake of energy and macronutrients, a minimum of three to four days should be recorded (Food and Agriculture Organization & World Health Organization, 1998). Therefore assessing dietary intake over a period of four days seems appropriate.

In order to accurately assess eating habits, appropriate methodology needs to be used (Oltersdorf et al., 1999). It has been suggested that when assessing eating habits various components should be considered including the sequence and combinations of different foods, the number and order of different menu items, food quality, food preparation techniques, social aspects (preparation, eating times, eating location and presence of others), the timing of meals and snacks as well as the influence of circadian rhythms (Esmaillzadeh et al., 2008; McCrory & Campbell, 2011; Oltersdorf et al., 1999).

There are several methodological issues that can make comparisons between studies difficult when assessing the temporal distribution of eating habits. There is great variation in how meal periods are defined, most broadly as breakfast, lunch, dinner and mid-morning and mid-afternoon snacks (Almoosawi et al., 2012). Other definitions include morning, afternoon and night (Dattilo et al., 2011), different time periods (e.g. 6-9 am, 12-2 pm) (de Castro, 1987; Fayet et al., 2012) and self definition by participants (United States Department of Agriculture, 2014a, 2014b, 2014d, 2014e). It may be more meaningful to look at trends, rather than hourly intake, due to the many possible combinations (Burke et al., 2005). There is also variation in how weekdays and weekends are defined. For example weekdays have been defined as Monday to Friday and weekends as Saturday and Sunday (O'Dwyer et al., 2005) and weekdays as Monday to Thursday and weekends as Friday to Sunday (de Castro, 1991, 2002; Haines, Hama, Guilkey, & Popkin, 2003). Thus due to great variation in the timing and composition of meals and snacks, definitions should be stated and it may be preferable to use the term eating occasion (EO) (Food and Agriculture Organization & World Health Organization, 1998). Currently there is no standard definition of EOs, although it has been suggested EOs may be separated from one another by a minimum of 15 minutes and should contain at least 210kJ (Gibney & Wolever, 1997). There is also great variation in the methodology used to assess EOs, such as FRs (Bellisle et al., 2003; Burke et al., 2005) or a 24-hour diet recall (Cho et al., 2003; Nicklas et al., 1998).

Another methodological consideration when assessing usual food intake is how to code and categorise the data so it is comparable with other studies. The

choice of method largely depends on the aim of the study (Faber et al., 2013). For example studies have looked at the top foods consumed, specific food items (e.g. fruit and vegetables) or a specific nutrient (e.g. sodium) (Faber et al., 2013). Another variable is how consumers classify foods (e.g. are potatoes a vegetable or a starch?), with great variation between different cultures and ethnicities (Thompson, Willis, Thompson, & Yaroch, 2011). Mixed dishes pose another problem and it may be more accurate to classify similar dishes together, such as soup, pasta dishes or rice dishes, rather than by the meat or fish component, or main ingredient (Fitt, Prynne, Teucher, Swan, & Stephen, 2009).

Eating habits differ between countries and cultures and so it is difficult to compare the eating habits of NZ women to that of women worldwide. Due to the large variation in eating habits worldwide, it is important that data specific to New Zealand women is researched.

2.5.2 Validation of eating habit questionnaires

2.5.2.1 How methods are validated

Eating habit questionnaires should be validated to see whether they measure what they are intended to measure (R. S. Gibson, 2005a). Using unvalidated methods may obscure relationships between diet and disease (Nelson, 1997). In dietary validation studies a reference method is compared to a test method to show the agreement or relative validity between methods (Nelson, 1997). Dietary assessment methods or biochemical measures can be used to assess validity. Biochemical measures however are often expensive, invasive and can only measure one nutrient at a time (Nelson, 1997). All new versions of a questionnaire should be validated separately, as even small changes may affect the results (Cade et al., 2002). In addition, questionnaires should be validated when used in different population groups as eating habits can vary between cultures and by demographic characteristics (Cade et al., 2002).

There is no individual dietary assessment method that is completely valid, therefore only relative validity can be measured (Nelson, 1997). Because of this methods should have independent error sources (Willett, 1998). A weighed food record is an appropriate reference method for an EHQ, as it has

independent error sources, such as not relying on memory (Cade et al., 2002). Other methods such as a 24-hour recall are not as appropriate as they have similar error sources, such as being reliant on memory and possible distorting of the diet (Cade et al., 2002). Extending the period of dietary intake data collection may increase validity by providing a better estimate of habitual intake, although validation studies do not normally need more than four or five days of food records per participant (Cade et al., 2002).

In validation studies the reference method should be administered in a sub-sample that is representative of the whole study population (Cade et al., 2002). The sample size will depend on the choice of statistical method (Cade et al., 2002), although a sample of more than 100 participants seems to be suitable (Serra-Majem et al., 2009; Willett, 1998). When usual intake is assessed the test method should preferably be administered prior to the reference method. This ensures they are encountered independently and the participant does not become more conscious of their diet and make adjustments which are reflected in the test method (Cade et al., 2002; Nelson, 1997).

Although it is vital to validate short qualitative questionnaires, some food items are more prone to overestimation and underestimation than others. One study that compared a FFQ to a FR found fruit and vegetables, nuts, condiments and drinks tended to be overestimated (Hu et al., 1999); and processed meat, eggs, butter, dairy products (high fat), mayonnaise, refined grains, sweets and desserts tended to be underestimated (Hu et al., 1999). Foods that are consumed occasionally may also be overreported (Bel-Serrat et al., 2014).

2.5.2.2 Statistical analysis

There are many different methods that can be used to validate EHQs. The most common ones are correlation coefficients, cross classification, the weighted kappa statistic (Kw) and group means.

Correlation coefficients are the most common validation method and measure the strength of the relationship. Pearson's correlation coefficients are used for parametric data and Spearman's for non-parametric data. Correlation coefficients do not however show the agreement between methods, only the

degree to which they are related. Therefore they should be used alongside other validation methods (Cade et al., 2002). Correlations for validation studies tend to range from 0.5 to 0.7, although should be at least greater than 0.4 so associations aren't attenuated (Willett, 1998). In cross-classification participants are classified into categories, such as tertiles, quartiles or quintiles for both the test and reference method. The percentage of participants in the same category and those misclassified into the opposite category for both methods is then calculated to estimate the relative validity. For validation purposes, >50% of participants should be classified into the correct tertile and <10% grossly misclassified into opposite thirds (Masson et al., 2003). A limitation however is that agreement can occur by chance, which can be prevented by using Kw (R. S. Gibson, 2005a). The Kw is used to compare categories of food intake such as the frequency of consumption (Cade et al., 2002). The agreement of Kw values is as follows: 0.81-1.00 very good; 0.61-0.80 good; 0.41-0.60 moderate; 0.21-0.40 fair; and <0.20 poor (Altman, 1991). When validating nutrients of interest Kw values >0.4 are preferable to minimise false-negative associations (Masson et al., 2003). Comparing the difference between group means is useful when the mean difference between groups or the absolute difference is required. Paired *t*-tests should be used for parametric data. Food data is more commonly non-parametric and therefore the Wilcoxon signed rank test should be used (Cade et al., 2002). As each statistical method has its own downfalls, a variety of tests should be used to assess validity (R. S. Gibson, 2005a).

2.5.3 Validation of previous studies assessing eating habits

The majority of studies investigating diet and chronic disease use FFQs to assess usual food intake (Kristal & Potter, 2006). Although this quantitative method can be useful for investigating diet, it may be too complex and time consuming for use in intervention studies (Risica et al., 2007), the clinical setting and for health education purposes (Yatsuya et al., 2003). In these settings qualitative dietary assessment methods such as EHQs can be a useful alternative (Thompson & Byers, 1994). Studies that investigate eating habits, including validation results, from qualitative questionnaires are shown in Table 2.10. No such studies were identified that have been conducted on NZ women.

Table 2.10 Qualitative assessment and validation of eating habits

Reference	Aim	Population	Method	Dietary reference method and validation statistics	Validation results
Block, Clifford, Naughton, Henderson, and McAdams (1989)	Development and validation of a dietary screening tool to measure fat intake	Women aged 45-69 yrs (n=101) America	A 13-item fat screener questionnaire was compared to the average of three 4-day FRs The fat screener focused on the serving size and frequency certain fat containing foods were consumed	4-day food record Correlation coefficients (Spearman)	Correlation coefficients between fat screener and FR: 0.58 (total fat (g)), 0.23 (total fat (%))
Kristal, Shattuck, and Henry (1990)	Developed and validated a questionnaire on dietary behaviours linked to low-fat diets	Women aged 45-59 yrs (n=97) America	Development and validation of an 18-item questionnaire that assessed aspects of dietary behaviour related to fat intake. The questionnaire focused on: • Exclusion of high-fat ingredients and preparation techniques • Modification of high-fat food • Substitution with low-fat manufactured foods • Replacement of high-fat foods with lower-fat alternatives	FFQ and two 4-day food records used to calculate average fat intake (%) Correlation coefficients Regression analysis	Correlation coefficients between FFQ and FR: 0.64 (total fat (%)) Correlation coefficients between questionnaire and fat intake (%): 0.68 Regression between questionnaire and fat intake (%): 0.47
Kristal et al. (1994)	Assessed the validity of a fat and fibre-related eating habits questionnaire in the eating patterns study, a study designed to assess the efficacy of a self-help intervention to reduce fat and increase fibre intake	Individuals from 28 physician practices (n=2108) America	Assessed the validity of an EHQ questionnaire compared to a FFQ in a self-help intervention at baseline and 1 year (Baseline n=2108; 1 year: intervention n=857, control n=957). A subgroup additionally completed a 4-day FR (Baseline n=110; 1 year: intervention n=38; control n=48)	FFQ A subgroup also completed a 4-day FR Correlation coefficients (Pearson)	All correlation coefficients are shown for fat as a % of total energy All participants: EHQ and FFQ: Baseline (0.53); 1 year: intervention (0.56), control (0.51) Subgroup: EHQ and FFQ: Baseline (0.60); 1 year: intervention (0.62), control (0.62); EHQ and FR: Baseline (0.45); 1 year: intervention (0.34), control (0.59)

Reference	Aim	Population	Method	Dietary reference method and validation statistics	Validation results
Shannon, Kristal, Curry, and Beresford (1997)	Modified previous questionnaires to create and validate a fat and fibre questionnaire that assessed the effectiveness of a self-help intervention in the eating patterns study	Individuals recruited from 28 physician practice units (n=1795; intervention n=850, control n=945) America	Developed a 33-item fat and fibre questionnaire and compared to a previously validated FFQ in a self-help intervention designed to reduce fat and increase fibre intake	FFQ Correlation coefficients (Spearman)	Correlation coefficients between fat and fibre questionnaire for fat intake (%): Baseline (0.53), 3 months (0.54) and 12 months (0.53)
Block, Gillespie, Rosenbaum, and Jenson (2000)	Assessed the agreement between a food screener and the 100-item Block FFQ	Adults 20-69 yrs (n=208) America	A 22-item fat, fruit and vegetable screener was compared to the 100-item Block FFQ	100-item Block FFQ Correlation coefficients (Spearman)	Correlation coefficients between fat screener and Block FFQ: 0.69 (total fat (g)), 0.63 (total fat (%)), 0.72 (saturated fat (g))
Bertéus Forslund, Lindroos, Sjöström, and Lissner (2002)	Developed a tool that assesses meal patterns	Women aged 37-60 yrs (obese n=83 and controls n=94) Sweden	Developed a new instrument that describes usual meal types, frequency and timing of meals. Four different meal types were described: main meal, light meal/breakfast, snack or drink	n/a	n/a
Capps et al. (2002)	Modified previous questionnaires to create and validate a questionnaire that assessed predictors of fat intake in the Diet and Health Knowledge Survey	Adults >20 yrs (n=5026) America	A 19 item fat-related behaviour questionnaire was modified from previous questionnaires and compared to two 24-hour recalls in a nationally representative sample	Two 24-hour recalls Multiple regression	The set of 19 behaviours were significant predictors of both total fat (P<0.001) and saturated fat (P<0.001) as a percentage of energy

Reference	Aim	Population	Method	Dietary reference method and validation statistics	Validation results
Schlundt, Hargreaves, and Buchowski (2003)	Development and validation of an eating behaviour pattern questionnaire (EBPQ) to predict fat and fibre intake	African American women, mean age 36.1±13.4 yrs (n=277) America	A culturally specific EBHQ was developed and validated from focus groups, a FFQ and a 24-hour recall The final EBHQ had sections on: • Low-fat eating • Emotional eating • Snacking on sweets • Cultural and lifestyle behaviours • Haphazard planning • Meal skipping	FFQ (n=259) and an eating styles questionnaire (ESQ) (n=158) Correlation coefficients (Pearson) Multiple linear regression (n=259)	Correlation coefficients between the EBHQ and energy, total fat (g), saturated fat (g) and % energy from fat respectively for the following sections were: low fat eating (-0.28, -0.37, -0.37, -0.50) and snack on sweets (0.43, 0.46, 0.45, 0.26), all values *P*<0.001 Correlation coefficients between EBPQ and ESQ: low fat eating (0.65), emotional eating (-0.26) and snack on sweets (-0.40), all values *P*<0.001 Regression values between EBPQ and FFQ: total energy (0.52), total fat (g) (0.58) and percentage energy from fat (0.57)
Risica et al. (2007)	Development and evaluation of the SisterTalk Food Habits Questionnaire (STFHQ) for an ethnic population	African American women Pilot study (n=178 women) SisterTalk study (n=368 women) America	Developed the STFHQ from a pilot study that included culturally specific questions. This questionnaire was then used in the SisterTalk study, a 12-week intervention that provided a television channel to help participants be healthier. The STFHQ was completed at baseline and 4-weeks and validated against a FFQ completed at 2-weeks A 95 question tool was developed that included: • 28 introductory questions (e.g. how often did you eat chicken in the past month?) • 67 behavioural questions related to introductory questions (e.g. how often was the chicken baked/broiled?)	FFQ Correlation coefficients	Correlation coefficients between STFHQ and FFQ: 0.35 to 0.54 (total fat (g)), 0.37 to 0.45 (total energy (%)), 0.17 to 0.39 (total energy)

Reference	Aim	Population	Method	Dietary reference method and validation statistics	Validation results
Di Noia, Contento, and Schinke (2008)	Adapted a Food Habits Questionnaire for an adolescent African American population to assess behaviours that predict low fat intake	Adolescents 10-15 yrs (n=399) America	Adapted a food habits questionnaire (FHQ) to assess fat-related dietary behaviours in African American adolescents Fat intake was assessed from the block fat screener, a 17-item tool that includes key dietary fat sources	Block fat screener Correlation coefficients (Spearman) Multiple regression	Correlation coefficients that were significantly related between the FHQ and block fat screener for fat intake (% energy): chicken (not fried) (-0.15), pasta or pizza without meat sauce or meat topping (-0.11), vegetarian dinner (-0.13), low energy salad dressing (-0.13), ≥2 vegetables at dinner (-0.11), bread without butter or margarine (-0.20) and avoid fried food (-0.12) (sample size ranged from n=270 to 396, as n/a excluded) The regression equation containing the 7 significant behaviours (from correlations) accounted for 17% of the fat intake variance (0.36). Pasta or pizza without meat sauce or toppings and bread without butter or margarine were significant predictors of fat intake (n=221)
Zazpe et al. (2011)	Assessed the association between eating behaviours and the risk of weight gain	University graduates ≥18 yrs (n=10509) Spain	Assessed ten eating habit questions with the responses yes and no at the end of a FFQ	n/a	n/a
Muñoz-Pareja, Guallar-Castillón, Mesas, López-García, and Rodríguez-Artalejo (2013)	Assessed the association between obesity related eating behaviours (OREB) and increased energy intake (portion size, energy density, number of eating occasions and energy rich beverages)	Adults ≥18 yrs (n=11,546) Spain	OREB were assessed from 8 questions: • Not planning how much to eat before sitting down • Pre-cooked and canned food consumption • Snacks from vending machines • Fast-food consumption • Selection of low-energy foods • Removing fat from meat • Trimming skin from chicken • Frequency of eating while watching TV Usual dietary intake was assessed from a computerized diet history that had been previously validated	n/a	n/a

EBPQ: Eating behaviour pattern questionnaire; ESQ: Eating styles questionnaire FDDR: Four day diet record; FFQ: Food frequency questionnaire; FH: Food habits; FR: Food record; n/a: not applicable; yrs: years; OREB: Obesity related eating behaviours; STFHQ: SisterTalk food habits questionnaire

Although many EHQ have been validated, not all have been. The most common reference method used to validate EHQs is the FFQ (Kristal et al., 1994; Kristal et al., 1990; Risica et al., 2007; Schlundt et al., 2003; Shannon et al., 1997). Food records (Block et al., 1989; Kristal et al., 1994; Kristal et al., 1990), 24-hour recalls (Capps et al., 2002) and the block fat screener (Block et al., 2000; Di Noia et al., 2008) have also been used.

Correlation coefficients are the most common statistical method used to validate EHQs (Block et al., 1989; Di Noia et al., 2008; Kristal et al., 1994; Kristal et al., 1990; Risica et al., 2007; Schlundt et al., 2003; Shannon et al., 1997). Several studies use regression analysis in addition to correlation coefficients (Di Noia et al., 2008; Kristal et al., 1990; Schlundt et al., 2003) or regression alone (Capps et al., 2002). As previously mentioned, it is not ideal to only use one measure to assess validity, as each method has its own limitations.

Another statistical method used for validation is cross-classification, where categories of intake are compared between the test and reference method to assess the amount of agreement and misclassification. The majority of studies assess intake using a FFQ and validate this against a FR. From this method studies tend to assess the intake of both nutrients and foods by classifying them into categories such as tertiles for different ranges of intake. Few studies have validated an EHQ or short questionnaire using cross-classification in adults. One study developed a short food list from FRs and compared this to 7-day FRs and a FFQ to assess nutrient intakes in a sample of 1502 adults aged 35 to 64 years (Rohrmann & Klein, 2003). Agreement ranged from 54 to 66%, and gross misclassification was ≤1% (Rohrmann & Klein, 2003). A 15-item screener as part of a larger FFQ (60 items) was conducted in 997 adults (Caan, Coates, & Schaffer, 1995). The screener classified more participants into the correct quartile for total fat intake in grams (64.9 to 85.5%) than as a percentage of energy (43.2 to 60.5%), and gross misclassification was low (≤2.7%). Although previous studies have used cross-classification for validation purposes, none were identified that were based purely on whether foods were

consumed or not. Instead tertiles or quintiles tended to be created so ranges of food and nutrient intakes could be compared.

2.5.3.1 Questionnaires focusing on fat intake

Fat intake and sources in the diets of Americans has been assessed by a fat screener questionnaire that was developed by Block et al. (1989). Correlation coefficients between a 4-day FR and total fat intake in g and as a percentage of energy were 0.58 and 0.23 respectively. Another 18-item questionnaire was originally developed by Kristal et al. (1990) which focused on four fat-related dietary behaviours. The correlation coefficient between the average fat intake (%) from a FFQ and two 4-day FRs was 0.68. When the percentage of energy from fat was predicted from the questionnaire, a regression value of 0.47 was found.

The questionnaire developed by Kristal et al. (1990) has since been adapted to assess dietary fat intakes in a nationally representative American population (Capps et al., 2002) and in African American adolescents (Di Noia et al., 2008). In the American population all 19 behaviours assessed in the diet and health knowledge survey together predicted the percentage of energy from total fat (0.43, $P<0.001$) and saturated fat (0.44, $P<0.001$) using regression analysis (Capps et al., 2002). In African American adolescents several fat-related eating habits were significantly correlated with a FFQ for fat intake (% energy) (Di Noia et al., 2008). These were chicken (not fried) (-0.15), pasta or pizza without meat sauce or topping (-0.11), vegetarian dinner (-0.13), low energy salad dressing (-0.13), ≥2 vegetables at dinner (excluding green salad) (-0.11), bread without butter or margarine (-0.20) and avoiding fried food (-0.12) (Di Noia et al., 2008). Regression analysis also found these seven behaviours accounted for 17% of the variance in fat intake (0.13), with pasta or pizza without meat sauce or topping ($P=0.029$) and bread without butter or margarine ($P=0.007$) being significant predictors of lower fat intake (Di Noia et al., 2008).

2.5.3.2 Multicomponent questionnaires

A variety of multicomponent questionnaires have been developed that focus on different aspects of eating habits including fat, fibre, and fruit and vegetable

intake. One questionnaire was altered (Block et al., 2000), from the fat block screener developed by Block et al. (1989), to assess the top sources of fat and fruit and vegetable intake as determined from research and NNS. Fat intake was assessed from 15 items and fruit and vegetables from seven items. Correlation coefficients between the screener and the Block FFQ were 0.69 (total fat (g)) and 0.63 (total fat (%)).

The questionnaire developed by Kristal et al. (1990) has also been adapted to include fibre related behaviours for intervention studies (Kristal et al., 1994; Shannon et al., 1997). One of the intervention studies that evaluated the effectiveness of a self-help booklet to promote dietary change found a fat and fibre-related EHQ was found to correlate better with total fat intake (%) from a FFQ (all participants: 0.51 to 0.56; subsample: 0.60 to 0.62) than a 4-day FR (subsample: 0.34 to 0.59), although only a small subsample completed both the FFQ and FR (n=84) (Kristal et al., 1994). Another intervention also found correlations between a fat and fibre-related EHQ and FFQ for fat intake (%) averaged 0.53 (Shannon et al., 1997). More recently this questionnaire was adapted in an ethnic population to create the SisterTalk Food Habits Questionnaire (STFHQ) (Risica et al., 2007). Additional culturally specific questions and Likert scales were provided to quantify responses (often, sometimes, rarely or never) for foods consumed. The STFHQ was found to correlate with a FFQ for total fat (g) (0.35 to 0.54) and as a percentage of energy (0.37 to 0.45), and total energy (0.17 to 0.39) in an ethnic group (Risica et al., 2007).

Another study assessed a variety of habits from an eating behaviour pattern questionnaire (EBPQ), which was developed for African American women (Schlundt et al., 2003). In addition to low-fat eating practices, behaviours including snacking on sweets, meal skipping and emotional eating were assessed. Correlation coefficients were calculated between the EBPQ and nutrient intakes from a FFQ. Intakes from total energy, total fat (g and %) and saturated fat (g) were significantly correlated ($P<0.01$) with low fat eating (-0.28, -0.37, -0.50, -0.37) and snacking on sweets (0.43, 0.46, 0.26, 0.45) respectively. In addition regression analysis was used to predict total energy (0.52), total fat

(g) (0.58), saturated fat (g) (0.57) and fat (% energy) (0.57) intake between the EBPQ and FFQ. The EBPQ was also significantly correlated ($P<0.01$) with an eating styles questionnaire, which contained 16 behaviours that often reduce fat intake, for the behaviours low fat eating (0.65), emotional eating (-0.26) and snacking on sweets (-0.40).

Other tools have been developed to assess eating habits, although these have not been validated. A tool developed by Bertéus Forslund et al. (2002) assessed meal patterns using a newly developed questionnaire. Women were asked to describe how they usually ate during a 24-hour period. From this questionnaire meal patterns throughout the day could be investigated, although additional behaviours associated with obesity could not be determined. Although reproducible, it was not validated against other more traditional dietary methods, as these were not considered appropriate comparisons. Zazpe et al. (2011) assessed ten dietary habits in conjunction with a FFQ. Although the FFQ had been previously validated the eating habit questions were not, as they only required yes and no responses and were thought to be simple enough. Muñoz-Pareja et al. (2013) assessed obesity related eating behaviours (OREB) associated with higher energy intake through a questionnaire, and dietary intake from a previously validated diet history. Although the diet history was validated, there are limited definitions of OREB and validated questionnaires to assess these behaviours.

2.5.3.3 Assessment of eating habits in New Zealand

In NZ, the key survey that provides national data on the eating habits and macronutrient intakes of women is the nutrition survey. However this is conducted infrequently, most recently in 2008/09 (ANS) (University of Otago & Ministry of Health, 2011a) and prior to that in 1997 (NNS) (Ministry of Health, 1999). Both these surveys collected diet data nationally from participants aged ≥15 years through a 24-hour diet recall and FFQ. The ANS additionally used an EHQ to look at eating habits in the previous four weeks. This questionnaire focused on breakfast consumption, food groups, food preparation and cooking practices, low fat and reduced salt foods, high fat and high sugar foods, fast food and takeaways and beverages (University of Otago & Ministry of Health,

2011b). It was developed based on questions from the NNS and nutrition surveys from overseas, such as America, the UK and Australia. The EHQ was not validated, although a specialist group cognitively tested it to assess understanding of the questions. In the NNS, questions on certain eating habits were asked as part of the FFQ (Quigley & Watts, 1997). Findings from these questionnaires have been discussed previously.

2.6 Summary

Eating habits are behavioural patterns that become an automatic response after repeat performances. They include meal patterns and habits such as the consumption of high fat and high sugar foods, the consumption of low fat alternatives, and food choices at social occasions. Eating habits are a contributing factor to obesity and excess body fat, for which rates are increasing at an alarming rate both worldwide and in New Zealand. One group at greater risk of obesity and increased body fatness is pre-menopausal women. At menarche young women start gaining independence and become more responsible for decisions related to their diet. This is a critical stage in their lives when poor eating habits may be developed, which can continue throughout adulthood. As poor eating habits may lead to obesity and its associated health concerns it is important to understand the contributing factors in NZ women.

The major method used to assess eating habits in NZ is the EHQ that is part of the nutrition survey. However this is conducted infrequently, only assesses certain eating habits and does not investigate common foods consumed for different meals and snacks. Eating habit questionnaires are a useful tool to quickly assess qualitative aspects of eating habits. It is critical that EHQs are validated for each new population group to ensure eating habits are accurately assessed. Currently validated EHQs that investigate eating habits associated with body fatness in NZ women are lacking in the literature. Therefore this research will strive to develop and validate an EHQ so eating habits associated with obesity and body fatness can be further understood in NZ women.

Chapter 3: Methodology

3.1 Study design

The Women's EXPLORE (EXamining the Predictors Linking Obesity Related Elements) study is a large, cross-sectional, observational study aimed at investigating different aspects of women's health such as obesity and body fatness (Kruger et al., 2015). This thesis focuses on validating an Eating Habits Questionnaire (EHQ) against a 4-day weighed food record (WFR) conducted on consecutive days in a subsection of the EXPLORE study population. The EHQ was specifically designed to investigate the eating habits that contribute to obesity and body fatness, such as behaviours associated with healthy/unhealthy eating, social occasions, the time distribution of meals and snacks and typical foods consumed for these meal occasions. Figure 3.1 shows the study flow for the sub-section of the study on which this thesis is based.

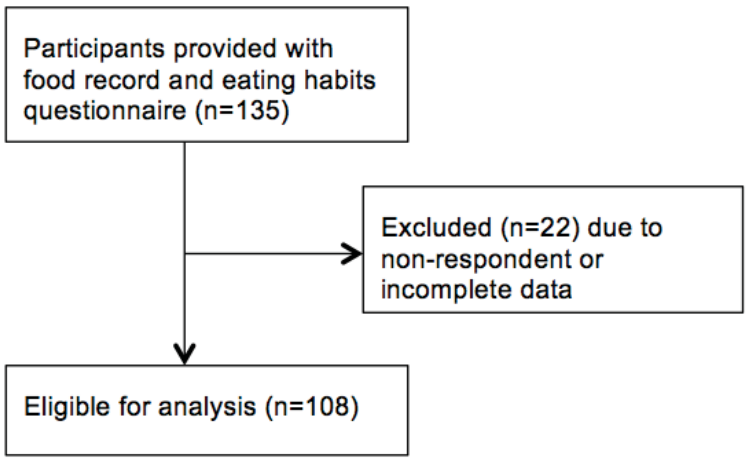


Figure 3.1 Study flow for eligibility screening criteria

3.2 Ethical Approval

Ethical approval was obtained from the Massey University Human Ethics Committee: Southern A, Application 13/13. All participants were provided with an information sheet and given an explanation of the study prior to signing a consent form.

3.3 Participants

Participants recruited were women aged 16-45 years of New Zealand (NZ) European, Māori and Pacific ethnicities living in Auckland, NZ. Women were defined as being one of these ethnicities if at least one parent was either NZ European, Māori or Pacific. Women were included if they were post-menarcheal or pre-menopausal, as defined by having a regular menstrual cycle for the past year. Exclusion criteria were pregnancy, lactation, the presence of any chronic disease (particularly those affecting metabolic health e.g. cancer, diabetes or heart disease) and a dairy allergy to ensure the objectives of the EXPLORE study were met.

3.4 Recruitment

Participants were recruited from July 2013 to June 2014 in this sub-section of the EXPLORE study. A variety of methods were used for recruitment including email lists, social media (e.g. Facebook), flyers, newsletters, newspapers; and promotion to different groups such as church groups, workplaces, pre-schools and community events. Recruitment of Māori and Pacific women was culturally specific and included liaison with ethnic coordinators and local communities, which allowed women to be recruited using a face-to-face approach at. These included churches in West and South Auckland, secondary schools in West Auckland and the North Shore, a women's welfare event and the Māori women's welfare league.

3.5 Data Collection

There were two stages to this study: 1) screening and 2) data collection.

3.5.1 Screening

Participants completed a screening questionnaire either online or on paper to determine their eligibility. Questions included personal details, ethnicity, pregnancy and breastfeeding status, menstruation frequency, contraception use and the presence of chronic disease. Participants who met the inclusion criteria from the screening questionnaire had their body mass index (BMI) and

percentage body fat (%BF) measured using a stadiometer (height) and bioelectrical impedance analysis (BIA) (InBody230, Biospace Co. Ltd, Seoul) (%BF and weight) for classification into three body composition groups. These body composition groups were as follows:

- Normal fat (normal BMI: <25 kg/m^2, normal %BF: ≥22 and <30%)
- Hidden fat (normal BMI: <25 kg/m^2, high %BF: ≥30%)
- Apparent fat (high BMI: ≥25 kg/m^2, high %BF: ≥30%)

Participants who met the criteria for these body composition groups were eligible for the remainder of the EXPLORE study. Once a body composition group had enough participants (n=75 for each of the three ethnicities) no more women were recruited for that body composition group. Although women were recruited based on these body composition groups, analysis of their eating habits according to these groups is outside the scope of this thesis.

3.5.2 Data collection

Eligible participants for the EXPLORE study were booked in for an appointment to complete the main part of the study at the Human Nutrition Research Unit (HNRU) at Massey University in Albany. All women were in the first two weeks of their menstrual cycle and arrived early in the morning in a fasted state. Participants completed a variety of tests throughout the morning including a questionnaire (general demographic information, occupation, whether they were on a special diet for health or cultural/religious reasons, and medication and/or supplement use); body composition measurements including height (Stadiometer), weight, waist and hip circumferences (Lufkin tape), Dual XRay Absorptiometry (Hologic QDR Discovery A, Hologic Inc, Bedford, MA) and Air Displacement Plethysmography (BodPod) (2007A, Life Measurement Inc, Concord, Ca); a venipuncture blood sample; taste testing (sweet and fat taste); blood pressure (Riester Ri-Champion N digital blood pressure monitor); and three online dietary questionnaires (eating habits questionnaire, food frequency questionnaire and three factor eating questionnaire) (Kruger et al., 2015). Participants were given an accelerometer (WGT3X Actigraph) to wear over the

seven days following their appointment while completing a physical activity diary. At the end of the seven days participants completed a physical activity questionnaire and a dietary diversity questionnaire. Breakfast was provided upon completion of phlebotomy and body composition measurements. For validation purposes participants were given a WFR to complete for the days following their appointment (see Figure 3.2 for the study timeline). For this thesis dietary assessment using an EHQ and WFR were the focus and thus further detail is only provided for the methodology of these.

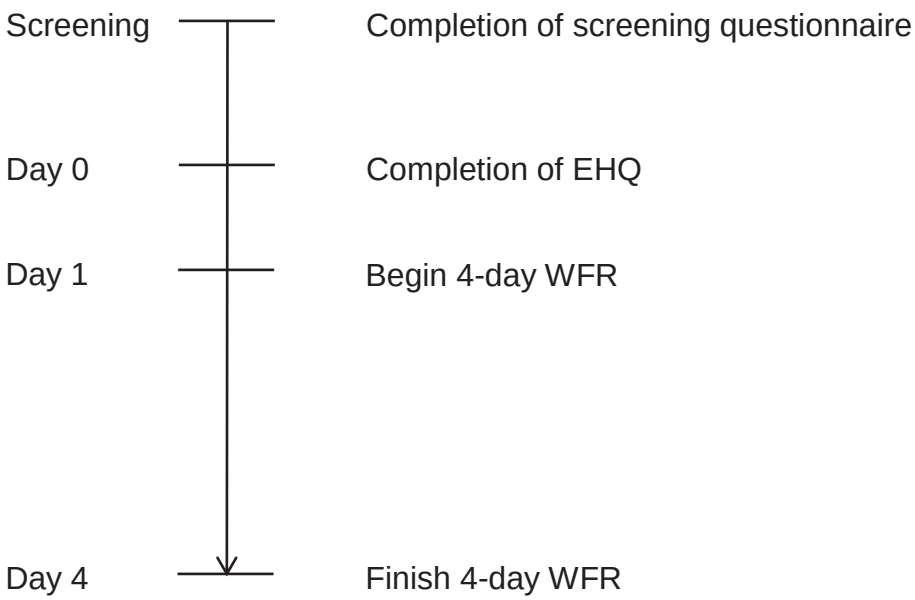


Figure 3.2 Flowchart of the study timeline

3.5.2.1 Dietary Assessment

An EHQ was used to assess participants' eating habits, and was validated against a WFR. The methodology used is described below.

Eating Habits Questionnaire (EHQ)

The EHQ was developed for this study to provide qualitative information about the dietary habits that may contribute to obesity and body fatness. A copy of the questionnaire is provided in Appendix A. The EHQ was based on previous questionnaires, (e.g. (Beck, 2013; Kruger, Stonehouse, von Hurst, & Coad, 2012)), but was adapted to be culturally relevant for NZ women and included

additional questions about social occasions, waking times and the timing of and typical foods consumed during snacking occasions. Prior to participants completing the EHQ, it was pre-tested on fellow researchers involved with the women's EXPLORE study. The EHQ assessed eating habits in the past month. As participants were recruited from July 2013 to June 2014, eating habits over a period of a year were measured.

The aspects of participants' eating habits that were focused on are described below:

- Views on weight status: current weight status, change in the past year, desire to change weight.

- General eating habits: perception of appetite, diversity of the diet including meals, snacks, beverages and alcohol intake.

- Eating behaviours associated with healthy/unhealthy eating including reading food labels, eating sweets, consumption of vegetarian meals, eating fried foods and takeaways, removing skin from chicken, trimming fat from meat, eating with regard to fullness and choosing low fat alternatives (milk, crisps, crackers, margarine, ice cream, salad dressing, cheese, meat and fast food).

- Social occasions (up to seven most common types of events influencing eating habits): type of event, how often it was attended and food and beverage choices.

- Time distribution of meals and snacks: timing of meals (breakfast, lunch, dinner) and snacks (between meals) on weekdays and weekends in relation to sleeping habits. Typical foods consumed for meals and snacks for all the meal occasions mentioned above.

The EHQ is an online self-administered questionnaire that was completed through SurveyMonkey. A researcher supervised the completion of the questionnaire so any queries could be answered. If a computer was unavailable

(e.g. due to technology issues) a paper copy of the questionnaire was filled in and entered online later by a researcher.

4-day weighed food record (WFR)

Participants completed a 4-day WFR and were asked to describe as accurately as possible all foods and fluids consumed. To ensure that a consistent explanation was given, participants watched a DVD on a computer with instructions for completing the WFR. Nutritionists and dietitians at the HNRU, Massey University, developed this DVD. Information on how to complete the WFR, how to precisely measure the quantity of foods and tips to increase accuracy such as including nutrition information panels, packaging and photos were included in the DVD. Participants were provided with a take home pack, containing a paper copy of the WFR with written instructions (Appendix B), a photographic portion size booklet (Nelson, Atkinson, & Meyer, 2002), electronic scales (Tanita KD-200) and a courier ticket and box to post the scales back.

A researcher allocated the specific days for which participants would complete the WFR and answered any additional questions participants had. The WFR was completed for four consecutive days, starting the day following the appointment and included at least one weekend day. This ensured all days of the week were covered, with proportionately more weekdays included, as participants attended their appointment on different days of the week. Participants were asked to maintain their usual eating habits, weigh all food and beverages consumed and include recipes for mixed dishes. In some instances (e.g. restaurant meals), when participants were unable to weigh their food, they were requested to give a detailed description of the food, and to estimate their portions consumed using the portion size booklet provided. Contact was made with participants by the researchers if further detail was required about the information in the completed WFR.

3.6 Data analysis

3.6.1 Eating Habits Questionnaire

Responses from the EHQ were coded in Microsoft Excel for Mac 2011 by the main researcher as specified in Appendix C. All data was cleaned and spot-checked for accuracy.

In the EHQ the questions on typical food intake for meals and snacks on weekdays and weekends required open-ended responses and therefore certain coding decisions were made. These questions were coded according to the instructions in Appendix D and the table provided in Appendix E, with each meal and snack period coded separately. When a participant mentioned a food item in the EHQ it was coded as being 'eaten'. Similarly foods were coded as 'not eaten' when they were not mentioned by participants in the EHQ.

Foods were coded as per the foods and food categories provided in Appendix F. Coding of the foods consumed by participants was based on 49 major food items. These were similar to those used in the 2008/09 NZ Adult Nutrition Survey (University of Otago & Ministry of Health, 2011b). Examples of food items included meat (e.g. beef, lamb, chicken and pork), grains (e.g. rice, pasta and noodles) and starchy vegetables (e.g. potato and kumara). Foods were coded separately for each meal (breakfast, lunch and dinner) and snack period (between meals) on both weekdays and weekends so typical foods consumed by participants during each eating occasion could be determined. Up to ten food combinations were also coded for each eating occasion as per Appendix G. This consisted of foods commonly eaten together. Typical food combinations included 'dairy + grains' for breakfast and 'meat + grains + NSV' for dinner.

Further assumptions used to code the EHQ from participants' responses are provided in Appendix H. For example porridge or cereal was coded as 'dairy + grains', as it was assumed these were eaten together, and toast was coded as 'basic sandwich'.

Several other questions contained open-ended responses. These included those on why participants were unhappy with their weight, why participants had

lost or gained weight and questions about social occasions. Responses to these questions were grouped according to common responses provided by participants.

3.6.2 Weighed food records

The weighed food records were analysed using the FoodWorks program (version 7.0, 2012, Xyris Software, Queensland, Australia) to obtain nutrient data. The Abridged database was used with foods from New Zealand FOODfiles 2010, which is included as part of the FoodWorks program. This database was developed by the NZ Institute for Plant and Food Research and the NZ Ministry of Health (Plant and Food Research, 2010). Three researchers entered approximately one third of the WFRs each. Throughout data entry assumptions were discussed amongst the researchers to ensure consistency. See Appendix I for the major assumptions used. For example if the weight of raw meat was provided in the WFR, the cooked weight was assumed to have a yield of 70% to account for cooking losses (Gerber, Scheeder, & Wenk, 2009). Once all WFRs had been entered, the researchers rechecked their own data for accuracy. To ensure consistency amongst data entry, the three researchers conducted a total of ten spot checks on one another's WFRs.

Similar to the EHQ, the WFRs were coded into foods and food combinations so comparisons could be made based on typical foods consumed for meals and snacks on weekdays and weekends. Foods were coded as being eaten in the WFR when they were consumed at least once during any meal or snack period. Foods were coded and analysed separately for weekdays and weekends. The times meals and snacks were eaten were also coded so they could be compared with the EHQ. Instructions and assumptions used are provided in Appendices D and H respectively. Similar to the coding of the EHQ, the template in Appendix E was used and foods and food combinations were coded as per Appendices F and G respectively. The main researcher coded the majority of WFRs, with additional help from another researcher. Additional spot checks were conducted on ten WFRs to ensure accuracy amongst data entry.

3.6.3 Validation

The EHQ was compared to the WFR to determine if responses to certain questions were valid. The EHQ was administered prior to the WFR to ensure the two methods were encountered independently. This meant participants did not become more conscious of their diet and make adjustments that were reflected in the EHQ (Cade et al., 2002; Nelson, 1997).

The major questions validated were those regarding food intake for meals and snacks on weekdays and weekends; and the times these were eaten. In this instance participants reported that they performed a particular habit or usually ate something at a particular time of the day in the EHQ. The EHQ was considered valid if these habits were actually practiced as evidenced by the recording of their food intake in the WFR.

Additional questions from the EHQ were compared to the WFR, where it was deemed sufficient information was available for meaningful comparisons to be made. These included nutrient intakes in the WFR being compared to the answers to certain questions in the EHQ (dietary composition, alcohol intake at meals, eating behaviours and low fat alternatives). Other qualitative questions were also compared to see if the habits in the EHQ were actually practiced in the WFR. These questions were validated as follows:

- "*Your snacks are mainly based on: (you may choose more than one option)"*. Snack foods listed in the EHQ were coded as eaten in the WFR when consumed ≥3 times as a snack over weekdays and weekends.
- *"Do you usually drink alcohol (e.g. wine or beer) at meals?"*. Answers from the EHQ were coded only for the dinner meal as follows:
    - Never: not consumed in the WFR;
    - Sometimes: consumed on one day in the WFR;
    - Often: consumed on two to three days in the WFR;
    - Always: consumed every day in the WFR.

- *"Which beverages do you usually drink between meals?"*. The beverage consumed most frequently in the WFR was coded against the appropriate EHQ option (i.e. water, soft drinks, alcohol or fruit drinks). As tea and coffee were not included, these were ignored when consumed in the WFR and therefore some participants had missing data.

- *"How often do you usually practice the following behaviours*?". Comparisons were made for the behaviours: eat sweets, eat meals without meat, eat fried foods and eat takeaway foods. Responses were coded as:

    - Never and rarely: not eaten in the WFR;
    - Sometimes: eaten once in WFR;
    - Often: eaten two or more times in WFR, but not every day;
    - Always: eaten every day in the WFR.

  The following behaviours 'remove the skin from chicken' and 'trim the fat from meat' were practiced infrequently and therefore were unable to be compared to the EHQ. The behaviours about reading food labels, food choice behaviour and eating until overfull were also not coded, as these could not be tracked within the WFR.

- *"For which of the following foods do you regularly choose low fat alternatives for?"*. Responses were coded as:

    - Yes: participant ate a low fat alternative ≥1 times in the WFR;
    - No: participant ate food in the WFR but did not eat a low fat alternative;
    - Not applicable: participant did not eat that food in the WFR.

3.7 Statistical analysis

SPSS statistical package for Mac version 21.0 (IBM incorporation, New York, USA) was used for statistical analysis of results. The sample size was selected based on other validation studies where it was suggested a sample of more than 100 participants was suitable (Serra-Majem et al., 2009; Willett, 1998). All variables were tested for normality using the Kolmogorov-Smirnov and Shaprio-Wilk test and by examining normality plots, and for homogeneity using the Levene's test. Non-normally distributed data was log-transformed to obtain normality where possible and is presented as the geometric mean (95% confidence interval). Participant characteristics are presented as the mean ± standard deviation (SD) for normally distributed data and median [25, 75 percentile] for non-normally distributed data. When multiple comparisons were made between energy, sugar, total fat (g and % energy) and saturated fat intake (g and percentage energy) (i.e. for eating behaviours and low fat alternatives), a *P*-value of <0.01 was considered significant. For all other tests a *P*-value of <0.05 was considered significant. All tests were two-tailed.

Cross-classification, chi-squared (χ^2) and the weighted kappa statistic (Kw) were used to compare participants' responses between the EHQ and WFR for categorical data. Both cross-classification and χ^2 were conducted for the following questions: what type of food snacks were based on, beverages drunk between meals, alcohol consumption at meals, eating behaviours, low fat alternatives, whether meals and snacks were consumed (weekdays and weekends), timing of meals and snacks (weekdays and weekends), and typical foods and food combinations (weekdays and weekends). The recommendations by Masson et al. (2003) for validation studies were used for cross-classification where >50% of participants should fall into the same third, and <10% grossly misclassified into the opposite third. For χ^2 all observations were independent and when the assumption of cells having an expected count of >5 was violated, significance was calculated using Fisher's exact test. When appropriate (e.g. beverages consumed between meals) categories were combined to provide 2x2 contingency tables. The weighted kappa statistic (Kw) was used to assess agreement between categorical data from the EHQ and

WFR for questions with 3x3 contingency tables: alcohol consumption at meals, eating behaviours and the timing of meals and snacks on weekdays and weekends. For the question on meal and snack timing, the responses 'Don't eat a meal (breakfast, lunch or dinner)' and 'Don't eat a snack' were excluded from Kw analysis. A value of 1 was used to weight participants into the same third for the EHQ and WFR; 0.5 for adjacent thirds and 0 for opposite thirds. The agreement of Kw values used were as follows: 0.81-1.00 very good; 0.61-0.80 good; 0.41-0.60 moderate; 0.21-0.40 fair; and <0.20 poor (Altman, 1991). For validation studies Masson et al. (2003) suggests Kw values should be above 0.4.

To assess the ability of the EHQ to rank participants' responses by nutrient intakes, various questions from the EHQ were compared to their nutrient intakes from the WFR. The questions on eating behaviours and choice of low fat alternatives were compared to certain nutrients (energy (kJ), sugar (g), saturated fat (g and % energy) and total fat (g and % energy)) from the WFR. To provide more meaningful data the question asking participants how often they usually practice certain behaviours was condensed into: 1) never and rarely 2) sometimes, and 3) often and always. For the question in the EHQ on whether low fat alternatives were regularly chosen, comparisons were only made between nutrient intakes from the WFR and participants who responded 'yes' or 'no', as there was uncertainty on why participants responded 'not applicable'. Participants' responses to the question 'What is your diet mainly based on?' were also compared to their food records according to protein, carbohydrate and fat intake in both grams and as a percentage of energy. Comparisons were unable to be made with the response 'high fat foods', due to the small sample size (n=1). In addition participants' responses to how frequently they consumed alcohol at meals were compared to their alcohol intake from the WFR in both grams and as a percentage of energy. For parametric data the independent *t*-test was used for comparisons between two groups (e.g. for nutrient intakes between participants who responded 'yes' and 'no' for low fat foods such as milk) and ANOVA for more than two groups (e.g. for nutrient intakes for the frequency participants practiced eating behaviours such as vegetarian meals). For non-parametric data the Mann-Whitney test was

used for comparisons between two groups and Kruskal-Wallis for more than two groups. The effect size was calculated between participants' responses in the EHQ and nutrient intakes from the WFR for statistical tests that were statistically significant to determine whether the effect was important. The following formulae were used: independent *t*-test $r = \sqrt{t^2}/(t^2+df)$ (*t* = test statistic and df = degrees of freedom); Mann-Whitney $r = Z/\sqrt{n}$ (Z = *z* score and n = sample size). Effect size indicators were taken as small (0.10), medium (0.30) and large (≥50) (Field, 2009).

Chapter 4: Results

This chapter presents the findings from this subsection of the women's EXPLORE study. Firstly the demographic characteristics of participants are displayed. The eating habits of participants are then described alongside the validation results, where the eating habits questionnaire (EHQ) was compared to the 4-day food record (WFR).

4.1 Demographic characteristics

From July 2013 to June 2014, 471 women were screened for inclusion in the women's EXPLORE study. Many women were excluded (n=363) due to being ineligible (n=244), dropping out (n=23), non-respondent (n=69) or having incomplete data (n=27). Therefore a total of 108 women living in Auckland, New Zealand who completed both the EHQ and a WFR participated in this validation study. The demographic characteristics of the participants are provided in Table 4.1.

Table 4.1 Demographic characteristics of participants

Characteristic	**n=108**		***P*-value**
Age (years)[a]	31.3 [25.6, 39.0]		
Age group[b]			
16-25 years	22 (20.4)		
25-35 years	45 (41.7)		
35-45 years	41 (38.0)		
Ethnicity[b]			
NZ European	86 (79.6)		
Māori	14 (13.0)		
Pacific	8 (7.4)		
Body fat percentage[c]	29.9 (28.7, 31.2)		
Body fat percentage categories	**Normal (<30%)**	**High (≥30%)**	
n (%)[b]	49 (45.4)	59 (54.6)	
Body fat percentage[a]	24.8 [22.2, 28.0]	34.3 [31.5, 37.6]	**<0.001****
BMI (kg/m^2)[a]	21.1 [20.4, 23.1]	25.3 [23.2, 28.7]	**<0.001****
BMI (kg/m^2)[a]	23.2 [21.1, 26.1]		
BMI categories	**Normal (18.5-24.9 kg/m^2)**	**Overweight and obese (≥25.0 kg/m^2)**	
n (%)[b]	72 (66.7)	36 (33.3)	**<0.001****
Body fat percentage[a]	27.8 [23.4, 31.5]	34.6 [31.6, 41.4]	**<0.001****
BMI (kg/m^2)[a]	22.0 [20.6, 23.2]	27.6 [26.1, 30.8]	

BMI: Body mass index
[a] Median [25, 75 percentile], [b] n (%), [c] geometric mean (95% confidence interval)
** *P* <0.001

The majority of women were of New Zealand European ethnicity (79.6%). Most women had a normal BMI (66.7%) and the median [25, 75 percentile] BMI (23.2 [21.1, 26.1] kg/m^2) was within the suggested normal range of 18.5-24.9 kg/m^2 (World Health Organization, 2000).

4.2 Eating habits questionnaire including validation against the food record

The EHQ is composed of different aspects including 1) views on weight status; 2) eating habits (e.g. perception of appetite, and dietary diversity including meal, snack, beverage and alcohol consumption); 3) eating behaviours; 4) choice of low fat alternatives; 5) social occasions; 6) time distribution of meals and snacks (weekdays vs. weekends); and 7) foods and meal combinations eaten across the day (weekdays vs. weekends). Results are described below, along with results from the various questions that were validated against the WFR. A copy of the EHQ is provided in Appendix A.

4.2.1 Views on weight status

Women's views on their weight status are presented in Table 4.2.

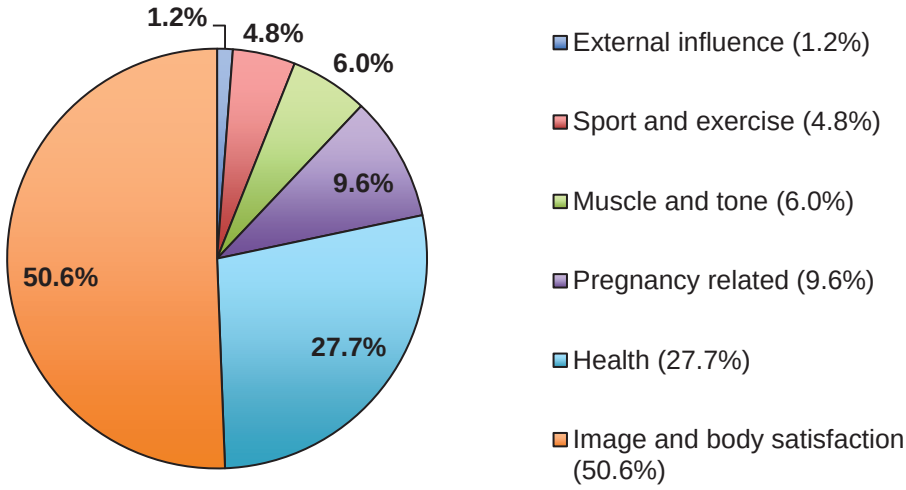
Table 4.2 Participants' views on weight status that may influence eating habits

Question	Response n (%)		
Satisfied with current weight? (n=108)	**Yes**	**No**	
	34 (31.5)	74 (68.5)	
Desirable weight change[a] (n=74)			
+ 1 to 5 kg		3 (3.9)	
+ 5 to 10 kg		1 (1.3)	
- 1 to 5 kg		44 (57.9)	
- 5 to 10 kg		28 (36.8)	
Weight change in the past year (n=108)	**Same**	**Gained**	**Lost**
	33 (30.6)	35 (32.4)	40 (37.0)
Level of weight change in the past year[b] (n=75)			
Unsure	2 (2.7)		
+ 1 to 5 kg		17 (22.7)	
+ 5 to 10 kg		17 (22.7)	
- 1 to 5 kg			21 (28.0)
- 5 to 10 kg			18 (24.0)
Concern about weight status (n=108)			
Yes		54 (50.0)	
No		54 (50.0)	

[a] Only included participants who responded "No" to the question "Are you happy with your current weight?"
[b] Only included participants who responded "Gained" or "Lost" to the question "Has your weight changed in the past year?"

The majority of women (68.5%) were unhappy with their current weight and wanted to weigh less, mostly between 1-5 kg (57.9%). In the past year approximately one third of women either gained (32.4%), lost (37.0%) or remained the same weight (30.6%) respectively. Of the women who had lost weight in the past year, slightly more had lost between 1-5 kg (28.0%) than 5-10 kg (24.0%).

The reasons why women were dissatisfied with their weight are displayed in Figure 4.1.



Only included participants who responded “No” to the question “Are you happy with your current weight” (n=74)

Figure 4.1 Reasons participants are dissatisfied with their current weight

Approximately half of women (50.6%) were unhappy with their weight due to **image and body satisfaction** reasons. Common responses included not feeling good about themselves, clothes not fitting and gaining weight. Some of their statements on this issue are:

“To feel better about the way I look”,

“Clothes that I can’t fit anymore that I don’t want to throw out”,

“Would feel more comfortable”,

"Feels good when I weigh 5-10kg less",

"Has gone up over the past 2 years",

"Not happy with the weight around my waist".

Just over one quarter of women (27.7%) mentioned they were unhappy with their weight due to **health** reasons:

"Would be healthier to be a lower weight",

"I want to be at my ideal body weight / body fat level",

"I am carrying too much weight around my body, which I know is a health risk".

Pregnancy related reasons were mentioned by 9.6% of participants:

"Since having children I haven't lost all the weight I gained",

"After having children it has been difficult to shift the weight",

"I have just had 2 babies in the past 2 years by C section so could only exercise lightly in order to not put stress on scar area".

Six percent of participants mentioned they were unhappy with their weight due to **muscle and tone** reasons. These included wanting to lose fat and gain muscle, rather than wanting to lose weight:

"Would like to lose some fat and gain some muscle, not so concerned with the weight as becoming a bit more lean",

"While I am in the healthy range I do still have excess fat - so it's not a weight thing as such, I would like to be leaner but not necessarily lighter (would like more muscle tone)",

"Just be a bit more toned for summer".

Sport and exercise was the reason 4.8% of women were unhappy with their weight:

"I would like to be leaner and fitter for sports",

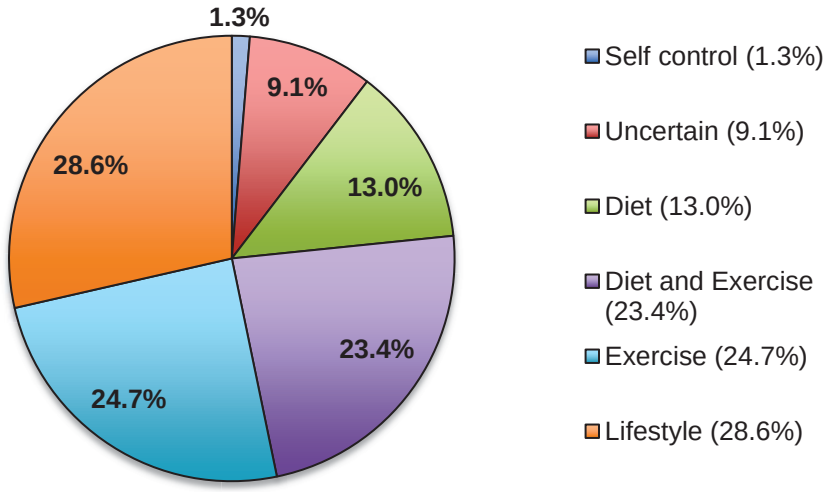
"Have difficulties when trying to play sports and dance again. It's a lot harder to try and move quickly when you have a lot of weight to carry",

"Would like to be a bit lighter to help with training".

A few women (1.2%) stated an **external source** was their source of dissatisfaction with their current weight:

"My doctor said this would be a good weight for me".

Reasons why women gained and lost weight are displayed in Figure 4.2.



Only included participants who responded "lost" or "gained" to the question "Has your weight changed in the past year?" (n=75)

Figure 4.2 Reasons for losing or gaining weight

Lifestyle was the most common reason (28.6%) for weight loss or gain. This included family, job and study commitments:

"Change of lifestyle" (weight loss and weight gain),

"New job with more responsibility, no down time, high stress. Role is very sedentary" (weight gain),

"After having my third child I found it difficult to lose weight and difficult to find time for fitness" (weight gain),

"Probably through studying and sitting down a lot" (weight gain).

Approximately a quarter of women's (24.7%) weight change was due to either a lack of or an increased amount of **exercise**:

"Lack of exercise" (weight gain),

"Exercising more" (weight loss),

"Lost fat, gained muscle through exercise" (weight gain).

Specific **diet and exercise** regimes were also mentioned by approximately a quarter of women (23.4%) as a reason for weight gain or loss:

"Increased exercise, diet change" (weight loss),

"Started going regularly to the gym and trying to watch what I eat" (weight loss),

"Am watching what I eat - eating more fruit and vegetables and am exercising regularly" (weight loss),

"Not eating as healthy and not exercising as much" (weight gain).

A few of the women (13.0%) stated that **diet** was the reason for their weight change:

"I am drinking more and have stopped being so conscious of what I'm eating" (weight gain),

"Not being careful about my portion sizes" (weight gain),

"Changed my diet" (weight loss).

Some women (9.1%) were **uncertain** why their weight had changed:

"Unintentional, probably due to stress" (weight loss),

"Bad decisions" (weight gain),

"I don't know. Can't figure it out! Just seem to be putting on weight despite eating healthy and exercising" (weight gain).

A few women (1.3%) stated **self control** was their reason for weight change:

"Lost self control" (weight gain).

Figure 4.3 shows the methods that women employ to control their weight. Just over three quarters of these women (77.8%) were trying to control their weight with a combination of diets, exercising and healthy eating. None were trying to control their weight purely with dieting. Interestingly all women who selected 'other' (7.4%) mentioned they were using a combination of healthy eating and exercise, but not dieting.

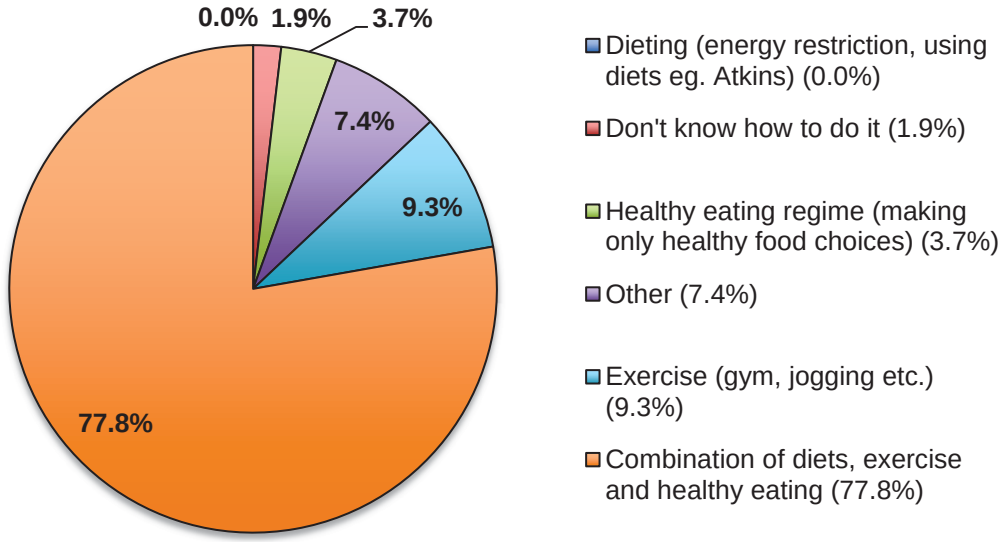


Figure 4.3 Methods employed to control weight

4.2.2 Eating habits

Participants described their eating habits, which included general eating habits (appetite and diet diversity), dietary macronutrient composition, types of snacks, beverages consumed between meals and alcohol consumed with meals. Further analysis was made with the WFR when possible (dietary macronutrient

composition, snacks, beverages between meals and alcohol consumed with meals).

4.2.2.1 General eating habits

Participants were asked about general eating habits, as shown in Table 4.3. These habits were appetite and dietary diversity.

Table 4.3 Participants' general eating habits

Question	Response	n (%)
How would you describe your appetite?[a]	Good Fair Poor	101 (93.5) 6 (5.6) 1 (0.9)
How diverse is your diet?	Different every day Different only sometimes during the week Different only during weekend days Very monotonous	30 (27.8) 43 (39.8) 25 (23.1) 10 (9.3)

[a] How appetite was described:
Good: being able to eat and enjoy moderate sized meals without difficulty and being able to snack between meals
Moderate: being able to eat moderate sized meals, but finding it hard to complete meals, and seldom snacking between meals
Poor: never feeling like eating OR being hungry but don't feel like eating AND generally not enjoying eating at all

The majority of participants had a good appetite (93.5%). Diversity of diet varied with participants reporting a diet that was different only sometimes during the week (39.8%), different every day (27.8%) or different only on weekend days (23.1%).

4.2.2.2 Dietary composition

Most women reported eating different foods every day (59.8%), rather than viewing their diet as being based on a certain macronutrient (protein (24.3%), carbohydrate (15.0%), fat (0.9%)).

Comparison of dietary composition with food record

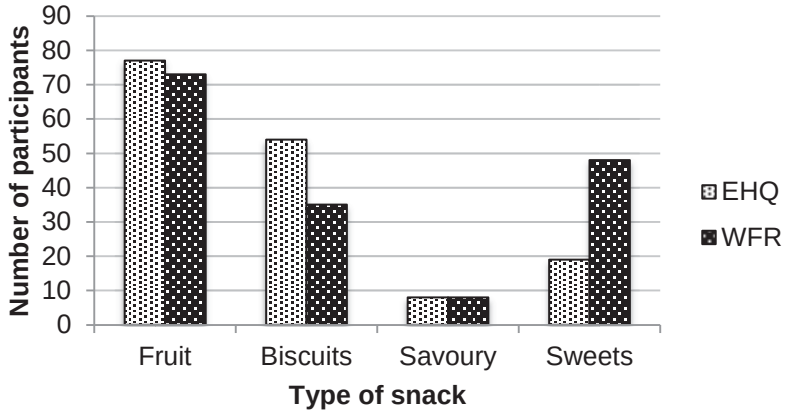
Comparison of the EHQ with participants' nutrient intakes from the WFR found women who perceived their diet as being based on carbohydrate foods had a higher carbohydrate intake (g) than women who viewed their diet as being based on protein foods (mean±SD) (227±51.0 vs. 171±43.6) (P=0.001, r=0.51). Women who viewed their diet as being different every day also had a higher carbohydrate intake (g) than women who thought their diet was based on protein foods (202.2±50.3 vs. 171.4±43.6) (P=0.008, r=0.28). Carbohydrate

intake (%) was higher in women who perceived their diet as being based on carbohydrate foods than women who thought their diet was based on protein foods (46.2±5.82 vs. 38.7±8.14) (*P*=0.002, r=0.45); and in women whose diets were viewed as being different every day compared to women who thought their diet was based on protein foods (43.1±7.55 vs. 38.7±8.14) (*P*=0.016, r=0.25).

Women who thought their diet was mainly based on protein foods had a higher protein intake (g) than women who viewed their diet as being different everyday (89.6 [72.7, 111.8] vs. 78.3 [69.5, 89.8]) (*P*=0.027, r=-0.23); and higher protein intake (%) than women who viewed their diet as being based on carbohydrate foods (19.7 [16.7, 24.9] vs. 16.6 [15.0, 20.8]) (*P*=0.009, r=-0.40) and different foods everyday (19.7 [16.7, 24.9] vs. 16.7 [15.4, 18.8) (*P*=0.001, r=-0.37). Comparisons were not made with women who viewed their diet as being based on fatty foods due to the small sample size (n=1).

4.2.2.3 Snacks

Results showing participants' snack choices are provided in Figure 4.4 and comparison of the EHQ with the WFR in Table 4.4.



Food examples provided under each snack:
Fruit: Fruit, fruit juice, fruit and milk shakes, yoghurt
Biscuits: Biscuits, crackers, bread, stick bread
Savoury: Hot chips, pop corn, peanuts, chips, soft drinks
Sweets: Sweets, chocolates, ice cream, cakes

Figure 4.4 Participants' snack choices

Table 4.4 Comparison of the EHQ and WFR for participants' snack choices

	Snack	Snack eaten	WFR n (%)[a] (n=108)		
			Eaten	**Not eaten**	***P*-value[b]**
EHQ n (%) (n=108)	**Fruit**	**Eaten**	61 (56.5%)	16 (14.8%)	**<0.001****
		Not eaten	12 (11.1%)	19 (17.6%)	
	Biscuits	**Eaten**	26 (24.1%)	28 (25.9%)	**0.001***
		Not eaten	9 (8.3%)	45 (41.7%)	
	Savoury	**Eaten**	1 (0.9%)	7 (6.5%)	0.471
		Not eaten	7 (6.5%)	93 (86.1%)	
	Sweets	**Eaten**	12 (11.1%)	7 (6.5%)	0.081
		Not eaten	36 (33.3%)	53 (49.1%)	

EHQ: eating habits questionnaire; WFR: weighed food record
See the footnotes in Figure 4.4 above for foods included under each snack choice
[a] Responses in the FR were coded as eaten when consumed ≥3 times
[b] Fishers exact test
* *P* <0.05, ** *P* <0.001

Women's snacks were clearly based on fruit, as shown in both the EHQ (n=77) and WFR (n=73). Agreement was greater than 60% between the EHQ and WFR for fruit, biscuits, savoury snacks and sweets. The biggest discrepancy was seen when sweets were eaten in the WFR but not mentioned in the EHQ (33.3%) and when biscuits were mentioned in the EHQ but not eaten in the WFR (25.9%).

4.2.2.4 Beverages between meals

Beverages that participants usually drank between meals are compared between the EHQ and WFR in Table 4.5. In the EHQ almost all women stated they drank water between meals (92.6%). Soft drinks, alcohol and fruit drinks were merged into 'other beverages', as few participants consumed these (7.5%).

Table 4.5 Comparison of the EHQ and WFR for beverage consumption between meals

		WFR n (%)[a]		***P*-value[b]**
		Water[c]	**Other beverages[d]**	
EHQ n (%) (n=100)	**Water[c]**	89 (89.0%)	4 (4.0%)	0.055
	Other beverages[d]	5 (5.0%)	2 (2.0%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Responses were coded in WFR as the beverage consumed most frequently
[b] Fishers exact test
[c] Mineral water or tap water;
[d] Includes soft drinks (cola, orange, soda, iced tea, tonic water, energy drinks), alcohol (wine, beer, other alcoholic beverages) and fruit drinks (fruit, fruit juice, fruit and milk shakes)

There was good agreement between the EHQ and WFR, with 91% of participants responding with either water or other beverages in both the EHQ and WFR.

4.2.2.5 Alcohol at meals

Table 4.6 compares women's responses from the EHQ with the WFR for alcohol consumption at meals. The EHQ found most women 'sometimes' drank alcohol at meals (60.2%). Nearly half of women fell into the same tertile for both the EHQ and WFR (45.4%) rather than opposite tertiles (2.8%). The largest amount of misclassification was seen in participants who responded 'sometimes' in the EHQ but 'never' drank alcohol in the WFR (27.8%). The Kw found fair agreement (0.29).

Table 4.6 Cross classification of alcohol consumption at meals between the EHQ and WFR

		WFR n (%)[a]			***P*-value[b]**	**Kw[c]**
		Often and always	**Sometimes**	**Never**		
EHQ n (%) (n=108)	**Often and always**	8 (7.4%)	5 (4.6%)	2 (1.9%)	**<0.001****	**0.29**
	Sometimes	16 (14.8%)	19 (17.6%)	30 (27.8%)		
	Never	1 (0.9%)	5 (4.6%)	22 (20.4%)		

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Responses in the WFR were coded as:
Never: not consumed
Sometimes: consumed for dinner one day
Often and always: consumed for dinner on ≥2 days
[b] Fisher exact test
[c] Weighted kappa statistic
* *P* <0.05, ** *P* <0.001

Further analysis was conducted between participants' responses in the EHQ and alcohol intake from the WFR. Alcohol intake (g and % energy) (*P*=0.003 and *P*=0.005 respectively) differed by women's frequency of alcohol consumption at meals. More specifically, alcohol intake (g) was greater in women who 'often and always' consumed alcohol (median [25th, 75th percentile]) (17.9 [6.5, 25.7]) compared to women who 'sometimes' (3.22 [0.00, 12.8]) (*P*=0.005, r=-0.31) and 'never' (0.35 [0.00, 3.00]) (*P*=0.001, r=-0.48) consumed alcohol at meals. Alcohol intake (% energy) was greater in women who 'often and always' consumed alcohol at meals (6.85 [2.43, 8.92]) than women who 'sometimes' (1.58 [0.00, 5.34) (*P*=0.008, r=-0.30) and 'never' (0.15 [0.00, 0.97]) (*P*=0.002, r=-0.46) consumed alcohol at meals.

4.2.3 Eating behaviours

Eating behaviours were explored in relation to high fat and high sugar food choices. Vegetarian meals were also investigated. Participant's responses to the EHQ are provided in Table 4.7.

Table 4.7 Frequency of eating practice behaviours from the EHQ

Behaviour	Often and always n (%)	Sometimes n (%)	Never and rarely n (%)
Read food labels when deciding what to eat	51 (47.2)	38 (35.2)	19 (17.6)
Eat sweets[ac]	40 (37.4)	47 (43.9)	20 (18.7)
Eat meals without meat (vegetarian meal)	36 (33.3)	35 (32.4)	37 (34.3)
Eat fried foods[bd]	5 (4.7)	34 (32.1)	67 (63.2)
Remove the skin from chicken[e]	66 (63.5)	13 (12.5)	25 (24.0)
Trim (cut away) the fat from meat[f]	69 (67.6)	19 (18.6)	14 (13.7)
Eat takeaway foods	25 (23.1)	59 (54.6)	24 (22.2)
Eat until you are overfull[d]	15 (13.9)	56 (51.9)	37 (34.3)

[a] Examples: chocolate, lollies, cakes, biscuits
[b] Examples: fried chicken, fried fish
Missing data for: [c] one participant; [d] two participants; [e] four participants; [f] six participants

Just under half of women (47.2%) 'often and always' read food labels when deciding what to eat. A third of women (33.3%) were vegetarian. The majority of women 'often and always' removed the skin from chicken (63.5%) and trimmed the fat from meat (67.6%). Approximately half of women 'sometimes' ate takeaway food (54.6%) and 'sometimes' ate until they were overfull (51.9%).

4.2.3.1 Eating behaviours comparison between EHQ and WFR

The EHQ was compared to the WFR for the behaviours related to eating sweets, meals without meat, fried foods and takeaways. Several behaviours were unable to be compared as they were practiced infrequently (remove the skin from chicken and trimming the fat from meat), or could not be tracked within the WFR (read food labels and eat until overfull). Comparisons between the EHQ and WFR are presented in Table 4.8.

Table 4.8 Comparison between EHQ and WFR on eating practice behaviours

	Question	Response	WFR n (%)[a]			*P*-value[d]	Kw[e]
			Often and Always	Sometimes	Never and Rarely		
EHQ n (%)	Eat sweets[b] (n=107)	Often and Always	35 (32.7%)	3 (2.8%)	2 (1.9%)	0.020*	0.21
		Sometimes	28 (26.2%)	12 (11.2%)	7 (6.5%)		
		Never and Rarely	12 (11.2%)	3 (2.8%)	5 (4.7%)		
	Eat meals without meat (vegetarian meal) (n=108)	Often and Always	14 (13.0%)	10 (9.3%)	12 (11.1%)	<0.001**	0.26
		Sometimes	1 (0.9%)	9 (8.3%)	25 (23.1%)		
		Never and Rarely	2 (9.1%)	9 (8.3%)	26 (24.1%)		
	Eat fried foods[c] (n=106)	Often and Always	2 (1.9%)	2 (1.9%)	1 (0.9%)	0.002*	0.31
		Sometimes	4 (3.8%)	15 (14.2%)	15 (14.2%)		
		Never and Rarely	4 (3.8%)	13 (12.3%)	50 (47.2%)		
	Eat takeaways (n=108)	Often and Always	11 (10.2%)	7 (6.5%)	7 (6.5%)	<0.001**	0.33
		Sometimes	10 (9.3%)	27 (25.0%)	22 (20.4%)		
		Never and Rarely	2 (1.9%)	2 (1.9%)	20 (18.5%)		

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Responses in FR coded as:
Often and always: eaten ≥2 times in WFR
Sometimes: eaten once in WFR
Never and rarely: not eaten in WFR
[b] Examples: chocolate, lollies, cakes, biscuits
[c] Examples: fried chicken, fried fish
[d] Fishers exact test used when assumptions not met
[e] Weighted kappa statistic
* *P* <0.05, ** *P* <0.001

Cross-classification between the EHQ and WFR found >50% of participants were classified into the same tertile and <10% into the opposite tertiles for fried food and takeaways. The greatest amounts of misclassification were found for women who responded: 'sometimes' in the EHQ and 'often and always' in the WFR for eating sweets (26.6%); 'sometimes' in the EHQ and 'never and rarely' in the WFR for vegetarian meals (23.1%); and 'sometimes' in the EHQ and 'never and rarely' in the WFR for ate takeaways (20.1%). The Kw between the EHQ and WFR found fair agreement (0.21-0.33) for the four behaviours.

4.2.3.2 Eating behaviours and nutrient intakes

Table 4.9 shows whether energy (kJ), sugar (g), total fat (g and % energy) and saturated fat (g and % energy) intake calculated from the food records differed between women who 'never and rarely', 'sometimes', and 'often and always' practiced certain behaviours, as reported in the EHQ.

Table 4.9 Energy, sugar, total fat (g and % energy) and saturated fat (g and % energy) intakes for different eating behaviours

Behaviour		Energy (kJ/day)		Sugar (g/day)		Total fat (g/day)		Total fat (% energy)		Saturated fat (g/day)		Saturated fat (% energy)	
	Response	Median [25, 75 percentile]	*P*-value	Geometric mean (95% CI)	*P*-value	Mean±SD	*P*-value	Mean±SD	*P*-value	Mean±SD	*P*-value	Median [25, 75 percentile]	*P*-value
Read food labels (n=108)	Never & rarely	8047 [6290, 9248]	0.371	88.2 (74.4, 104.6)	0.735	75.1±19.6	0.171	35.4±7.83	0.206	30.4±10.1	0.019	13.7 [11.4, 15.9]	0.034
	Sometimes	8112 [7520, 8921]		90.9 (83.1, 100.5)		80.8±23.7		37.6±7.13		30.9±12.1		13.8 [11.1, 16.7]	
	Often & always	7630 [6762, 8782]		86.5 (79.8, 94.6)		71.6±22.8		34.9±7.16		25.0±9.23		12.2 [10.5, 14.5]	
Eat sweets (n=107)	Never & rarely	7807 [5880, 8837]	0.155	85.6 (70.8, 102.5)	0.177	70.0±21.9	0.231	34.3 [30.8, 39.3][c]	0.408	22.9 [18.3, 26.7][c]	0.011	11.7 [9.26, 13.6]	0.028
	Sometimes	7668 [6234, 8715]		84.8 (78.3, 92.8)		73.3±24.4		34.8 [29.7, 39.8]		23.7 [18.4, 35.0]		12.2 [10.6, 15.4]	
	Often & always	8214 [7245, 9181]		95.6 (87.4, 104.6)		80.0±20.3		37.9 [32.2, 41.1]		30.5 [25.6, 38.2]		13.8 [12.5, 16.3]	
Vegetarian meals (n=108)	Never & rarely	8149 [6889, 8933]	0.914	90.0 (80.6, 99.5)	0.829	82.6 [59.2, 91.2][c]	0.663	36.7±7.18	0.738	30.5±12.2	0.190	14.3±4.35[a]	0.065
	Sometimes	7964 [6546, 8807]		86.5 (78.3, 95.6)		76.0 [57.4, 92.7]		35.7±6.08		27.6±9.95		13.0±2.99	
	Often & always	7633 [6780, 9002]		90.0 (80.6, 100.5)		72.0 [58.6, 85.6]		35.4±8.57		25.9±9.73		12.3±3.53	
Eat fried foods (n=106)	Never & rarely	7727 [6234, 8782]	0.080	87.4 (80.6, 94.6)	0.424	71.6±23.5	0.073	34.7 [29.7, 39.8][c]	0.104	23.8 (21.5, 26.6)[b]	**0.009***	12.1 (11.2, 13.0)[b]	0.027
	Sometimes	8113 [7549, 9112]		85.6 (80.6, 97.5)		81.9±20.9		39.5 [34.1, 41.2]		30.3 (27.1, 33.8)		14.1 (13.0, 15.4)	
	Often & always	9248 [7658, 10115]		105.6 (80.6, 138.4)		83.6±16.2		33.8 [32.6, 38.3]		32.1 (22.0, 47.5)		13.7 (10.5, 17.9)	
Remove the skin from chicken (n=104)	Never & rarely	8782 [7666, 9399]	0.027	108.4 [72.7, 133.9][c]	0.096	80.0±19.9	0.425	35.5±6.44	0.818	30.3 (26.3, 34.8)[b]	0.074	14.3 [10.5, 17.5]	0.463
	Sometimes	7616 [6766, 8615]		88.0 [75.7, 101.9]		78.4±26.4		37.1±8.91		27.4 (21.1, 35.5)		12.8 [11.0, 15.2]	
	Often & always	7800 [6168, 8741]		82.5 [67.1, 106.6]		73.3±23.7		36.0±7.47		24.3 (22.0, 27.1)		12.7 [10.8, 15.6]	
Trim the fat from meat (n=102)	Never & rarely	9246 [8301, 10307]	**0.002***	103.5 (83.1, 129.0)	0.087	87.1±23.5	0.086	35.4±8.46	0.817	36.0 [26.6, 44.6][c]	0.018	14.5 [10.4, 18.2]	0.485
	Sometimes	7622 [6290, 9212]		89.1 (78.3, 100.5)		78.7±29.7		37.0±8.71		24.3 [17.2, 38.3]		13.3 [11.8, 14.7]	
	Often & always	7727 [6654, 8660]		84.8 (79.0, 90.9)		72.6±20.7		35.9±6.93		25.4 [18.6, 33.8]		12.8 [10.8, 15.6]	
Eat takeaway foods (n=108)	Never & rarely	7777±1469[a]	0.286	90.7 [57.6, 110.8][c]	0.752	74.3±23.6	0.350	34.7 [28.8, 42.6][c]	0.575	26.8±11.3	0.235	12.0 (10.4, 13.9)[b]	0.448
	Sometimes	7722±1433		92.0 [70.9, 110.3]		73.4±21.0		36.0 [30.6, 39.7]		27.2±9.33		12.8 (12.0, 13.6)	
	Often & always	8289±1526		83.3 [74.4, 103.9]		81.2±25.8		38.1 [29.8, 41.9]		31.2±13.1		13.3 (11.7, 15.2)	
Eat until you are overfull (n=106)	Never & rarely	7708±1353[a]	0.356	89.1 (79.8, 100.5)	0.976	72.9±22.5	0.486	35.4±8.16	0.831	23.8 [20.7, 33.5][c]	0.327	12.4 (11.3, 13.6)[b]	0.706
	Sometimes	7815±1674		88.2 (81.5, 95.6)		75.3±24.1		36.1±7.23		28.5 [18.9, 36.3]		12.7 (11.7, 13.8)	
	Often & always	8412±1364		88.2 (77.5, 101.5)		81.9±18.5		36.8±5.70		33.3 [24.7, 37.9]		13.4 (11.7, 15.3)	

CI: confidence interval; [a] mean±SD, [b] geometric mean (95% confidence interval), [c] median [25, 75 percentile]; *P*-values were calculated using ANOVA or Kruskal-Wallis; * *P* <0.01

Daily energy intake (kJ) differed significantly by the frequency women trimmed the fat from meat (*P*=0.002). Women who 'never and rarely' trimmed the fat from meat had a higher energy intake than those who 'sometimes' or 'often and always' trimmed the fat from meat. Daily saturated fat intake (g) differed significantly by the frequency women ate fried food (*P*=0.009). Women who 'never and rarely' ate fried food had a lower saturated fat intake (g) than women who sometimes or often and always ate fried food.

4.2.4 Low fat alternatives

Women's food choice behaviours regarding low fat alternatives were investigated. Participants' responses from the EHQ are shown in Table 4.10.

Table 4.10 Food choice behaviour for low fat alternatives from the EHQ

Low fat alternative	Yes n (%)	No n (%)	Not Applicable n (%)
Milk (low fat or fat free)	85 (78.7)	12 (11.1)	11 (10.2)
Crisps (low fat)	41 (38.0)	42 (38.9)	25 (23.1)
Crackers (low fat)	63 (58.3)	38 (35.2)	7 (6.5)
Margarine (lite or low fat)	64 (59.3)	22 (20.4)	22 (20.4)
Ice cream (low fat or sorbet)	31 (28.7)	61 (56.5)	16 (14.8)
Salad dressings or mayonnaise (lite or low fat)	62 (57.4)	31 (28.7)	15 (13.9)
Cheese (low fat)	57 (52.8)	47 (43.5)	4 (3.7)
Meat (premium minced)[a]	82 (76.6)	14 (13.1)	11 (10.3)
Fast food choices (salads, grilled)	69 (63.9)	35 (32.4)	4 (3.7)

[a] Missing data for one participant

Women most commonly chose low fat alternatives for milk (78.7%), meat (76.6%) and fast food choices (63.9%). Low fat alternatives were least commonly chosen for ice cream (56.6%), cheese (43.5%), crisps (38.9%) and crackers (35.2%).

The number of foods participant's regularly consumed as low fat alternatives according to the EHQ is presented in Figure 4.5.

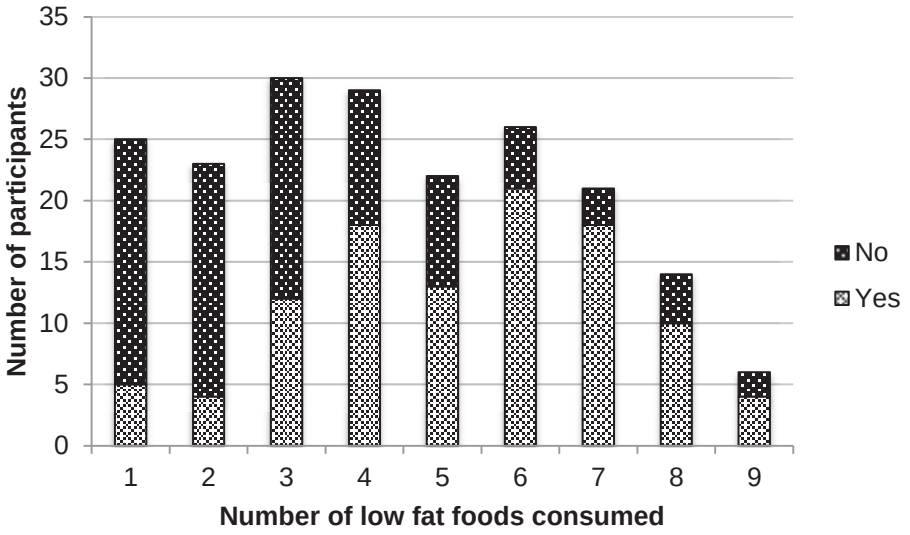


Figure 4.5 Number of foods participants regularly consumed as low fat alternatives from the EHQ

Most participants regularly chose low fat alternatives for six (n=21), four (n=18) or seven foods (n=18) and did not regularly choose low fat alternatives for between one (n=20) or two foods (n=19).

4.2.4.1 Low fat alternatives compared between the EHQ and WFR

Women's responses to low fat alternatives in the EHQ are compared to their food consumption in the WFR in Table 4.11. Statistical comparisons were only made between women who responded 'yes' and 'no', as there was uncertainty as to why women responded 'not applicable' (n/a).

Comparison of the EHQ with the WFR for low fat foods found greater than 50% of participants fell into the same tertile for milk (80.5%), cheese (62.1%) and meat (59.8%). The greatest amounts of misclassification were seen for participants who did not eat a food in the FR (i.e. n/a) and who responded 'yes' in the EHQ: crisps (25.0%), crackers (28.7%), margarine (35.2%), ice cream (26.9%), salad dressing (25.9%) and fast food choices (35.2%); or responded 'n/a' in the WFR and 'no' in the EHQ: crisps (25.0%), crackers (20.4%), ice cream (38.9%) and fast food choices (14.8%).

Table 4.11 Comparison of the EHQ and WFR for low fat alternatives

	Question	Response	WFR n (%)[a]			*P*-value[cd]
			Yes	No	Not Applicable	
EHQ n (%)	Milk (low fat or fat free)	Yes	75 (69.4%)	6 (5.6%)	4 (3.7%)	**<0.001****
		No	3 (2.8%)	8 (7.4%)	1 (0.9%)	
		Not Applicable	5 (4.6%)	2 (1.9%)	4 (3.7%)	
	Crisps (low fat)	Yes	5 (4.6%)	9 (8.3%)	27 (25.0%)	0.71
		No	7 (6.5%)	8 (7.4%)	27 (25.0%)	
		Not Applicable	4 (3.7%)	3 (2.8%)	18 (16.7%)	
	Crackers (low fat)	Yes	28 (25.9%)	4 (3.7%)	31 (28.7%)	0.14
		No	11 (10.2%)	5 (4.6%)	22 (20.4%)	
		Not Applicable	0 (0%)	0 (0%)	7 (6.5%)	
	Margarine (lite or low fat)	Yes	13 (12%)	13 (12%)	38 (35.2%)	0.08
		No	2 (1.9%)	10 (9.3%)	10 (9.3%)	
		Not Applicable	0 (0%)	0 (0%)	22 (20.4%)	
	Ice cream (low fat or sorbet)	Yes	1 (0.9%)	1 (0.9%)	29 (26.9%)	1.00
		No	7 (6.5%)	12 (11.1%)	42 (38.9%)	
		Not Applicable	0 (0%)	1 (0.9%)	15 (13.9%)	
	Salad dressings or mayonnaise (lite or low fat)	Yes	21 (19.4%)	13 (12.0%)	28 (25.9%)	**0.017***
		No	6 (5.6%)	15 (13.9%)	10 (9.3%)	
		Not Applicable	0 (0%)	1 (0.9%)	14 (13.0%)	
	Cheese (low fat)	Yes	46 (42.6%)	3 (2.8%)	8 (7.4%)	**<0.001****
		No	23 (21.3%)	18 (16.7%)	6 (5.6%)	
		Not Applicable	0 (0%)	1 (0.9%)	3 (2.8%)	
	Meat (premium minced)[b]	Yes	56 (52.3%)	15 (14.0%)	11 (10.3%)	**0.005***
		No	5 (4.7%)	8 (7.5%)	1 (0.9%)	
		Not Applicable	10 (9.3%)	1 (0.9%)	0 (0%)	
	Fast food choices (salads, grilled)	Yes	24 (22.2%)	7 (6.5%)	38 (35.2%)	1.00
		No	14 (13.0%)	5 (4.6%)	16 (14.8%)	
		Not Applicable	0 (0%)	0 (0%)	4 (3.7%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Responses coded in WFR as:
Yes: low fat alternative consumed ≥1 time in WFR
No: low fat alternative not consumed in WFR
Not applicable: food not eaten in WFR
[b] Missing data for one participant
[c] Fishers exact test used when assumptions not met
[d] Comparisons between yes vs. no responses
* *P* <0.05, ** *P* <0.001

4.2.4.2 Low fat alternatives and nutrient intakes

Table 4.12 shows whether energy (kJ/day), total fat (g and % energy) and saturated fat (g and % energy) intake from the WFR differs between women who regularly choose low fat alternatives compared to those who do not for certain foods, as reported from the EHQ.

Table 4.12 Energy, total fat (g and % energy) and saturated fat (g and % energy) intakes for different low fat alternatives

Low fat alternative		Energy (kJ/day)		Total fat (g/day)		Total fat (% energy)		Saturated fat (g/day)		Saturated fat (% energy)	
	Response	Median [25, 75 percentile]	*P*-value[d]	Mean±SD	*P*-value[d]	Mean±SD	*P*-value[d]	Median [25, 75 percentile]	*P*-value[d]	Geometric mean (95% CI)	*P*-value[d]
Milk (n=97)	Yes	7948±1526[a]	0.903	73.3±22.4	0.145	34.7 [29.8, 39.8][c]	0.014	25.3 (23.1, 27.7)[b]	0.082	12.3 (11.6, 13.1)	0.017
	No	7889±1563		83.3±20.1		39.5 [37.4, 42.1]		31.5 (25.5, 38.9)		15.3 (13.8, 16.9)	
Crisps (n=83)	Yes	7630 [6192, 8687]	0.050	70.9±20.8	0.029	35.1±5.93	0.100	23.7 [19.8, 29.1]	**0.002***	12.4 [10.5, 13.6][c]	**0.002***
	No	8272 [7549, 8966]		81.4±22.2		37.6±7.21		33.7 [22.3, 38.5]		15.0 [12.2, 16.8]	
Crackers (n=101)	Yes	7630 [6762, 8725]	0.017	70.4±20.8	**0.004***	34.4±6.77	0.030	23.8 [19.1, 28.9]	**<0.001****	11.9 [9.77, 13.6][c]	**<0.001****
	No	8272 [7795, 9256]		83.7±24.0		37.5±7.17		35.0 [26.4, 41.3]		15.3 [12.4, 17.2]	
Margarine (n=86)	Yes	7626 [6214, 8800]	**0.008***	71.3±21.0	**0.001***	35.1±6.53	0.019	25.6±9.58[a]	**<0.001****	12.5 [10.4, 14.5][c]	**0.001**
	No	8448 [7954, 9202]		88.8±21.1		39.0±7.10		36.3±11.3		15.9 [12.5, 18.0]	
Ice cream (n=92)	Yes	7561 [5777, 8159]	0.021	63.7±22.6	**0.001***	32.1±6.46	**<0.001****	22.1±9.20[a]	**<0.001****	11.1±2.97[a]	**<0.001****
	No	8047 [7246, 9111]		79.5±20.3		37.2±5.89		30.6±9.65		14.3±3.21	
Salad dressing or mayonnaise (n=93)	Yes	7651 [6065, 8732]	0.050	69.7±19.6	**0.001***	34.8±6.94	0.023	25.6±9.47[a]	**0.002***	12.2 (11.3, 13.1)	**0.007***
	No	8149 [7561, 9199]		85.1±24.1		38.4±7.43		33.0±11.7		14.4 (13.1, 15.8)	
Cheese (n=104)	Yes	7565±1526[a]	0.026	67.8±20.7	**<0.001****	33.6±7.08	**0.001***	23.1 (20.5, 25.8)[b]	**0.001***	11.7 (10.8, 12.7)	**0.001***
	No	8239±1494		83.9±23.0		38.2±6.54		30.3 (27.4, 33.4)		14.1 (13.2, 15.2)	
Meat (n=96)	Yes	7758±1549[a]	0.214	74.4±23.9	0.107	35.8±7.41	0.142	25.2 [18.7, 34.5]	0.016	12.4 (11.7, 13.3)	0.014
	No	8306±1272		85.4±19.8		19.0±7.27		35.3 [22.7, 43.0]		15.2 (13.2, 17.5)	
Fast food (n=104)	Yes	7630 [6211, 8798]	0.035	72.6±22.9	0.082	35.3±6.93	0.387	23.7 [18.4, 32.1]	**0.001***	12.0 (11.2, 12.9)	**0.005***
	No	8294 [7802, 9121]		80.8±21.7		36.6±7.21		31.2 [27.1, 39.2]		14.2 (12.9, 15.6)	

CI: Confidence interval

[a] mean±SD, [b] geometric mean (95% confidence interval), [c] median [25th, 75th percentile]

[d] *P*-values were calculated using independent *t*-test (parametric) or Mann-Whitney (non-parametric); ** *P*<0.001, * *P* <0.01

Energy and fat intakes from the WFR were significantly lower in women who regularly consumed low fat alternatives compared to those who do not for several foods in the EHQ. Results are described below.

Energy intake (kJ/day) was lower in women who regularly consumed low fat margarine compared to those who did not (*P*=0.008, r=-0.29).

Total fat intake (g) was lower in women who regularly consumed low fat alternatives compared to those who did not for crackers (*P*=0.004, r=0.28), margarine (*P*=0.001, r=0.35), ice cream (*P*=0.001, r=0.34), salad dressing (*P*=0.001, r=0.33) and cheese (*P*<0.001, r=0.35).

Total fat intake (% energy) was lower in women who regularly consumed low fat alternatives compared to those who did not for ice cream (*P*<0.001, r=0.38) and cheese (*P*=0.001, r=0.32).

Saturated fat intake (g) was lower in women who regularly consumed low fat alternatives compared to those who did not for crisps (*P*=0.002, r=-0.33), crackers (*P*<0.001, r=-0.40), margarine (*P*<0.001, r=0.43), ice cream (*P*<0.001, r=0.39), salad dressing (*P*=0.002, r=0.32), cheese (*P*=0.001, r=0.33), and fast food (*P*=0.001, r=-0.33).

Saturated fat intake (%) was lower in women who regularly consumed low fat alternatives compared to those who did not for crisps (*P*=0.002, r=-0.34), crackers (*P*<0.001, r=-0.41), margarine (*P*=0.001, r=-0.37), ice cream (*P*<0.001, r=0.44), salad dressing (*P*=0.007, r=0.28), cheese (*P*=0.001, r=0.31) and fast food (*P*=0.005, r=0.28).

4.2.5 Social occasions

When attending social occasions eating habits often change. The majority of women (87.0%) ate differently when attending social occasions. Women were asked to describe up to seven different types of social occasions, the frequency of attendance, and what foods and beverages they consumed at these social occasions (see Table 4.13).

The most common social occasion attended by women was dinner or lunch with friends or family (n=132) or parties (n=74). Social occasions were most commonly attended fortnightly or monthly (n=115) and alcohol was the beverage consumed most often (n=130), followed by soft drinks (n=32).

Table 4.13 Common social occasions attended, frequency of occasions and beverages consumed from the EHQ

	Frequency (n)
Occasion	
Dinner or lunch with friends or family	132
Parties	74
Brunch or lunch	21
Other	12
Morning tea or meet friends at a café	8
Drinks with friends or work	8
Church	4
Holiday or camping	4
Takeaways	3
Frequency of occasions	
Weekly or more often	43
Fortnightly and monthly	115
Less than monthly	39
Beverage	
Alcohol	130
Soft drinks and juice	32
Alcohol or soft drinks	17
Tea or coffee or hot chocolate	14
Soft drinks or water	8
Water	7
Alcohol or water	3
Water or coffee	1

At the different social occasions described by participants common themes were seen in the types of foods consumed (data not shown). As expected, more foods typical of meals were consumed for lunch or dinner with friends and family, such as meat with vegetables, meat with carbohydrate or dinner with dessert. For brunch or lunch participants also consumed meal type foods, such as from a café. Examples included eggs benedict or a meal with dessert. Snack foods were consumed for morning tea such as cakes and chips. At parties snack foods were also eaten including cakes, savouries and chips and dip. At church events foods varied between snacks such as cake and meals like curry. When participants had drinks with friends or get-togethers at work, takeaways such as pizza or hot chips were frequently eaten. While on holiday participant's

intake of takeaways and snacks increased. Takeaway meals were described as a social occasion where foods such as pizza or fish and chips were eaten. Participants attended a variety of other social occasions such as the movies, date nights and sports events where common foods eaten included cake, lollies or hot chips.

4.2.6 Time distribution

Participants described their eating habits based on the timing of eating occasions: consuming main meals (breakfast, lunch and dinner) and snacks (between breakfast and lunch, between lunch and dinner and after dinner).

4.2.6.1 Sleeping patterns of women

Most women woke up between 6-8 am (n=71) on weekdays but slept later on weekends, mostly waking up between 6-8 am (n=48) or 8-10 am (n=50). On both weekdays and weekends most women tended to go to bed between 10 pm and 12 am (n=77 and n=75 respectively).

4.2.6.2 Consumption of main meals and snacks

Meal and snack times changed on weekends for 60.2% of women. Comparisons between the EHQ and WFR for whether meal and snacks were consumed on weekdays and weekends are presented in Table 4.14.

Table 4.14 Comparison between the EHQ and WFR for the usual consumption of meals and snacks on weekdays and weekends

	Meal or snack	**Meal or snack eaten**	**WFR n (%) (n=108)**					
			Weekdays			**Weekends**		
			Yes	**No**	***P*-value[e]**	**Yes**	**No**	***P*-value[e]**
EHQ n (%)	**Meals**							
	Breakfast	**Yes**	102 (94.4%)	1 (0.9%)	**<0.001****	88 (83.0%)	5 (4.7%)	**<0.001**[b]**
		No	0 (0%)	5 (4.6%)		6 (5.7%)	7 (6.6%)	
	Lunch	**Yes**	106 (98.1%)	0 (0%)	**0.019***	95 (90.5%)	5 (4.8%)	0.259[c]
		No	1 (0.9%)	1 (0.9%)		4 (3.8%)	1 (1.0%)	
	Dinner	**Yes**	105 (98.1%)	0 (0%)	-[a]	95 (92.2%)	5 (4.9%)	1.000[d]
		No	2 (1.9%)	0 (0%)		3 (2.9%)	0 (0%)	
	Snacks							
	Between breakfast and lunch	**Yes**	87 (80.6%)	0 (0%)	**<0.001****	30 (28.6%)	14 (13.3%)	**0.011*[c]**
		No	13 (12.0%)	8 (7.4%)		26 (24.8%)	35 (33.3%)	
	Between lunch and dinner	**Yes**	87 (80.6%)	3 (2.8%)	**<0.001****	63 (60.0%)	9 (8.6%)	**0.008*[c]**
		No	8 (7.4%)	10 (9.3%)		21 (20.0%)	12 (11.4%)	
	After dinner	**Yes**	50 (46.7%)	6 (5.6%)	**<0.001**[a]**	37 (34.9%)	11 (10.4%)	**0.001*[b]**
		No	11 (10.3%)	40 (37.4%)		26 (24.5%)	32 (30.2%)	

EHQ: eating habits questionnaire; WFR: weighed food record
Missing data for: [a] one participant; [b] two participants (no weekend days recorded in WFR);
[c] three participants; [d] five participants
[e] Fisher exact test
* *P* <0.05, ** *P* <0.001

Main meals

On weekdays and weekends respectively the majority of women ate breakfast (95.3% vs. 87.7%), lunch (98.1% vs. 95.3%) and dinner (98.1% vs. 97.1%). Agreement between participants' responses for the EHQ and WFR was mostly greater than 90%, indicating very high agreement between their habits and practices. On weekdays and weekends respectively agreement between the EHQ and WFR was as follows for breakfast (99% vs. 89.6%), lunch (99% vs. 91.5%) and dinner (98.1% vs. 92.2%).

Snacks

On weekdays most women ate a snack between breakfast and lunch (80.6%) in the EHQ. At weekends more women did not snack (58.1%). Results were comparable between the EHQ and WFR on weekdays (88.0%, $P<0.001$) and weekends (61.9%, $P=0.011$). The majority of women ate a snack between lunch and dinner on weekdays (83.4%) and weekends (68.6%), with results comparable between the EHQ and WFR (weekdays: 89.9%, $P<0.001$; weekends: 71.4%, $P=0.008$). After dinner approximately half of women had a snack on weekdays (52.3%) and weekends (45.3%); the EHQ and WFR results were comparable on weekdays (84.1%, $P<0.001$) and weekends (65.1%, $P=0.001$).

4.2.6.3 Time of day participants ate main meals

Breakfast

The times of day that participants ate breakfast on weekdays and weekends are presented in Table 4.15. On weekdays most women ate breakfast between 6-8 am (62.1%), followed by 8-10 am (29.6%). On weekends women tended to eat breakfast later, mostly from 8-10 am (59.5%). The EHQ was comparable to the WFR with most participants falling into the same rather than opposite quartiles on both weekdays (76.9%, *P*<0.001) and weekends (59.5%, *P*<0.001). The weighted kappa statistic (Kw) showed good (0.64) agreement between breakfast times on weekdays and fair agreement on weekends (0.36). Participants that did not eat breakfast were excluded from the Kw calculation.

Table 4.15 Comparison between the EHQ and WFR for the time of day participants ate breakfast on weekdays and weekends

	Day	**Time**	**WFR n (%)**				***P*-value[b]**	**Kw[c]**
			Before 6 am	**6-8 am**	**8-10 am**	**Don't eat breakfast**		
EHQ n (%)	**Weekdays**	**Before 6 am**	2 (1.9%)	3 (2.8%)	2 (1.9%)	0 (0%)	**<0.001****	0.64
		6-8am	0 (0%)	54 (50.0%)	11 (10.2%)	2 (1.9%)		
		8-10am	0 (0%)	1 (0.9%)	25 (23.1%)	6 (5.6%)		
		Don't eat breakfast	0 (0%)	0 (0%)	0 (0%)	2 (1.9%)		
	Weekends[a]	**Before 6 am**	0 (0%)	1 (0.9%)	0 (0%)	0 (0%)	**<0.001****	0.36
		6-8am	0 (0%)	16 (15.1%)	13 (12.3%)	0 (0%)		
		8-10am	0 (0%)	9 (8.5%)	36 (34.0%)	18 (17.0%)		
		Don't eat breakfast	0 (0%)	0 (0%)	2 (1.9%)	11 (10.4%)		

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Missing data for two participants (no weekend days recorded in WFR)
[b] Fisher exact test
[c] Weighted kappa statistic, excluding the response "don't eat breakfast"
** *P* <0.001

Lunch

Table 4.16 presents the time of day that participants ate lunch on weekdays and weekends. The majority of women ate lunch from 12-2 pm on weekdays (94.5%) and weekends (74.6%). Results were comparable between the EHQ and WFR for both periods (weekdays: 92.6%, *P*<0.001; weekends: 60.3%, *P*=0.030). The Kw showed moderate agreement (0.46) on weekdays and poor agreement (0.14) on weekends.

Table 4.16 Comparison between the EHQ and WFR for the time of day participants ate lunch on weekdays and weekends

	Day	**Time**	**WFR n (%)**				***P*-value[b]**	**Kw[c]**
			Before 12 pm	**12-2 pm**	**After 2 pm**	**Don't eat lunch**		
EHQ n (%)	**Weekdays**	**Before 12 pm**	2 (1.9%)	0 (0%)	1 (0.9%)	0 (0%)	**<0.001****	0.46
		12-2 pm	2 (1.9%)	96 (88.9%)	3 (2.8%)	1 (0.9%)		
		After 2 pm	0 (0%)	0 (0%)	1 (0.9%)	0 (0%)		
		Don't eat lunch	0 (0%)	1 (0.9%)	0 (0%)	1 (0.9%)		
	Weekends[a]	**Before 12 pm**	1 (0.9%)	0 (0%)	2 (1.9%)	0 (0%)	**0.030***	0.14
		12-2 pm	4 (3.8%)	55 (51.9%)	15 (14.2%)	5 (4.7%)		
		After 2 pm	1 (0.9%)	12 (11.3%)	7 (6.6%)	0 (0%)		
		Don't eat lunch	0 (0%)	1 (0.9%)	2 (1.9%)	1 (0.9%)		

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Missing data for two participants (no weekend days recorded in WFR)
[b] Fisher exact test
[c] Weighted kappa statistic, excluding the response "don't eat lunch"
* *P* <0.05, ** *P* <0.001

Dinner

The time of day that participants ate dinner on weekdays and weekends is presented in Table 4.17. Dinner was most commonly consumed from 6-8 pm on weekdays (80.5%) and weekends (72.1%), with results consistent between the EHQ and WFR (weekdays: 89.8%, *P*<0.001; weekends: 68.2%, *P*=0.002). Kw showed good agreement (0.74) on weekdays and fair agreement (0.34) on weekends.

Table 4.17 Comparison between the EHQ and WFR for the time of day participants ate dinner on weekdays and weekends

	Day	Time	WFR n (%)				*P*-value[b]	Kw[c]
			Before 6 pm	**6-8 pm**	**8-10 pm**	**Don't eat dinner**		
EHQ n (%)	**Weekdays**	**Before 6 pm**	6 (5.6%)	2 (1.9%)	0 (0%)	1 (0.9%)	**<0.001****	0.74
		6-8 pm	0 (0%)	82 (75.9%)	4 (3.7%)	1 (0.9%)		
		8-10 pm	0 (0%)	3 (2.8%)	9 (8.3%)	0 (0%)		
		Don't eat dinner	0 (0%)	0 (0%)	0 (0%)	0 (0%)		
	Weekends[a]	**Before 6 pm**	2 (1.9%)	4 (3.8%)	0 (0%)	0 (0%)	**0.002***	0.37
		6-8 pm	2 (1.9%)	59 (56.7%)	9 (8.7%)	5 (4.8%)		
		8-10 pm	1 (1.0%)	9 (8.7%)	10 (9.6%)	2 (1.9%)		
		Don't eat dinner	0 (0%)	1 (1.0%)	0 (0%)	0 (0%)		

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Missing data for four participants
[b] Fisher exact test
[c] Weighted kappa statistic, excluding the response "don't eat dinner"
* *P*<0.05, ** *P* <0.001

4.2.6.4 Time of day participants ate snacks

The EHQ found most participants consumed snacks between breakfast and lunch on weekdays between 10-12 pm (63.0%); and on weekends, participants mostly did not have a snack (40.7%) or consumed a snack between 10-12 pm (31.5%). Between lunch and dinner women mainly consumed snacks on weekdays between 2-4 pm (62.0%) or 4-6 pm (38.9%); and on weekends between 2-4 pm (38.0%) or 4-7 pm (45.4%). On both weekdays and weekends women most commonly consumed snacks after dinner from 8-10 pm (43.6% and 38.9%) respectively, or did not have a snack (43.3% and 50.0%) respectively.

4.2.7 Eating habits across the day

The eating habits in terms of foods consumed and food choices of women across the day for both weekdays and weekends were further explored. The main meal periods that were investigated were 1) breakfast; 2) lunch, and 3) dinner, and the snack periods investigated were 1) between breakfast and lunch; 2) between lunch and dinner, and 3) after dinner. The main foods consumed for each meal and snack period are described below.

Individual foods were identified and sorted into the food categories listed in Table 4.18. Further detail on the foods included under each category is shown in Appendix F and the assumptions made in Appendices H and I. Once the individual foods commonly consumed at each main meal period were identified, combinations were created based on foods that tended to be consumed together. Other combinations that were consumed infrequently and therefore did not warrant further discussion are provided in Appendix G.

The EHQ and WFR were validated using the Fisher exact test from chi-square (χ^2) and cross-classification to show agreement between responses. For cross-classification foods were assessed as being valid when >50% of participants fell into the same category for both the EHQ and WFR, according to the criteria by Masson et al. (2003). Results are only presented for the top five foods and the top two food combinations (bolded in tables) consumed during each period on both weekdays and weekends, as these were of more practical importance.

Table 4.18 Food categories and foods used to describe what NZ women eat throughout the day

Category	Food	Foods included under each category
Protein	Meat	Beef, lamb, chicken, pork, ham, bacon, fish, sausages, pate, protein
Protein	Eggs	All cooking methods
Protein	Legumes	Tofu, chickpeas, beans, wasabi peas, hummus
Protein	Nuts and seeds	Almonds, cashew nuts, sunflower seeds, pumpkin seeds
Protein	Dairy	Cow's milk, soy milk, nut milks, yoghurt, cheese
Protein	Smoothie	Fruit smoothie with milk, protein shake, Up and go, smoothies with protein added
Carbohydrate	Starchy vegetables	Potato, kumara, taro, yam
Carbohydrate	Grains	Rice, pasta, noodles, couscous, quinoa, pastry, oats, muesli, porridge, corn thins, crackers, corn fritter, spaghetti, oat cakes, dumpling, carbohydrate, starch
Carbohydrate	Breads	Toast with butter or margarine, bagel
Carbohydrate	Basic sandwich	Toast with butter or margarine and a spread (e.g. jam, peanut butter, vegemite), sandwich
Carbohydrate	Fancy sandwich	Bread with meat, NSV and a sauce; pita, panini, subway
Vegetable	Non-starchy vegetables	Fresh (e.g. garden salad, tomato, avocado, salad, carrots) and frozen (e.g. peas, beans)
Fruit	Fresh fruit	Fresh fruit, berries
Fruit	Canned, dried, stewed fruit	Canned, dried, stewed fruit
Takeaways	Unidentified	The type of takeaway was not specified
Takeaways	Pizza	Homemade and takeaway
Takeaways	Pie	
Takeaways	Hot chips	Hot chips, hash brown, wedges
Takeaways	Meal type takeaway	Thai, Chinese, Indian, Asian, Kebab, restaurant meal, meals out
Takeaways	Café food	
Takeaways	Sushi	
Takeaways	Burger and chips	
Takeaways	Fish and chips	
Takeaways	Chicken and chips	
Takeaways	Fried chicken	
Takeaways	Burger	Homemade and takeaway
Other	Bakery items	Muffin, cake, scone, crumpet, waffles, pancakes, pikelets, croissant, cupcake, doughnut, scroll, custard twist, something from the bakery
Other	Baking	Slice, baking, biscuit, macaroon, lamington
Other	Lollies	Lollies, liquorice, candy floss
Other	Chocolate	Include chocolate with nuts
Other	Muesli bar	Weight watchers bar, nut bar, one square meal bite
Other	Potato chips	Potato chips, corn chips
Other	Savoury snack item	Popcorn, bakery items, savouries, pretzel, spring roll, sausage roll
Other	Protein bar	
Other	Carbohydrate gel	
Other	Ice-cream	Ice cream, frozen yoghurt
Other	Baked dessert	Apple pie

Category	Food	Foods included under each category
Other	Dessert	Cheesecake, jelly, pear pastry with jam, éclairs, something sweet
Other	Soup	
Other	Leftovers	Leftover food from previous meals
Other	Varies or do not specify	Only coded in the EHQ when no specific food examples were provided
Beverage	Tea and coffee	Tea, herbal tea, instant coffee, coffee sachets
Beverage	Café drinks	Mochaccino, milky drinks, latte, plunger coffee with milk, hot chocolate
Beverage	Fruit juice	Fruit juice, fruit and vegetable based smoothie
Beverage	Fruit drink	Cordial, fruit drinks, juice
Beverage	Milk based drinks	Milo, hot chocolate, Nesquik, flavoured milk, iced coffee
Beverage	Sugar sweetened beverages	Soft drinks, energy drinks, sports drinks
Beverage	Diet drinks	Diet soft drinks, diet energy drinks
Beverage	Alcohol	Beer, wine, spirits

EHQ: eating habits questionnaire; NSV: non-starchy vegetables

4.2.7.1 Main meals

Breakfast

The most common foods consumed at breakfast by women on both weekdays and weekends are presented in Table 4.19. Comparisons between the EHQ and WFR for breakfast on weekdays and weekends are presented in Table 4.20.

Table 4.19 Foods and food combinations consumed for breakfast on weekdays and weekends

	Weekdays			Weekends			Common food examples
	EHQ	WFR	Total	EHQ	WFR	Total	
Food							
Dairy	**85**	**80**	**165**	**65**	**50**	**115**	Milk, yoghurt
Grains	**82**	**76**	**158**	**61**	**49**	**110**	Breakfast cereal, porridge
Tea and coffee	**17**	**43**	**60**	**10**	**39**	**49**	
Basic sandwich	**32**	**25**	**57**	32	18	50	Toast with butter and a spread e.g. jam, peanut butter
Fresh fruit	**24**	**33**	**57**	17	21	38	Banana, berries
Smoothie	16	18	34	5	5	10	
Eggs	13	17	30	**59**	**29**	**88**	Poached, scrambled
Breads	9	21	30	**39**	**29**	**68**	Bread and butter
Canned, dried, stewed fruit	5	17	22	3	9	12	Canned peaches, stewed fruit
Fruit juice	4	12	16	1	7	8	
Café drink	1	15	16	1	7	8	Latte, flat white
Non starchy vegetables	4	10	14	12	11	23	Tomato, avocado
Meat	3	5	8	21	10	31	Bacon

	Weekdays			Weekends			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Milk based drink	3	5	8	1	1	2	Hot chocolate
Nuts and seeds	2	3	5	0	1	1	
Bakery items	1	4	5	14	5	19	Pancakes, crumpets, croissant
Fruit drink	2	3	5	1	3	4	
Baking	1	2	3	0	1	1	
Legumes	0	2	2	2	3	5	Baked beans
Hot chips	0	2	2	0	1	1	
Fancy sandwich	0	2	2	1	1	2	
Chocolate	0	1	1	0	2	2	
Varies or do not specify	1	0	1	0	0	0	
Diet drink	0	1	1	0	1	1	
Lollies	0	0	0	0	2	2	
Muesli bar	0	0	0	0	2	2	
Burger and chips	0	0	0	1	1	2	
Leftovers	0	0	0	0	2	2	
Starchy vegetables	0	0	0	1	0	1	
Café food	0	0	0	1	0	1	
SSB	0	0	0	0	1	1	
Food combinations							
Dairy + grain	**52**	**46**	**98**	**47**	**26**	**73**	Cereal and milk; cereal with milk and yoghurt; porridge and milk
Dairy + grain + fruit	**19**	**20**	**39**	7	14	21	Cereal with milk and banana
Bread-based foods	9	20	29	**41**	**23**	**64**	Egg on toast; bread with egg and meat; bread with tomatoes or avocado
Dairy + grain + canned fruit	5	14	19	2	6	8	Cereal with milk and canned peaches or stewed fruit
Dairy + grain + basic sandwich	3	3	6	2	0	2	Cereal and milk with toast
Protein foods	2	3	5	9	1	10	Bacon and eggs; eggs and baked beans

EHQ: eating habits questionnaire; WFR: weighed food record

Table 4.20 Comparisons of food and food combinations consumed for breakfast on weekdays and weekends

			WFR n (%) (n=108)					
			Weekdays			Weekends		
			Yes	No	*P*-value[a]	Yes	No	*P*-value[a]
EHQ n (%)	**Food**							
	Dairy	**Yes**	74 (68.5%)	11 (10.2%)	**<0.001****	42 (38.9%)	23 (21.3%)	**<0.001****
		No	6 (5.6%)	17 (15.7%)		8 (7.4%)	35 (32.4%)	
	Grains	**Yes**	72 (66.7%)	10 (9.3%)	**<0.001****	41 (38.0%)	20 (18.5%)	**<0.001****
		No	4 (3.7%)	22 (20.4%)		8 (7.4%)	39 (36.1%)	
	Tea and coffee	**Yes**	12 (11.1%)	5 (4.6%)	**0.007***	6 (5.6%)	4 (3.7%)	0.164
		No	31 (28.7%)	60 (55.6%)		33 (30.6%)	65 (60.2%)	
	Basic sandwich	**Yes**	16 (14.8%)	16 (14.8%)	**<0.001****	8 (7.4%)	24 (22.2%)	0.160
		No	9 (8.3%)	67 (62.0%)		10 (9.3%)	66 (61.1%)	
	Fresh fruit	**Yes**	20 (18.5%)	5 (4.6%)	**<0.001****	6 (5.6%)	11 (10.2%)	0.095
		No	12 (11.1%)	71 (65.7%)		15 (13.9%)	76 (70.4%)	
	Eggs	**Yes**	6 (5.6%)	7 (6.5%)	**0.006***	27 (25.0%)	32 (29.6%)	**<0.001****
		No	11 (10.2%)	84 (77.8%)		2 (1.9%)	47 (43.5%)	
	Breads	**Yes**	6 (5.6%)	3 (2.8%)	**0.002***	17 (15.7%)	22 (20.4%)	**0.006***
		No	15 (13.9%)	84 (77.8%)		12 (11.1%)	57 (52.8%)	
	Food combinations							
	Dairy + grain	**Yes**	36 (33.3%)	16 (14.8%)	**<0.001****	19 (17.6%)	28 (25.9%)	**<0.001****
		No	10 (9.3%)	46 (42.6%)		5 (4.6%)	56 (51.9%)	
	Dairy + grain + fruit	**Yes**	13 (12.0%)	6 (5.6%)	**<0.001****	3 (2.8%)	4 (3.7%)	**0.045***
		No	7 (6.5%)	82 (75.9%)		11 (10.2%)	90 (83.3%)	
	Bread-based foods	**Yes**	7 (6.5%)	2 (1.9%)	**<0.001****	19 (17.6%)	22 (20.4%)	**<0.001****
		No	13 (12.0%)	86 (79.6%)		4 (3.7%)	63 (58.3%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Fisher exact test
* *P* <0.05, ** *P* <0.001

Dairy products were the most common food consumed (weekdays: EHQ n=85, WFR n=80; weekends: EHQ n=65, WFR n=50), followed by grains (weekdays: EHQ n=82, WFR=76; weekends: EHQ n=61, WFR n=49), basic sandwich (weekdays: EHQ n=32, WFR n=25; weekends: EHQ n=32, WFR=18) and fresh fruit (weekdays: EHQ n=24, WFR=33; weekends: EHQ n=17, WFR n=21). Tea and coffee was the most common beverage consumed on both weekdays (EHQ n=17, WFR n=43) and weekends (EHQ n=10, WFR n=39), although

many women did not mention this in the EHQ. On weekends, eggs (weekdays: EHQ n=13, WFR n=17; weekends: EHQ n=59, WFR n=29) were more commonly consumed than on weekdays, and bread was more commonly mentioned in the EHQ on weekends (weekdays: EHQ n=9, WFR n=21; weekends: EHQ n=39, WFR n=29). Agreement between the EHQ and WFR was much greater than the recommended 50% for validation studies (Masson et al., 2003) at >65%. These values were as follows on weekdays and weekends respectively for dairy (84.2% vs. 71.3%), grains (87.1% vs. 74.1%), tea and coffee (66.7% vs. 65.8%), basic sandwich (76.8% vs. 68.5%), fresh fruit (84.2% vs. 76.0%), eggs (83.4% vs. 68.5%) and breads (83.4% vs. 68.5%). On weekdays the largest disagreement was found for tea and coffee (28.7%) when participants did not mention them in the EHQ, yet consumed them in the WFR. On weekends the largest disagreement was found when participants mentioned a food in the EHQ, but did not consume it in the WFR for dairy (21.3%), basic sandwich (22.2%), eggs (29.6%) and breads (20.4%); and when tea and coffee was consumed in the WFR, but not mentioned in the EHQ (30.6%). This disagreement on weekends may partly be due to some participants only recording one weekend day in the WFR.

Similar to the most common individual foods consumed for breakfast, ‘dairy + grain’ was the most common food combination on both weekdays and weekends (weekdays: EHQ n=52, WFR n=46; weekends: EHQ n=47, WFR n=26), followed by ‘dairy + grain + fruit’ (weekdays: EHQ n=19, WFR n=20; weekends: EHQ n=7, WFR n=14). Bread-based foods were consumed by a similar number of participants in the WFR on both weekdays and weekends, but were mentioned much more frequently in the EHQ on weekends (weekdays: EHQ n=9, WFR n=20; weekends: EHQ n=41, WFR n=23). Agreement between the EHQ and WFR on weekdays and weekends respectively was much higher than recommended at mostly >70%. On weekdays and weekends respectively these values were as follows for ‘dairy + grain’ (75.9% vs. 69.5%), ‘dairy + grain + fruit’ (87.9% vs. 86.1%) and ‘bread-based foods’ (86.1% vs. 75.9%). On weekends the greatest disagreement was found when ‘dairy + grain’ (25.9%) and ‘bread-based foods’ (20.4%) were mentioned in the EHQ, but not consumed in the WFR.

Lunch

The foods and food combinations most commonly consumed by women for lunch on weekdays and weekends are presented in Table 4.21. Comparisons between the EHQ and WFR for lunch on weekdays and weekends are presented in Table 4.22.

Table 4.21 Foods and food combinations consumed for lunch on weekdays and weekends

	Weekdays			Weekends			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Food							
Non starchy vegetables	**63**	**64**	**127**	**41**	**44**	**85**	Salad, avocado, tomato
Meat	**38**	**52**	**83**	**32**	**33**	**65**	Ham, chicken, canned fish
Breads	**30**	**39**	**69**	**36**	**27**	**63**	
Dairy	**20**	**49**	**69**	**19**	**36**	**55**	Cheese, yoghurt
Leftovers	**32**	**30**	**62**	16	5	21	
Grains	28	32	60	22	23	45	Corn thins, rice, pasta, couscous
Fancy sandwich	21	36	57	**29**	**23**	**52**	Sandwich with meat and salad
Fresh fruit	7	31	38	7	15	22	Pear, apple
Basic sandwich	28	8	36	39	7	46	
Eggs	12	20	32	25	13	38	
Sushi	19	13	32	12	5	17	
Soup	12	8	20	7	4	11	
Legumes	6	12	18	2	7	9	Hummus, chickpeas, beans
Tea and coffee	2	12	14	1	6	7	
Starchy vegetables	1	9	10	4	3	7	Pumpkin, potatoes, kumara
Bakery item	2	7	9	6	9	15	Muffin, crumpet, cake
Baking	1	8	9	1	9	10	Biscuit, slice
Chocolate	2	6	8	1	4	5	
Café drink	0	7	7	1	4	5	
Potato chips	1	5	6	1	2	3	
Savoury snack item	1	3	4	2	5	7	
Milk based drink	1	4	5	0	3	3	
Diet drink	1	4	5	0	6	6	
Nuts and seeds	2	2	4	0	1	1	
Smoothie	1	3	4	1	2	3	
Hot chips	1	2	3	2	3	5	
Pie	0	3	3	6	7	13	
Lollies	1	2	3	0	3	3	
Ice cream	0	3	3	1	1	2	
Fruit juice	0	4	4	1	2	3	
Canned/dried fruit	0	3	3	0	0	0	

	Weekdays			Weekends			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Unidentified takeaways	1	1	2	2	1	3	
Pizza	1	0	1	4	3	7	
Burger and chips	0	1	1	2	1	3	
Meal type	0	1	1	3	4	7	
Fish and chips	0	0	0	1	0	1	
Fried chicken	0	1	1	0	0	0	
Muesli bar	0	1	1	0	0	0	
Fruit drink	0	1	1	0	2	2	
Sugar sweetened beverages	0	1	1	1	6	7	
Alcohol	0	1	1	0	5	5	
Varies/vague	0	0	0	6	0	6	
Café food	0	0	0	10	1	11	
Burger	0	0	0	3	0	3	
Chicken and chips	0	0	0	1	0	1	
Food combinations							
Bread-based foods	**48**	**59**	**107**	**47**	**45**	**92**	Sandwiches (e.g. meat and salad; meat; meat and cheese; meat, egg and hummus)
Leftover combinations	**35**	**25**	**60**	17	4	21	Dinner leftovers; dinner leftovers with NSV
Protein + NSV	20	22	42	9	11	20	Meat and NSV; egg and NSV,
Sushi combinations	18	12	30	12	5	17	Sushi; sushi and miso soup; sushi and NSV
Protein + grain + NSV	14	15	29	10	13	23	Fish with couscous or corn thins or rice or pasta and NSV; quiche; couscous or corn thins with egg and NSV
Soup combinations	12	8	20	6	4	10	Soup; soup with bread
Protein + grain	6	7	13	5	2	7	Tuna or chicken with rice; egg on corn thins
Grain + NSV	7	6	13	4	3	7	Corn thins and NSV (e.g. avocado, tomato); rice or pasta and NSV; quinoa salad
Takeaway combinations	1	7	8	**17**	**17**	**34**	Burger; pie; pizza; hot chips and NSV
Protein + SV + NSV	0	6	6	1	1	2	Meat with potato or kumara and NSV; chickpeas with SV and NSV

EHQ: eating habits questionnaire; WFR: weighed food record; NSV: non-starchy vegetables; SV: starchy vegetables

Table 4.22 Comparisons of foods and food combinations consumed by participants for lunch on weekdays and weekends

			WFR n (%)					
			Weekdays			Weekends		
			Yes	No	*P*-value[a]	Yes	No	*P*-value[a]
EHQ n (%)	**Food**							
	Non-starchy vegetables	**Yes**	47 (43.5%)	16 (14.8%)	**<0.001****	25 (23.1%)	16 (14.8%)	**0.001***
		No	17 (15.7%)	28 (25.9%)		19 (17.6%)	48 (44.4%)	
	Meat	**Yes**	26 (24.1%)	12 (11.1%)	**0.002***	14 (13.0%)	18 (16.7%)	0.068
		No	26 (24.1%)	44 (40.7%)		19 (17.6%)	57 (52.8%)	
	Breads	**Yes**	13 (12.0%)	17 (15.7%)	**0.375**	11 (10.2%)	25 (23.1%)	0.356
		No	26 (24.1%)	52 (48.1%)		16 (14.8%)	56 (51.9%)	
	Dairy	**Yes**	15 (13.9%)	5 (4.6%)	**0.005***	8 (7.4%)	11 (10.2%)	0.426
		No	34 (31.5%)	54 (50.0%)		28 (25.9%)	61 (56.5%)	
	Leftovers	**Yes**	17 (15.7%)	15 (13.9%)	**<0.001****	1 (0.9%)	15 (13.9%)	0.559
		No	13 (12.0%)	63 (58.3%)		4 (3.7%)	88 (81.5%)	
	Fancy sandwich	**Yes**	9 (8.3%)	12 (11.1%)	0.314	7 (6.5%)	22 (20.4%)	0.791
		No	27 (25.0%)	60 (55.6%)		16 (14.8%)	63 (58.3%)	
	Food combinations							
	Bread-based foods	**Yes**	32 (29.6%)	16 (14.8%)	**0.033***	20 (18.5%)	27 (25.0%)	1.000
		No	27 (25.0%)	33 (30.6%)		25 (23.1%)	36 (33.3%)	
	Leftover combinations	**Yes**	16 (14.8%)	19 (17.6%)	**<0.001****	1 (0.9%)	16 (14.8%)	0.501
		No	9 (8.3%)	64 (59.3%)		3 (2.8%)	88 (81.5%)	
	Takeaway combinations	**Yes**	1 (0.9%)	0 (0%)	0.065	6 (5.6%)	11 (10.2%)	**0.027***
		No	6 (5.6%)	101 (93.5%)		11 (10.2%)	80 (74.1%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Fisher exact test
* *P*<0.05, ** *P*<0.001

The most common foods consumed for lunch were non-starchy vegetables (NSV) (weekdays: EHQ n=63, WFR n=64; weekends: EHQ n=41, WFR n=44), meat (weekdays: EHQ n=38, WFR n=52; weekends: EHQ n=32, WFR n=33), bread (weekdays: EHQ n=30, WFR n=39; weekends: EHQ n=36, WFR n=27) and dairy (weekdays: EHQ n=20, WFR n=49; weekends: EHQ n=19, WFR n=36). Leftovers were more commonly consumed on weekdays than weekends (weekdays: EHQ n=32, WFR n=30; weekends: EHQ n=16, WFR n=5) and 'fancy sandwiches' were the fifth most popular food on weekends (weekdays: EHQ n=21, WFR n=36; weekends: EHQ n=29, WFR n=23). Agreement between the EHQ and WFR was much greater than the recommended 50% (Masson et al., 2003) at >60% on weekdays and weekends respectively for NSV (69.4% vs. 67.5%), meat (64.8% vs. 65.8%), bread (60.1% vs. 62.1%), dairy (63.9% vs. 63.9%), leftovers (74.0% vs. 82.4%) and 'fancy sandwich' (63.9% vs. 64.8%). The greatest disagreement on weekdays was seen when participants consumed a food in the WFR but did not mention it in the EHQ for example meat (24.1%), bread (24.1%), dairy (31.5%) and 'fancy sandwich' (25.0%); and on weekends when dairy (25.9%) was eaten in the WFR but not mentioned in the EHQ, and bread (23.1%) and 'fancy sandwich' (20.4%) were mentioned in the EHQ but not eaten in the WFR.

The most common food combination consumed for lunch was 'bread-based foods' (weekdays: EHQ n=48, WFR n=59; weekends: EHQ n=47, WFR n=45). The second most common combination on weekdays was 'leftover combinations' (weekdays: EHQ n=35, WFR n=25; weekends: EHQ n=17, WFR n=4) and on weekends was 'takeaway combinations' (weekdays: EHQ n=1, WFR n=7; weekends: EHQ n=17, WFR n=17). Agreement between the EHQ and WFR was >50% for all food combinations, although was much greater than this for most food combinations. Results are shown for weekdays and weekends respectively for 'bread-based foods' (60.2% vs. 51.8%), 'leftover combinations' (74.1% vs. 82.4%) and 'takeaway combinations' (94.4% vs. 79.7%). The greatest disagreement was found for 'bread-based foods' when eaten in the WFR and not mentioned in the EHQ on weekdays and weekends respectively (25.0% vs. 23.1%); and when 'bread-based foods' were mentioned in the EHQ on weekends but not consumed in the WFR (25.0%).

Dinner

The foods most commonly consumed by women for dinner on weekdays and weekends are presented in Table 4.23. Comparisons between the EHQ and WFR for dinner on weekdays and weekends are presented in Table 4.24.

Table 4.23 Food and food combinations consumed for dinner on weekdays and weekends

	Weekday			Weekend			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Food							
Non-starchy vegetables	**101**	**93**	**194**	**84**	**69**	**153**	Carrots, broccoil, peas, beans
Meat	**97**	**88**	**185**	**88**	**70**	**156**	Beef, pork, chicken, fish
Grains	**78**	**60**	**138**	**60**	**31**	**91**	Pasta, rice
Starchy vegetables	**50**	**39**	**89**	**47**	**34**	**81**	Potato, kumara
Alcohol	**0**	**44**	**44**	**1**	**29**	**30**	
Breads	8	34	42	5	18	23	
Eggs	12	21	33	8	2	10	
Legumes	14	17	31	9	13	22	Tofu, chickpeas
Dairy	4	25	29	5	11	16	Cheese
Fancy sandwich	5	20	25	5	4	9	
Soup	9	11	20	4	4	8	
Pizza	4	12	16	18	4	22	
Hot chips	2	11	13	3	4	7	
SSB	0	9	9	0	2	2	
Fresh fruit	1	7	8	0	4	4	
Burger	4	3	7	9	1	10	
Meal type takeaways	0	7	7	**19**	**11**	**30**	Thai, Indian, Chinese
Leftovers	0	7	7	2	3	5	
Tea and coffee	0	6	6	0	7	7	
Basic sandwich	0	5	5	0	2	2	
Savoury snack item	1	4	5	1	2	3	
Fruit juice	0	5	5	0	4	4	
Fruit drink	0	4	4	0	5	5	
Diet drink	0	3	3	0	3	3	
Sushi	0	3	3	0	2	2	
Burger and chips	0	3	3	5	2	7	
Baking	0	3	3	0	2	2	
Potato chips	0	3	3	2	2	4	
Ice-cream	0	3	3	0	0	0	
Varies or don't specify	3	0	3	5	0	5	
Bakery item	1	1	2	0	1	1	
Chocolate	0	2	2	0	1	1	

	Weekday			Weekend			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Unidentified takeaways	2	0	2	17	9	26	
Pie	0	2	2	0	0	0	
Smoothie	1	0	1	0	0	0	
Fried chicken	1	0	1	0	0	0	
Lollies	0	1	1	0	1	1	
Dessert	0	1	1	0	0	0	
Fish and chips	0	0	0	2	1	3	
Chicken and chips	0	0	0	1	0	1	
Food combinations							
Meat + grain + NSV	58	35	98	47	10	57	Meat with rice or pasta and NSV
Meat + SV + NSV	41	29	70	43	26	69	Meat with potatoes or kumara and NSV
Meat + NSV	34	25	59	30	16	46	Meat and NSV
Bread-based foods	12	40	52	8	16	24	Meat with bread and NSV; egg and bread
Takeaway combinations	11	36	47	52	21	73	Pizza; burger; meal type takeaways and NSV; burger and chips
Vegetarian meals	25	17	42	14	11	25	Tofu with couscous and NSV; chickpeas with rice and NSV; egg and NSV
Meat + grain	13	10	23	14	4	18	Meat and rice or pasta-
Soup combinations	9	8	17	4	4	8	Soup; soup and bread
Meat + SV + grain + NSV	3	6	9	0	1	1	Meat with kumara or potatoes, rice and NSV
Leftover combinations	0	7	7	2	3	5	Leftovers; leftovers with bread

EHQ: eating habits questionnaire; WFR: weighed food record; NSV: non-starchy vegetables; SV: starchy vegetable

Table 4.24 Comparisons of food and food combinations consumed for dinner on weekdays and weekends

			WFR n (%)					
			Weekdays			Weekends		
			Yes	No	*P*-value[a]	Yes	No	*P*-value[a]
	Food							
EHQ n (%)	**Non-starchy vegetables**	**Yes**	89 (82.4%)	12 (11.1%)	0.054	53 (49.1%)	31 (28.7%)	0.814
		No	4 (3.7%)	3 (2.8%)		16 (14.8%)	8 (7.4%)	
	Meat	**Yes**	84 (77.8%)	13 (12.0%)	**0.001***	59 (54.6%)	29 (26.9%)	0.314
		No	4 (3.7%)	7 (6.5%)		11 (10.2%)	9 (8.3%)	
	Grains	**Yes**	45 (41.7%)	33 (30.6%)	0.521	21 (19.4%)	39 (36.1%)	0.135
		No	15 (13.9%)	15 (13.9%)		10 (9.3%)	38 (35.2%)	
	Starchy vegetables	**Yes**	24 (22.2%)	26 (24.1%)	**0.027***	22 (20.4%)	25 (23.1%)	**0.003***
		No	15 (13.9%)	43 (39.8%)		12 (11.1%)	49 (45.5%)	
	Alcohol	**Yes**	0 (0%)	0 (0%)	-	0 (0%)	1 (0.9%)	1.000
		No	44 (40.7%)	64 (59.3%)		29 (26.9%)	78 (72.2%)	
	Meal type takeaways	**Yes**	0 (0%)	0 (0%)	-	0 (0%)	19 (17.6%)	0.207
		No	7 (6.5%)	101 (93.4%)		11 (10.2%)	78 (72.2%)	
	Food combinations							
	Meat + grain + NSV	**Yes**	27 (25.0%)	31 (28.7%)	**0.001***	5 (4.6%)	42 (38.9%)	0.744
		No	8 (7.4%)	42 (38.9%)		5 (4.6%)	56 (51.9%)	
	Meat + SV + NSV	**Yes**	20 (18.5%)	21 (19.4%)	**<0.001****	20 (18.5%)	23 (21.3%)	**<0.001****
		No	9 (8.3%)	58 (53.7%)		6 (5.6%)	59 (54.6%)	
	Takeaway combinations	**Yes**	6 (5.6%)	5 (4.6%)	0.175	13 (12.0%)	39 (36.1%)	0.224
		No	30 (27.8%)	67 (62.0%)		8 (7.4%)	48 (44.4%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Fisher exact test
* *P* <0.05, ** *P* <0.001

Similar to lunch, NSV was the most common food consumed for dinner (weekdays: EHQ n=101, WFR n=93; weekends: EHQ n=84, WFR n=69). Other commonly consumed foods were meat (weekdays: EHQ n=97, WFR n=88; weekends: EHQ n=88, WFR n=70), grains (weekdays: EHQ n=78, WFR n=60; weekends: EHQ n=60, WFR n=31) and starchy vegetables (SV) (weekdays: EHQ n=50, WFR n=39; weekends: EHQ n=47, WFR n=34). Alcohol was the

most popular beverage consumed at dinner, but was not mentioned in the EHQ by participants (weekdays: EHQ n=0, WFR n=44; weekends: EHQ n=1, WFR n=29). On weekends ‘meal type takeaways’ were also commonly consumed (weekdays: EHQ n=0, WFR n=7; weekends: EHQ n=19, WFR n=11). Agreement between the EHQ and WFR was greater than the recommended 50% for validation studies for all foods, and was much greater than this for most foods. On weekdays and weekends respectively these values were as follows for NSV (85.2% vs. 56.5%), meat (84.3% vs. 56.5%), grain (55.6% vs. 54.6%), SV (62.0% vs. 65.8%), alcohol (59.3% vs. 72.2%) and ‘meal type takeaways’ (93.4% vs. 72.2%). The highest amount of disagreement was found when a food was mentioned in the EHQ but not eaten in the WFR on weekdays for grain (30.6%) and SV (24.1%), and on weekends for NSV (27.8), meat (26.9%), grains (36.1%) and SV (23.1%). A large amount of disagreement was also found when alcohol was consumed in the WFR but not mentioned in the EHQ on both weekdays (40.7%) and weekends (26.9%).

Food combinations commonly consumed by participants were ‘meat + grain + NSV’ (weekdays: EHQ n=58, WFR n=35; weekends: EHQ n=47, WFR n=10) and ‘meat + SV + NSV’ (weekdays: EHQ n=41, WFR n=29; weekends: EHQ n=43, WFR n=26). On weekends ‘takeaway combinations’ (weekdays: EHQ n=11, WFR n=36; weekends: EHQ n=52, WFR n=21) were more commonly consumed. Agreement was >55% between the EHQ and WFR, with most values much greater than this. On weekdays and weekends respectively these values were as follows for ‘meat + grain + NSV’ (63.9% vs. 56.5%), ‘meat + SV + NSV’ (72.2% vs. 73.1%) and ‘takeaway combinations’ (67.6% vs. 56.4%). Disagreement was greatest when a food was mentioned in the EHQ but not eaten in the WFR on weekdays for ‘meat + grain + NSV’ (28.7%), and on weekends for ‘meat + grain + NSV’ (38.9%), ‘meat + SV + NSV’ (21.3%) and ‘takeaway combinations’ (36.1%).

4.2.7.2 Snacks

Snacks between breakfast and lunch

Foods that were consumed as a snack between breakfast and lunch on weekdays and weekends are presented in Table 4.25. Comparisons between the EHQ and WFR for snacks between breakfast and lunch on weekdays and weekends are presented in Table 4.26.

Table 4.25 Foods consumed as a snack between breakfast and lunch on weekdays and weekends

	Weekday			Weekend			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Food							
Fresh fruit	**59**	**49**	**108**	**28**	**24**	**52**	Apple, orange, banana
Tea and coffee	**9**	**58**	**67**	**5**	**19**	**24**	
Muesli bar	**24**	**14**	**38**	9	4	13	
Nuts and seeds	**19**	**19**	**36**	6	2	8	
Café drinks	**7**	**28**	**35**	**1**	**23**	**24**	Flat white, latte
Dairy	15	17	32	6	9	15	Yoghurt, cheese
Grains	12	19	31	9	4	13	Crackers, corn thins
Baking	14	13	27	**11**	**7**	**18**	Biscuits, slice
Bakery item	6	17	23	**7**	**9**	**16**	Muffin, cake, scone
Canned, dried, stewed fruit	7	10	17	0	1	1	Dried apricots, prunes
Non-starchy vegetables	8	8	16	1	2	3	Carrots, celery
Chocolate	3	8	11	1	6	7	
Protein bar	5	3	8	0	1	1	
Breads	1	6	7	2	6	8	
Meat	1	5	6	0	4	4	Tuna, beef jerky
Smoothie	1	5	6	1	2	3	
Basic sandwich	4	2	6	4	3	7	
Lollies	0	6	6	0	2	2	
Legume	0	5	5	0	3	3	Hummus
Sugar sweetened beverages	0	5	5	0	6	6	
Potato chips	0	4	4	1	1	2	
Savoury snack	2	2	4	0	0	0	
Fruit drink	0	4	4	1	1	2	
Milk based drink	1	3	4	1	5	6	
Egg	0	3	3	1	2	3	
Fruit juice	0	3	3	0	5	5	
Carbohydrate gel	0	2	2	0	1	1	
Pie	0	1	1	0	0	0	
Hot chips	0	1	1	0	0	0	

	Weekday			Weekend			Common food examples
	EHQ	WFR	Total	EHQ	WFR	Total	
Dessert	0	1	1	0	0	0	
Alcohol	0	1	1	0	2	2	
Leftovers	0	1	0	1	0	1	
Ice cream	0	0	0	0	4	4	
Soup	0	0	0	1	0	1	
Food combination							
Dairy + grain	4	8	12	2	0	2	Cheese on crackers

EHQ: eating habits questionnaire; WFR: weighed food record

Table 4.26 Comparison of snacks and snack combinations eaten between breakfast and lunch on weekdays and weekends

			WFR n (%)					
			Weekdays			Weekends		
	Food							
			Yes	**No**	***P*-value[a]**	**Yes**	**No**	***P*-value[a]**
EHQ n (%)	**Fresh fruit**	**Yes**	39 (36.1%)	20 (18.5%)	**<0.001****	10 (9.3%)	18 (16.7%)	0.064
		No	10 (9.3%)	39 (36.1%)		14 (13.0%)	66 (61.1%)	
	Tea and coffee	**Yes**	8 (7.4%)	1 (0.9%)	**0.036***	3 (2.8%)	2 (1.9%)	**0.037***
		No	50 (43.6%)	49 (45.4%)		16 (14.8%)	87 (80.6%)	
	Muesli bar	**Yes**	10 (9.3%)	14 (13.0%)	**<0.001****	2 (1.9%)	7 (6.5%)	**0.034***
		No	4 (3.7%)	80 (74.1%)		2 (1.9%)	97 (89.8%)	
	Nuts and seeds	**Yes**	10 (9.3%)	10 (9.3%)	**<0.001****	0 (0%)	6 (5.6%)	1.000
		No	9 (8.3%)	79 (73.1%)		2 (1.9%)	100 (92.6%)	
	Café drinks	**Yes**	5 (4.6%)	2 (1.9%)	**0.012***	0 (0%)	1 (0.9%)	1.000
		No	23 (21.3%)	78 (72.2%)		23 (21.3%)	84 (77.8%)	
	Baking	**Yes**	6 (5.6%)	8 (7.4%)	**0.002***	0 (0%)	11 (10.2%)	1.000
		No	7 (6.5%)	87 (80.6%)		7 (6.5%)	90 (83.3%)	
	Bakery item	**Yes**	4 (3.7%)	2 (1.9%)	**0.005***	3 (2.8%)	4 (3.7%)	**0.012***
		No	13 (12.0%)	89 (82.4%)		6 (5.6%)	95 (88.0%)	
	Food combination							
	Dairy + grain	**Yes**	1 (0.9%)	3 (2.8%)	0.268	0 (0%)	2 (1.9%)	-
		No	7 (6.5%)	97 (89.8%)		0 (0%)	106 (98.1%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Fisher exact test
* *P* <0.05, ** *P* <0.001

Common snacks consumed between breakfast and lunch were fresh fruit (weekdays: EHQ n=59, WFR n=49; weekends: EHQ n=28, WFR n=24), muesli bars (weekdays: EHQ n=24, WFR n=14; weekends: EHQ n=9, WFR n=4), nuts and seeds (weekdays: EHQ n=19, WFR n=19; weekends: EHQ n=6, WFR n=2), baking (weekdays: EHQ n=14, WFR n=13; weekends: EHQ n=11, WFR n=7) and bakery items (weekdays: EHQ n=6, WFR n=17; weekends: EHQ n=7, WFR n=9). 'Tea and coffee' (weekdays: EHQ n=9, WFR n=58; weekends: EHQ n=5, WFR n=19) and café drinks (weekdays: EHQ n=7, WFR n=28; weekends: EHQ n=1, WFR n=23) were more commonly eaten in the WFR than mentioned in the EHQ. 'Dairy + grain' was the only food combination commonly consumed, which tended to be cheese on crackers (weekdays: EHQ n=4, WFR n=8; weekends: EHQ n=2, WFR n=0). Agreement between the EHQ and WFR was much greater than recommendations for most foods with values typically >70%, although agreement for 'tea and coffee' was slightly lower (>50%). On weekdays and weekends respectively values were as follows for fresh fruit (72.2% vs. 70.4%), muesli bars (83.4% vs. 91.7%), nuts and seeds (82.4% vs. 92.6%), baking (86.2% vs. 83.3%), bakery items (86.1% vs. 90.8%), café drinks (76.8% vs. 77.8%), 'tea and coffee' (52.8% vs. 83.4%) and 'dairy + grain' (90.7% vs. 98.1%). Disagreement was mainly found when 'tea and coffee' (43.6%) and café drinks (21.3%) were eaten in the WFR but not mentioned in the EHQ on weekdays; and for café drinks (21.3%) on weekends.

Snacks between lunch and dinner

Foods that were consumed as a snack between lunch and dinner on weekdays and weekends are presented in Table 4.27. Comparisons between the EHQ and WFR for snacks between lunch and dinner on weekdays and weekends are presented in Table 4.28.

Table 4.27 Foods consumed as a snack between lunch and dinner on weekdays and weekends

	Weekday			Weekend			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Food							
Fresh fruit	**45**	**58**	**103**	**33**	**37**	**70**	Apple, orange, banana, grapes, kiwifruit, pear
Dairy	**28**	**36**	**64**	**26**	**13**	**39**	Cheese, yoghurt
Grains	**38**	**20**	**58**	**29**	**17**	**46**	Crackers, corn thins
Nuts and seeds	**18**	**29**	**47**	14	9	23	
Tea and coffee	**9**	**36**	**45**	**8**	**23**	**31**	
Chocolate	12	30	42	7	13	20	
Baking	19	20	39	**18**	**11**	**29**	Biscuits, slice
Muesli bar	13	16	29	3	4	7	
Bakery item	9	14	23	6	9	15	Muffin, cake
Potato chips	9	13	22	14	11	25	
Non starchy vegetables	6	15	21	7	11	18	Celery, carrots
Canned, dried, stewed fruit	8	13	21	3	7	10	Dried apricots, dates, raisins
Meat	6	11	17	1	8	9	
Lollies	3	11	14	0	7	7	
Breads	3	10	13	4	7	11	
Basic sandwich	7	6	13	4	4	8	
Café drink	0	12	12	0	7	7	
Smoothie	6	5	11	1	4	5	
Alcohol	2	9	11	5	15	20	
Sugar sweetened beverages	0	9	9	0	7	7	
Protein bar	3	5	8	0	3	3	
Milk based drink	1	6	7	3	6	9	
Legumes	4	2	6	4	8	12	
Fruit juice	0	6	6	2	4	6	
Fruit drink	1	4	5	0	2	2	
Diet soft drink	2	3	5	0	4	4	
Eggs	1	3	4	2	1	3	
Ice cream	0	4	4	0	7	7	
Dessert	1	2	3	3	2	5	
Soup	1	2	3	0	0	0	
Leftovers	1	2	3	0	0	0	

	Weekday			Weekend			Common food examples
	EHQ	WFR	Total	EHQ	WFR	Total	
Starchy vegetables	0	2	2	0	3	3	
Savoury snack item	1	1	2	2	0	2	
Pie	0	1	1	0	0	0	
Sushi	1	1	2	1	1	2	
Hot chips	1	0	1	0	1	1	
Café food	1	0	1	0	0	0	
Fancy sandwich	0	0	0	2	1	3	
Pizza	0	0	0	0	1	1	
Food combination							
Dairy + grain	2	5	7	15	5	20	Cheese on crackers

EHQ: eating habits questionnaire; WFR: weighed food record

Table 4.28 Comparison of snacks and snack combinations eaten between lunch and dinner on weekdays and weekends

			WFR n (%)					
			Weekdays			Weekends		
	Food							
			Yes	No	*P*-value[a]	Yes	No	*P*-value[a]
EHQ n (%)	Fresh fruit	Yes	32 (29.6%)	13 (12.0%)	**0.003***	16 (14.8%)	17 (15.7%)	**0.049***
		No	26 (24.1%)	37 (34.3%)		21 (19.4%)	54 (50.0%)	
	Dairy	Yes	11 (10.2%)	17 (15.7%)	0.488	6 (5.6%)	20 (18.5%)	0.078
		No	25 (23.1%)	55 (50.9%)		7 (6.5%)	75 (69.4%)	
	Grains	Yes	10 (9.3%)	28 (25.9%)	0.193	7 (6.5%)	22 (20.4%)	0.231
		No	10 (9.3%)	60 (55.6%)		10 (9.3%)	69 (63.9%)	
	Nuts and seeds	Yes	8 (7.4%)	10 (9.3%)	0.082	4 (3.7%)	10 (9.3%)	**0.016***
		No	21 (19.4%)	69 (63.9%)		5 (4.6%)	89 (82.4%)	
	Tea and coffee	Yes	7 (6.5%)	2 (1.9%)	**0.006***	5 (4.6%)	3 (2.8%)	**0.011***
		No	29 (26.9%)	70 (64.8%)		18 (16.7%)	82 (75.9%)	
	Baking	Yes	7 (6.5%)	12 (11.1%)	**0.045***	3 (2.8%)	15 (13.9%)	0.388
		No	13 (12.0%)	76 (70.4%)		8 (7.4%)	82 (75.9%)	
	Food combination							
	Dairy + grain	Yes	1 (0.9%)	1 (0.9%)	0.091	1 (0.9%)	14 (13.0%)	0.534
		No	4 (3.7%)	102 (94.4%)		4 (3.7%)	89 (82.4%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Fisher exact test
* *P* <0.05, ** *P* <0.001

Common snacks consumed between lunch and dinner on weekdays and weekends were fresh fruit (weekdays: EHQ n=45, WFR n=58; weekends: EHQ n=33, WFR n=37), dairy (weekdays: EHQ n=28, WFR n=36; weekends: EHQ n=26, WFR n=13), grains (weekdays: EHQ n=38, WFR n=20; weekends: EHQ n=29, WFR n=17), nuts and seeds (weekdays: EHQ n=18, WFR n=29; weekends: EHQ n=14, WFR n=9), 'tea and coffee' (weekdays: EHQ n=9, WFR n=36; weekends: EHQ n=8, WFR n=23) and baking (weekdays: EHQ n=19, WFR n=20; weekends: EHQ n=18, WFR n=11). The only common food combination consumed was 'dairy + grain', which tended to be cheese and crackers (weekdays: EHQ n=2, WFR n=5; weekends: EHQ n=15, WFR n=5). Agreement between the EHQ and WFR was much greater than recommendations, with all foods >60% and many much greater than this. On weekdays and weekends respectively values were as follows for fresh fruit (63.9% vs. 64.8%), dairy (61.1% vs. 75.0%), grains (64.9% vs. 70.4%), nuts and seeds (71.3% vs. 86.1%), 'tea and coffee' (71.3% vs. 80.5%) and baking (76.9% vs. 78.7%); and 'dairy + grain' (95.3% vs. 83.3%). The greatest disagreement was seen on weekdays when fresh fruit (24.1%), dairy (23.1%) and 'tea and coffee' (26.9%) were consumed in the WFR, but not mentioned in the EHQ; and when grains were mentioned in the EHQ, but not consumed in the WFR on both weekdays (25.9%) and weekends (20.4%).

Snacks after dinner

Foods that were commonly consumed as a snack after dinner on weekdays and weekends are presented in Table 4.29. Comparisons between the EHQ and WFR for snacks after dinner on weekdays and weekends are presented in Table 4.30.

Table 4.29 Foods consumed as a snack after dinner on weekdays and weekends

	Weekdays			Weekends			Common food examples
	EHQ	WFR	Total	EHQ	WFR	Total	
Food							
Tea and coffee	**15**	**40**	**55**	**11**	**29**	**40**	
Baking	**21**	**21**	**42**	**14**	**14**	**28**	Biscuits, slices, macaroon
Chocolate	**19**	**23**	**42**	**18**	**19**	**37**	
Fresh fruit	**17**	**20**	**37**	**8**	**14**	**22**	Apple, grapes, berries

	Weekdays			Weekends			Common food examples
	EHQ	**WFR**	**Total**	**EHQ**	**WFR**	**Total**	
Food							
Dairy	**12**	**20**	**32**	6	10	16	Yoghurt, milk, cheese
Ice cream	11	15	26	**9**	**8**	**17**	
Milk based drink	11	12	23	7	7	14	Hot chocolate, milo
Grains	12	9	21	6	3	9	Crackers, cereal
Alcohol	0	12	12	6	8	14	
Lollies	3	8	11	2	5	7	
Nuts and seeds	5	5	10	5	0	5	
Non starchy vegetables	3	7	10	1	0	1	Carrots, avocado, tomato
Bakery item	1	8	9	3	9	12	Cake, cupcake, muffin
Basic sandwich	5	3	8	2	3	5	Toast
Muesli bar	4	4	8	2	3	5	
Dessert	3	5	8	9	4	13	
Potato chips	2	4	6	6	4	10	
Legumes	2	3	5	0	0	0	Hummus
Breads	1	3	4	0	0	0	
Savoury snack item	2	2	4	3	2	5	
Meat	0	3	3	0	1	1	
Fruit juice	0	3	3	0	3	3	
Eggs	0	2	2	0	0	0	
Smoothie	2	0	2	1	0	1	
Baked dessert	0	2	2	0	1	1	
Café drink	0	2	2	0	1	1	
Fruit drink	0	2	2	1	2	3	
Diet soft drink	0	2	2	0	0	0	
Hot chips	1	0	1	0	1	1	
Soup	1	0	1	1	0	1	
Canned, dried, stewed fruit	0	1	1	0	4	4	
Fancy sandwich	0	0	0	0	1	1	
Pie	0	0	0	0	1	1	
Burger	0	0	0	1	0	1	
Leftovers	0	0	0	1	0	1	
Sugar sweetened beverages	0	0	0	1	0	1	
Food combination							
Dairy + grain	4	5	9	2	1	3	Cheese on crackers

EHQ: eating habits questionnaire; WFR: weighed food record

Table 4.30 Comparison of snacks eaten after dinner on weekdays and weekends

			WFR n (%)					
			Weekdays			Weekends		
	Food							
			Yes	**No**	***P*-value[a]**	**Yes**	**No**	***P*-value[a]**
EHQ n (%)	**Tea and coffee**	**Yes**	13 (12.0%)	2 (1.9%)	**<0.001****	5 (4.6%)	6 (5.6%)	0.161
		No	26 (24.1%)	67 (62.0%)		24 (22.2%)	73 (67.6%)	
	Baking	**Yes**	9 (8.3%)	12 (11.1%)	**0.005***	5 (4.6%)	9 (8.3%)	**0.018***
		No	12 (11.1%)	75 (69.4%)		9 (8.3%)	85 (78.7%)	
	Chocolate	**Yes**	5 (4.6%)	14 (13.0%)	0.547	8 (7.4%)	10 (9.3%)	**0.003***
		No	18 (16.7%)	71 (65.7%)		11 (10.2%)	79 (73.1%)	
	Fresh fruit	**Yes**	6 (5.6%)	11 (10.2%)	0.083	2 (1.9%)	6 (5.6%)	0.277
		No	14 (13.0%)	77 (71.3%)		12 (11.1%)	88 (81.5%)	
	Dairy	**Yes**	5 (4.6%)	7 (6.5%)	**0.044***	1 (0.9%)	5 (4.6%)	0.450
		No	15 (13.9%)	81 (75.0%)		9 (8.3%)	93 (86.1%)	
	Ice cream	**Yes**	2 (1.9%)	9 (8.3%)	0.649	1 (0.9%)	8 (7.4%)	0.514
		No	13 (12.0%)	84 (77.8%)		7 (6.5%)	92 (85.2%)	
	Food combination							
	Dairy + grain	**Yes**	1 (0.9%)	3 (2.8%)	0.175	1 (0.9%)	1 (0.9%)	**0.019***
		No	4 (3.7%)	100 (92.6%)		0 (0%)	106 (98.1%)	

EHQ: eating habits questionnaire; WFR: weighed food record
[a] Fisher exact test
* *P* <0.05, ** *P* <0.001

Common snacks consumed after dinner on weekdays and weekends were 'tea and coffee' (weekdays: EHQ n=15, WFR n=40; weekends: EHQ n=11, WFR n=29), baking (weekdays: EHQ n=21, WFR n=21; weekends: EHQ n=14, WFR n=14), chocolate (weekdays: EHQ n=19, WFR n=23; weekends: EHQ n=18, WFR n=19), fresh fruit (weekdays: EHQ n=17, WFR n=20; weekends: EHQ n=8, WFR n=14), dairy (weekdays: EHQ n=12, WFR n=20; weekends: EHQ n=6, WFR n=10) and ice cream (weekdays: EHQ n=11, WFR n=15; weekends: EHQ n=9, WFR n=8). The only food combination commonly consumed was 'dairy + grain', which again tended to be cheese on crackers (weekdays: EHQ n=4, WFR n=5; weekends: EHQ n=2, WFR n=1). Agreement between the EHQ and WFR was much greater than the recommended 50%, with all foods >70% and

many much greater than this. On weekdays and weekends respectively these values were as follows for ‘tea and coffee’ (74.0% vs. 72.2%), baking (77.7% vs. 83.3%), chocolate (70.3% vs. 80.5%), fresh fruit (76.9% vs. 83.4%), dairy (79.6% vs. 87.0%) and ice cream (79.7% vs. 86.1%); and ‘dairy + grain’ (93.5% vs. 99.0%). ‘Tea and coffee’ had the greatest amount of disagreement on both weekdays (24.1%) and weekends (22.2%), where they were consumed in the WFR, but not mentioned in the EHQ.

Chapter 5: Discussion

The aim of this research was to validate a newly developed eating habits questionnaire (EHQ), which assesses the usual dietary habits of women aged 16-45 years living in Auckland, New Zealand (NZ). This chapter will begin by discussing participants' characteristics, followed by a discussion of their eating habits and validation results, where responses from the EHQ were compared to the 4-day weighed food record (WFR).

5.1 Participant characteristics

The majority of women were of NZ European ethnicity (79.6%), which is similar to the 2013 NZ census (74.0%) (Statistics New Zealand, 2013a). The higher proportion of NZE women perhaps represents the ethnicities present in Auckland, which is where this study was conducted. In this study 33.3% of women were overweight or obese, as classified using a body mass index (BMI) ≥25.0 kg/m^2 (World Health Organization, 2000), which is much fewer than the proportion of women who were overweight and obese (60.6%) in the most recent NZ Adult Nutrition Survey (ANS) in 2008/09 (University of Otago & Ministry of Health, 2011a). Therefore this study is not representative of the NZ population, which perhaps is an indication that more health conscious women may have participated in this research.

5.2 Participants' eating habits

5.2.1 General eating habits

General eating habits that were practiced

Most participants perceived their diet as being different every day, with the remainder viewing their diet as being based on a particular macronutrient. Comparisons with the Acceptable Macronutrient Distribution Ranges (AMDR) (NHMRC, 2006) from the WFR however, showed participants' views were greatly distorted. All women's diets were greater than the AMDR (total fat: 20-35% energy; saturated fat: ≤10% energy; carbohydrate: 45-65% energy; protein: 15-25% energy) for total fat where they ranged from 35.4-36.3%, and for saturated fat where they ranged from 11.8-13.1%. Despite this only one

participant viewed their diet as being high in fat. Participants who perceived their diet as being based on high carbohydrate foods were the only group to marginally meet the AMDR (45-65% energy) for carbohydrate (46.2%). Although participants who thought their diet was high in protein (19.7%) had a slightly higher protein intake from the WFR, average protein intakes from all women (16.7-19.7%) were within the accepted AMDR range (15-25% energy). These are similar to the intakes from the 1997 National Nutrition Survey (NNS) and ANS (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a) for protein (16.0% (1997) and 16.5% (2008/09)) and slightly lower than carbohydrate intakes (47.0% (1997) and 47.1% (2008/09)). Total fat intakes (35.4-36.3%) from the WFR were similar to 1997 (35%) and slightly higher than 2008/09 (33.8%). Saturated fat intakes (11.8-13.1%) from the WFR were lower than 1997 (15%) and similar to the 2008/09 (13.1%) results. This shows that while participants may view their diet as being high in carbohydrate or protein, this is not the case and instead fat intakes are higher than recommendations.

In this study fruit was a popular snack item, which is similar to other studies (Basdevant et al., 1993; Duffey et al., 2013; Kearney et al., 2001; Ovaskainen et al., 2006). The proportion of women who consumed sweets as a snack in this study (17.6%) was also similar to the number of women who consumed sweets ≥5 times a week (15.6%) in the ANS (University of Otago & Ministry of Health, 2011a).

The majority of women consumed water between meals (93.0%), which is similar to the NNS where 85.0% of women consumed water ≥3 times a week (Ministry of Health, 1999). Based on the EHQ most participants drank alcohol ‘sometimes’ with meals. Women who ‘often and always’ consumed alcohol at meals had a greater alcohol intake (% energy) (6.85%) than women who practiced this ‘sometimes’ (1.58%) and ‘never’ (0.15%). The NNS and ANS found alcohol contributed approximately 3% of energy to the diet (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a).

Validation of general eating habits

For all snack foods agreement ranged from 60.2% to 87.0%, which is much greater than the recommendations for validation studies where >50% of participants should be classified into the same category for both dietary assessment methods (Masson et al., 2003). Despite this, greater misclassification was seen for sweets and biscuits, which is similar to other reports that show certain foods, such as sweets and desserts, are more prone to underreporting (Hu et al., 1999; Nelson & Bingham, 1997). Potential reasons for this include participants not believing they consume sweets as frequently as they do or not wishing to reveal their consumption of less healthy foods (Nelson & Bingham, 1997). There was very high agreement between the EHQ and WFR for beverages consumed between meals. However tea and coffee consumption could not be determined from the EHQ, which was shown to be consumed by 65.0% and 58.0% of women respectively ≥3 times weekly in the NNS (Ministry of Health, 1999). Agreement between the EHQ and WFR for alcohol consumption at meals was slightly lower (45.4%) than the recommendations. The largest amount of disagreement was found when participants responded 'sometimes' in the EHQ, yet did not drink alcohol in the WFR. Results show overall these general eating habits tended to be valid, however the large amount of disagreement for some habits may be due to intakes being variable and thus four days may be an insufficient length of time to pick up participants usual eating habits.

5.2.2 Eating behaviours

Eating behaviours, such as the consumption of foods with a high fat or sugar content are an aspect of eating habits that can contribute to obesity and excess body fat.

Eating behaviours that were practiced

In this study participants tended to eat sweets 'sometimes' (43.9%). This is greater than the proportion of women who ate chocolate and other confectionary at least once a week in the NNS (33%) (Ministry of Health, 1999) and 1-2 times a week (30.5%) in the ANS (University of Otago & Ministry of

Health, 2011a). Other studies have similarly found sweets are a popular snack food (Basdevant et al., 1993; Bellisle et al., 2003; Duffey et al., 2013; Ovaskainen et al., 2006), including one conducted in NZ (Health Sponsorship Council, 2007).

Based on the EHQ many women (63.2%) ate fried foods. In the NNS (Ministry of Health, 1999) 70.0% of women ate meat fried or roasted in fat or other oils (50.0%) (e.g. sunflower, corn and safflower oil), with only slightly fewer women (68.0%) consuming vegetables fried or roasted in fat or oil.

Just over half of participants 'sometimes' ate takeaways in the EHQ. This finding is much greater than the number of women who ate meat pies, sausage rolls and other savoury pastries (15%), hamburgers (11%) and pizza (7%) at least once a week in the NNS (Ministry of Health, 1999); and the number of women who ate takeaways one to two times weekly in the ANS (24.3%) (University of Otago & Ministry of Health, 2011a). A potential reason for this difference is that these nutrition surveys were conducted nearly ten years ago, and takeaway availability and intakes may have increased since then. Indeed De Vogli et al. (2014) found that over a period of a decade, takeaway consumption in NZ increased by 10% per capita. If this trend were to continue, then an even greater intake of takeaways would be expected over time.

According to the EHQ approximately one third of participants perceived themselves as regularly consuming vegetarian meals. This finding is much greater than the NNS which found few women avoided meat except chicken (3%), were a lacto-ovo vegetarian (1%) or vegan (1%) (Ministry of Health, 1999). A small proportion of women also did not eat red meat (6.6%) or chicken (5.8%) in the ANS (University of Otago & Ministry of Health, 2011a). A potential reason for the greater rate in the EHQ is that women may eat meals without meat, but may not necessarily call themselves a vegetarian or may have included meals less likely to contain meat (e.g. breakfast). Findings from this study are also different to the worldwide prevalence of vegetarians which range from 3% of Australians to 40% of Indians (European Vegetarian Union, 2007). Reasons for these differences include culture, health, environmental issues and

animal welfare beliefs (Beardsworth & Keil, 1991; Fox & Ward, 2008; Leitzmann, 2014).

In this study most women trimmed the fat from meat (67.6%) versus a slightly smaller proportion of women who followed this practice in the most recent ANS (67.4%) (University of Otago & Ministry of Health, 2011a), which is less than the NNS (72.0%) (Ministry of Health, 1999) and another study in American women (76.5%) (Capps et al., 2002). Most women also removed the skin from chicken (63.5%) in this study compared to fewer women who practiced this in the ANS (53.5%) (University of Otago & Ministry of Health, 2011a), the NNS (49.0%) (Ministry of Health, 1999) and a study in American women (56.3%).

Validation of eating behaviours

Validation was assessed by cross-classification where agreement between the EHQ and WFR was >50% and gross misclassification was <10% for the consumption of fried foods and takeaways (Table 4.8). The weighted kappa statistic found fair agreement for all eating behaviours, ranging from 0.21-0.33, although was greater for fried foods and takeaways. A large amount of misclassification was found for participants who 'sometimes' consumed sweets based on the EHQ, however regularly practiced this in the WFR. The underreporting seen in the EHQ aligns with previous studies that found sweets are more prone to underreporting (Hu et al., 1999; Nelson & Bingham, 1997). Misclassification was also seen for participants who 'sometimes' ate vegetarian meals and takeaways based on the EHQ but rarely practiced these in the WFR. It is possible that a 4-day WFR is an insufficient length of time to assess these behaviours if they are only practiced occasionally. In addition participants may have misreported their intake in the WFR (e.g. underreporting sweets), thus potentially contributing to the misclassification seen between the EHQ and WFR.

Comparisons of eating behaviours from the EHQ with nutrient intakes from the WFR (Table 4.9) found participants' nutrient intakes did not tend to differ based on their responses from the EHQ. This is potentially due to participants answering these questions differently from one another, as the response

options were not specifically defined (e.g. ‘sometimes’ or ‘often’). Variation in participants’ answers was however reduced, as response categories were merged together for final analysis.

5.2.3 Low fat alternatives

Consumption of low fat alternatives

In this study the proportion of participants who consumed low fat alternatives ranged from 28.7% for ice cream to 78.7% for milk. The number of NZ women who consumed low fat foods in the ANS (43.4%) falls within this range (University of Otago & Ministry of Health, 2011a). Another study found fewer French women consumed low fat foods (24%) in 1988 than the EHQ, possibly due to cultural differences or a change in intakes over time.

Based on the EHQ, the most popular low fat food in this study was milk (78.7%), which was consumed by more women than the most recent ANS (51.9%) (University of Otago & Ministry of Health, 2011a) and the NNS (27.0%) (Ministry of Health, 1999). As the NZ nutrition surveys were conducted nearly ten years ago, it is possible these results indicate that intakes have increased over time. Similar to the EHQ, other international studies have found low fat milk is the most commonly consumed low fat food (Bellisle et al., 2001; Stewart-Knox et al., 2005; Wierzbicka & Dqbrowska, 2009). A study in Northern Ireland (Stewart-Knox et al., 2005) found consumption of low fat milk (72.0%) was similar to the EHQ, whereas intakes in other studies were lower, ranging from 5.1% in France (Bellisle et al., 2001) to 63.0% in Britain (Buttriss, 2002). This large difference is potentially due to cultural differences or, in some instances, the use of national samples.

Another common low fat alternative consumed by participants in the EHQ was margarine (59.3%). Whereas far fewer women consumed reduced fat margarine in both the 1997 (3.0%) (Ministry of Health, 1999) and 2008/09 (30.5%) (University of Otago & Ministry of Health, 2011a) NZ nutrition surveys. A potential reason for the higher value in the EHQ than the nutrition surveys is that intakes may have increased over time. A study in Northern Ireland found,

similar to the EHQ, that 55.0% of participants consumed low fat spreads (Stewart-Knox et al., 2005).

In the EHQ 76.6% of women regularly consumed low fat meat such as premium minced beef, which is higher than the proportion of NZ women who regularly trimmed the fat from meat in 1997 (72.0%) (Ministry of Health, 1999) and 2008/09 (67.4%) (University of Otago & Ministry of Health, 2011a).

Low fat fast food choices were consumed by 63.9% of women in the EHQ. Another NZ study found only approximately one fifth of food choices available at major fast food restaurants were for healthier options such as salads, wraps and low fat smoothies (Chand et al., 2012). Although healthier fast food options were available, it is clear choices were limited, which is likely to influence what foods are purchased.

Other low fat foods investigated in this EHQ that were regularly consumed by participants were crisps, crackers, ice cream, salad dressing and cheese. None of these foods were investigated in the NZ nutrition surveys, however Capps et al. (2002) found consuming low fat cheese and ice cream (e.g. sorbet), and low energy salad dressing in American women were not as common as other low fat behaviours. Interestingly in the EHQ more participants chose regular ice cream than low fat varieties, whereas for other foods more participants tended to consume low fat varieties. Ice cream is perhaps a treat food that is only consumed occasionally and therefore participants may prefer to have regular ice cream instead.

Validation of low fat alternatives

Agreement with participants falling into the same tertile for the EHQ and WFR was >50% for milk, cheese and meat (see Table 4.11). It is possible that agreement was greater than the recommendations for validation studies (>50%) (Masson et al., 2003) for these foods as they tend to be consumed more frequently. For example in the NZ nutrition surveys milk and meat were major contributors to total fat intakes (Ministry of Health, 1999; University of Otago & Ministry of Health, 2011a). A large amount of misclassification was found for six foods when participants responded ‘yes’ in the EHQ and were

coded as ‘not applicable’ (n/a) in the WFR. Misclassification was also found for four foods when participants responded ‘no’ in the EHQ and were coded as ‘n/a’ in the WFR. A potential reason for this misclassification is how the WFR was coded for comparison with the EHQ. ‘Not applicable’ was coded for the WFR when participants did not eat that food, whereas there is uncertainty as to why participants responded ‘n/a’ in the EHQ. Possible reasons for selecting n/a in the EHQ could include that food was not consumed, low fat alternatives were not considered, not knowing whether low fat alternatives were consumed, not being able to afford low fat versions (e.g. premium meat) or being vegetarian and therefore not consuming foods such as meat. Another possible reason is that these foods may be consumed occasionally and therefore more than four days of dietary intake data may be needed to establish such intakes.

All low fat food choices from the EHQ were compared with energy (kJ), total fat (g and %) and saturated fat (g and %) intakes from the WFR to assess whether nutrient intakes differed between participants who responded ‘yes’ and ‘no’ in the EHQ (Table 4.12). Participants who responded ‘n/a’ to low fat food choices in the EHQ were excluded from analysis due to uncertainty around why they gave this response, as discussed previously. Other studies have similarly excluded n/a responses from statistical analysis (Capps et al., 2002; Di Noia et al., 2008). Fat intakes were significantly different between women who did and did not regularly consume most low fat foods (crisps, crackers, margarine, ice cream, salad dressing, cheese and fast food). This is possibly due to the lower fat content of these foods. Although milk and meat were the most commonly consumed low fat foods (see Table 4.10), which aligns with other studies (Buttriss, 2002; Capps et al., 2002; Stewart-Knox et al., 2005; Wierzbicka & Dqbrowska, 2009), energy and fat intakes were not significantly different between women who did and did not consume them. It is possible that women who consumed low fat milk and meat did not consume other low fat products, as a number of women (n=21) regularly consumed only one to three low fat foods. Although women who consumed a variety of low fat foods tended to have a lower overall dietary fat intake, energy intake did not differ between women who did and did not regularly consume low fat foods, apart from low fat margarine where energy intake was significantly lower. It is possible that energy

intake from low fat foods was not significantly lower due to the overall nutrient composition of these foods, as often they are adjusted by the manufacturers. For example to compensate for reducing the fat content it is likely that some foods may have sugar added to maintain flavour (Baghurst et al., 1994). This will counteract the benefit of reduced fat intake from low fat foods.

5.2.4 Social occasions

At social occasions many of the women's eating habits changed. Most commonly the consumption of alcohol and sugar-sweetened beverages (SSB) increased, which were mentioned by participants on 130 and 32 social occasions respectively in the EHQ, which is similar to previous NZ research (Health Sponsorship Council, 2007). In addition other studies have found alcohol intake is greater in the evening (S. Gibson & Shirreffs, 2013) and at weekends (S. Gibson & Shirreffs, 2013; Jaeger et al., 2009), which is when social occasions most frequently occur. Peer pressure during these social occasions may also lead to increased alcohol consumption (Kuntsche et al., 2005).

5.2.5 Meal distribution

When investigating eating habits it is essential that information is available for the group of interest as eating habits differ greatly amongst different population groups. There are few studies that investigate food intake patterns, with no studies identified that investigate the intake of food and beverages across the day in pre-menopausal NZ women. This causes difficulties when wanting to compare and critique results across studies. Although conducted in a different population group, one study was identified that assessed food intake patterns qualitatively across the day in NZ parents and caregivers (Health Sponsorship Council, 2007). However, the food intake of pre-menopausal women is likely to differ when compared with a group of parents and caregivers with the pre-menopausal women group including more single women and not including males. Therefore, it is essential that eating habits are not generalised over different population groups and are instead assessed using appropriate methods for the group of interest, which in this study was pre-menopausal NZ women.

Most of the other studies that investigated food intake at different meal and snack periods used food records or 24-hour recalls. The use of different methods can make comparisons between studies more difficult both with each other and with an EHQ, such as the one in this study. Although the use of methods such as the 24-hour recall can provide more detailed information about dietary intake, they can be burdensome by being time consuming and labour intensive (Thompson & Subar, 2013). Furthermore, detailed information is not always required and it may be more appropriate to obtain qualitative information, such as from an EHQ.

The consumption of breakfast, lunch, dinner (Kerver et al., 2006; O'Neil et al., 2014; Storey et al., 2009), and snacks (Miller et al., 2013) has been associated with a better diet quality. In contrast excess snacking on poor quality foods may contribute to weight gain (Miller et al., 2013). However, there is limited research available on this topic. Hence it would be beneficial to know what foods are commonly consumed for each meal and snack period in different population groups. Prior to assessing these eating habits, suitable tools and methods must be available, such as the EHQ that was developed and validated for NZ women in this study.

This section will begin by discussing participants' eating habits, including the consumption of foods and food combinations followed by a discussion of the validation results.

5.2.5.1 Breakfast

The majority of women ate breakfast on both weekdays and weekends. Breakfast tended to be consumed earlier on weekdays (between 6-8 am) than weekends (between 8-10 am). In this study slightly more women usually ate breakfast than the number of women who ate breakfast on three or more days weekly from the ANS (University of Otago & Ministry of Health, 2011a). Worldwide there is great variation in the proportion of people who skip breakfast, ranging from 1.7% in Croatia, to 30% in Brazil (Mullan & Monika, 2010). This is possibly due to differences in culture, ethnicity and socioeconomic status (Keski-Rahkonen et al., 2003; Moy et al., 2009).

In this study grains such as breakfast cereals and porridge were commonly consumed for breakfast, which is similar to other studies (Burke et al., 2005; Cho et al., 2003; de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001; Nicklas et al., 1998; Van Den Boom et al., 2006). Other studies (Cho et al., 2003; Nicklas et al., 1998) have also found that eggs were common for breakfast, which in this study were more popular on weekends. A qualitative study conducted on NZ parents and caregivers found similar results to this study with breakfast cereal, toast and fruit being common at breakfast, and eggs were more popular at weekends (Health Sponsorship Council, 2007). Fresh fruit and dairy products such as milk and yoghurt were also commonly eaten for breakfast in this study, which is similar to other studies (Burke et al., 2005; Cho et al., 2003; de Castro, 2009; Nicklas et al., 1998). Not surprisingly, popular food combinations tended to consist of the most common individual food items consumed ('dairy + grain' (e.g. breakfast cereal and milk), 'dairy + grain + fruit' (e.g. porridge with milk and banana) and 'bread-based foods' (e.g. eggs on toast)). This is similar to a study of young Spanish people where consuming ready-to-eat cereal was associated with a greater intake of fruit and dairy products (Van Den Boom et al., 2006).

5.2.5.2 Lunch

The majority of women ate lunch between 12-2 pm. In this study, vegetables (e.g. tomato, avocado), meat (e.g. ham, canned fish), bread and dairy products (e.g. cheese, yoghurt) were commonly eaten for lunch, which is similar to other studies (Burke et al., 2005; de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001; Rousset et al., 2003). Similar to breakfast in this study, yoghurt was a popular dairy product at lunchtime, whereas cheese was more common for lunch, tending to be eaten in sandwiches. Burke et al. (2005) also found yoghurt and cheese intakes to peak at lunchtime. In this study, certain food choices were more typically consumed on weekdays (e.g. leftovers) than weekends (e.g. takeaways). The qualitative study by the Health Sponsorship Council (2007) similarly found that NZ parents and caregivers tended to eat sandwiches and leftovers for lunch on weekdays, whereas meals out and takeaways were more common on weekends. Possible reasons for increased

takeaway consumption on weekends include having a break from the weekday routine or doing more activities away from home (e.g. catching up with family and friends or attending sports events) (Health Sponsorship Council, 2007). Common food combinations eaten for lunch reflected the popular individual food items consumed. For example these included ‘bread-based foods’ (e.g. sandwiches containing ham and salad or egg and hummus) and ‘leftover combinations’ (e.g. dinner leftovers with salad), with ‘takeaway combinations’ (e.g. pizza or a burger) more common on weekends.

5.2.5.3 Dinner

In this study common foods eaten for dinner were similar to other studies which included non-starchy vegetables (NSV) (e.g. carrots, peas) (de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001), meat (e.g. beef, chicken) (de Castro, 2009; Jaeger et al., 2009; Kearney et al., 2001), and carbohydrates such as pasta, rice and potatoes (Burke et al., 2005; Jaeger et al., 2009). Although in this study grains were also commonly eaten for breakfast (e.g. breakfast cereal), different sorts of grains (e.g. pasta, rice) were eaten for dinner. At weekends slightly more meat than vegetables were eaten, with the opposite seen on weekdays. This is similar to Jula et al. (1999) who found meat intake was greater on weekends, and a qualitative NZ study (Health Sponsorship Council, 2007) where fewer vegetables were eaten on weekends. On weekends more meal type takeaways were eaten, such as Chinese or Thai food. Similar to the most common foods consumed, the major food combinations were ‘meat + grain + NSV’ (e.g. chicken with pasta, peas and carrots), ‘meat + starchy vegetables + NSV’ (e.g. beef with potato and broccoli) and, on weekends, ‘takeaway combinations’ (e.g. burger and chips or pizza).

In this study participants also consumed alcohol for dinner in the WFR, with more participants reporting alcohol intake on weekdays than weekends. In contrast other studies have found alcohol intake to be greater at weekends (S. Gibson & Shirreffs, 2013; Health Sponsorship Council, 2007; Jaeger et al., 2009). This may be explained by more weekdays than weekend days being recorded in the WFR in this study, resulting in more opportunities for alcohol to be consumed. As only qualitative information was collected, differences in the

amount of alcohol consumed could not be assessed. In addition this study found alcohol consumption was greater during social occasions, which is similar to another qualitative NZ study, where these social occasions were also more common on weekends (Health Sponsorship Council, 2007). As alcohol intake tends to be greater during social occasions rather than being consumed regularly this may explain why participants did not record their consumption of alcohol in the EHQ.

Despite vegetables being a major food consumed for dinner, especially on weekdays, the most recent NZ Health Survey (NZHS) (Ministry of Health, 2014) conducted in 2013/14 found 67% of women met the vegetable recommendations (≥3 servings daily) (Ministry of Health, 2003) compared with approximately three-quarters of women that met the recommendations in the ANS (University of Otago & Ministry of Health, 2011a). Although vegetables were a common food consumed for both dinner and lunch, it is possible some women were not meeting the recommendations due to having an inadequate number of servings during these occasions. The increased takeaway consumption on weekends may also contribute to lower vegetable intakes.

5.2.5.4 Snacks

From the EHQ it was established that throughout the week snacks were most commonly consumed in the afternoon, and least commonly consumed after dinner. Other studies have similarly found snacks are more common in the afternoon (Basdevant et al., 1993; Duffey et al., 2013; Zalilah et al., 2008), and in contrast to this study Duffey et al. (2013) found snacks were also common in the evening. The lower number of morning snacks could be due to several reasons. Women tended to sleep later on weekends and may therefore be less inclined to have a morning snack. The consumption of snacks may also depend on when main meals are eaten, for example on weekends breakfast may be eaten later and be more relaxed than on weekdays, thereby influencing the consumption of snacks (Health Sponsorship Council, 2007).

In this study fruit was the most popular snack item consumed in the morning and afternoon throughout the week, which was similar to other studies

(Basdevant et al., 1993; Duffey et al., 2013; Kearney et al., 2001; Ovaskainen et al., 2006) and is snacked on throughout the day (Kearney et al., 2001). In this study, this was further confirmed in another question as participants reported that their snack choices were mainly based on fruit. Despite fruit being a major snack item in this study, the most recent NZHS (Ministry of Health, 2014) conducted nationally in 2013/14 found only 62.0% of women met the NZ fruit recommendations (≥2 servings a day) (Ministry of Health, 2003). This is the lowest intake from the NZHS since 2002/03. The ANS found only slightly more women (65.8%) met the recommendations for fruit. Although in this study many women usually consumed fruit as a snack food, they may not be doing this everyday or may only consume one portion per day in the afternoon. This reduced consumption of fruit may be contributing to the low number of women who met the recommendations for fruit intake in national surveys.

Comparable to other studies, dairy products (Basdevant et al., 1993; Ovaskainen et al., 2006; Rousset et al., 2003; Zizza et al., 2001), tea and coffee (Duffey et al., 2013; Ovaskainen et al., 2006) and sweet foods such as bakery items and chocolate (Basdevant et al., 1993; Bellisle et al., 2003; Burke et al., 2005; Duffey et al., 2013; Ovaskainen et al., 2006; Zizza et al., 2001) were also popular snack foods. In this study tea and coffee was the most common snack item after dinner and second most popular snack item in the morning, which was also mostly consumed in the morning in the study by S. Gibson and Shirreffs (2013). Baking and chocolate were popular after dinner, which is similar to the study conducted by the Health Sponsorship Council (2007) who found treat foods such as chocolate, lollies and chips were snacked on after dinner by NZ parents and caregivers. In this study other popular snack foods, particularly in the afternoon were the combination of ‘dairy + grains’ (e.g. cheese on crackers) which was the only frequently consumed food combination during snack periods. Although other studies (Basdevant et al., 1993; Bellisle et al., 2003; Duffey et al., 2013; Zizza et al., 2001) have found SSB to be a popular snack item, very few women in this study consumed them, with only one woman reporting them in the EHQ. Potential reasons for this include cultural differences between studies or underreporting, as SSB may be viewed as unhealthy and therefore less desirable to report (Nelson & Bingham, 1997)

or women in this study may have been more health conscious and therefore did not consume SSB. Although SSB were rarely consumed for a snack, they were a popular beverage on social occasions in this study, which is similar to the findings of another NZ study (Health Sponsorship Council, 2007).

5.2.5.5 Validation

In this study the EHQ was compared to the WFR to assess validity between meal timings and foods (top five) and food combinations (top two) on both weekdays and weekends. Cross-classification was used to assess agreement between the methods using the criteria for validation studies suggested by Masson et al. (2003) where >50% of participants should fall into the same category for both methods. Limited comparisons and therefore critical analysis could be made with other studies as none were identified that compared food intake between methods as either being ‘eaten’ or ‘not eaten’. Rather studies tended to compare nutrient intakes across a range of intakes by classifying participants into different tertiles of intake. Correlation coefficients and regression analysis were also used by other studies to validate EHQs, however these were unable to be calculated for this study.

Timing of meals and snacks

Agreement between the EHQ and WFR was very high for women who did and did not consume main meals, with findings ranging from 98.1% to 99.0% on weekdays and from 89.6% to 92.2% on weekends. For snack periods, agreement for women who did and did not eat snacks was also high, ranging from 84.1% to 88.0% on weekdays and from 61.9% to 71.4% on weekends. Agreement between the EHQ and WFR for the timing of meal periods was high, ranging from 76.9% to 92.6% on weekdays and from 59.5% to 68.2% on weekends. The Kw ranged from 0.14 to 0.74, with better agreement on weekdays than weekends. These results show that the EHQ was able to correctly classify women into the same category when compared to the WFR. However agreement tended to be lower on weekends, possibly due to some women only recording intake on one weekend day in the WFR, or women’s eating habits may be more regular on weekdays.

Consumption of foods and food combinations

Agreement between the EHQ and WFR for foods and beverages consumed at breakfast time ranged from 65.8% to 87.1% and for food combinations ranged from 69.5% to 87.9%. Agreement between the EHQ and WFR for foods and beverages consumed for lunch ranged from 60.1% to 82.4% and for food combinations ranged from 51.8% to 94.4%. At dinner agreement between the EHQ and WFR ranged from 54.6% to 93.4% for foods and ranged from 56.4% to 73.1% for food combinations. For all the popular foods consumed for main meals agreement was greater than those recommended for validation studies (>50%) (Masson et al., 2003), however was best for breakfast (>65%) and lowest for dinner (>50%). Agreement for food combinations was also greatest at breakfast (>65%). A potential reason for the lower disagreement seen at dinner is that a greater variety of foods may be consumed, which could be harder to pick up from a 4-day WFR. Despite this the largest amount of agreement was also seen at dinner for meal type takeaways on weekdays, however as only few participants consumed this in either method, agreement was easier to obtain.

All snack periods were found to be valid as per the recommendations (>50%) (Masson et al., 2003). For snacks consumed in the morning agreement mostly ranged from 70.4% to 92.6%, however for tea and coffee on weekdays this was 52.8%. Snacks after dinner had a similar amount of agreement, ranging from 70.3% to 87.0%, and agreement was lower for snacks consumed in the afternoon, ranging from 61.1% to 86.1%. Agreement for the food combination ‘dairy + grain’ ranged from 83.3% to 99.0% for all snack periods. A potential reason for agreement tending to be greater in the morning and evening is that fewer participants consumed snacks during these periods and there was less variety in the foods consumed, making these periods more comparable between the EHQ and WFR. Other studies have found snack foods are prone to underreporting (Bellisle et al., 1997; Poppitt et al., 1998), which may partially explain why agreement was lower during the most popular snack period in this study.

One beverage that showed a large amount of disagreement was tea and coffee, which tended to be consumed in the WFR, but not mentioned in the EHQ. This was seen for breakfast on both weekdays and weekends, and for snacks in the morning and afternoon on weekdays, and after dinner on both weekdays and weekends. A potential reason for this is that participants were not asked directly about their tea and coffee intake in the EHQ, and instead described it through an open-ended question. Another beverage that displayed a large amount of disagreement was alcohol, which tended to be consumed in the WFR, but not mentioned in the EHQ for dinner on both weekdays and weekends. This disagreement is possibly due to participants focusing on describing foods rather than beverages in the EHQ, which aligns with previous findings where beverages are prone to underreporting (Nelson & Bingham, 1997). Other potential reasons include participants may not want to admit to or believe they usually drink alcohol, or the process of recording their intake may cause some participants to under-report or reduce their alcohol intake (Nelson & Bingham, 1997). At lunch the largest amount of disagreement was found when dairy, mostly cheese, was eaten on weekdays and weekends in the WFR but was not mentioned in the EHQ. This was typically when cheese was eaten in sandwiches in the WFR, but was not mentioned in the EHQ, possibly due to participants thinking cheese was not a major part of their sandwich and therefore not mentioning it.

5.3 Validation summary

Overall the EHQ was a valid tool to assess the eating habits that contribute to the high prevalence of obesity and excess body fatness seen in NZ women. Validity was determined by assessing whether the eating habits participants' described in the EHQ were actually practiced in the WFR. A range of statistical tests were used to assess validity, including cross-classification (where agreement was >50% and misclassification was <10% (Masson et al., 2003)) and the weighted kappa statistic. The EHQ was particularly good at identifying the eating habits practiced during meal and snack periods, including the timing and consumption of foods and food combinations; general eating habits such as snack choices and beverages consumed between meals; eating behaviours

such as fried foods and takeaways; and the selection of low fat foods such as milk, meat and cheese. Agreement from cross-classification between the EHQ and WFR ranged from 51.8% to 99.0% for all these eating habits. The EHQ was not so good at identifying the habits of tea, coffee and alcohol consumption; and the behaviours of eating sweets and vegetarian meals. Agreement between the EHQ and WFR for these habits was less than the recommended 50%. Further recommendations for how the EHQ could be improved are provided in chapter 6.

Chapter 6: Conclusion

6.1 Summary of findings

This study was designed to develop and validate an eating habits questionnaire (EHQ) which assesses the usual dietary habits of women aged 16-45 years living in Auckland, New Zealand (NZ) as part of the women's EXPLORE study. Eating habits were assessed using an EHQ and validated against a 4-day weighed food record (WFR). The EHQ was designed to focus on eating habits that contribute to obesity and excess body fatness. This validation study was a subsample of the larger women's EXPLORE study, and included 108 women who were recruited from July 2013 to June 2014 and completed the online EHQ at the Human Nutrition Research Unit, Massey University, Albany. The validation statistics used were cross-classification (agreement >50% and gross misclassification <10% (Masson et al., 2003)), chi-squared analysis (χ^2) and the weighted kappa statistic (Kw). The findings from this study will be summarised below according to the four objectives that were specified in chapter one (section 1.4).

The first objective of this study was:

> *"To develop an eating habits questionnaire for use in New Zealand women aged 16-45 years".*

The EHQ was developed based on questionnaires and methods used in other studies (e.g. (Beck, 2013; Kruger et al., 2012)), with a focus on habits associated with obesity and excess body fatness. Previous questionnaires were adapted so that the EHQ used in this study was culturally relevant for NZ women. Additional questions were added that assessed social occasions, waking times and the timing of and typical foods consumed during snacking occasions. The final questionnaire comprised the following sections:

- Perceptions of weight status.
- General eating habits (e.g. appetite perception and diversity of the diet including meals, snacks, beverages and alcohol intake).

- Eating behaviours associated with healthy/unhealthy eating and the choice of low fat alternatives.
- Social occasions.
- Time distribution of meals (breakfast, lunch and dinner) and snacks (between meals), including foods and food combinations consumed during these meal and snack periods on both weekdays and weekends.

Therefore objective one was met, as an EHQ was successfully developed for use in NZ women aged 16-45 years. The EHQ has the potential to be used in future studies to explore the eating habits that contribute to obesity and body fatness in women. The use of this tool over others may be preferable as this tool is quicker and easier to use than more traditional methods and is appropriate for NZ women.

The second objective of this study was:

> *"To investigate the ability of the eating habits questionnaire to reflect usual dietary habits."*

Participants' usual dietary habits included those on perceptions of weight status, general eating habits, eating behaviours associated with healthy/unhealthy eating and low fat alternatives, and social occasions.

Validation from cross-classification found agreement was greater than the recommended 50% (Masson et al., 2003) for the general eating habits of snack choices (ranged from 60.2% to 87.0%) and beverages between meals (91.0%). Alcohol consumption at meals was slightly less than this (45.4%). The eating behaviours of fried food and takeaway consumption had an agreement of >50% and gross misclassification <10%; and nutrient intakes did not tend to differ by the frequency participants practiced different eating behaviours. Agreement was >50% (59.8% to 80.5%) for the low fat alternatives of milk, meat and cheese; total and saturated fat intakes tended to differ between women who did and did not regularly consume low fat foods.

Based on the EHQ, in terms of usual dietary habits, participants' snacks were mainly based on fruit; water was the most commonly consumed beverage between meals and participants' tended to 'sometimes' drink alcohol. The eating behaviours that were most commonly practiced were trimming the fat from meat, removing the skin from chicken and rarely eating fried foods; and the most popular low fat foods were milk and meat. Dinner or lunch with family or friends was the most commonly attended social occasion, with eating habits tending to change, particularly from an increased consumption of alcohol and sugar-sweetened beverages (SSB).

Agreement between the EHQ and WFR was particularly high in terms of snack choices, beverages consumed between meals, and the consumption of fried food, takeaways and low fat milk, meat and cheese. Therefore these results suggest the EHQ can be used to assess these usual dietary habits in NZ women.

The third objective of this study was:

> *"To investigate the ability of the eating habits questionnaire to determine distribution of food intake across the day".*

Overall the EHQ was able to correctly classify all foods consumed for meals and snacks into the correct category when compared with the WFR. Agreement was greater than that recommended for validation studies (>50%) (Masson et al., 2003) for all foods, with agreement much greater than this for many foods. The range of agreement values for the top five foods consumed for each meal period was as follows for breakfast (65.8% to 87.1%), lunch (60.1% to 82.4%) and dinner (54.6% to 93.4%). For snacks in the morning agreement mostly ranged from 70.4% to 92.6%, although for tea and coffee was 52.8%. Agreement for snacks in the afternoon ranged from 61.1% to 86.1% and in the evening from 70.3% to 87.0%.

Breakfast tended to consist of dairy, grains or basic sandwich, with eggs and bread more common on weekends. Although tea and coffee was the most popular beverage category drunk by women in the WFR, tea and coffee was

not mentioned as frequently in the EHQ. For **lunch** women mostly consumed non-starchy vegetables (NSV), meat, bread and dairy, with leftover meals more common on weekdays and takeaways more common on weekends. **Dinner** tended to comprise NSV, meat, grains and starchy vegetables (SV), with meal type takeaways more common on weekends. Alcohol was frequently consumed in the WFR however, was often not mentioned in the EHQ. **Snacks** were mostly consumed between lunch and dinner. Fruit was the most popular snack item and was mostly consumed in the morning and/or afternoon. Tea and coffee was another popular snack item, particularly after dinner and also in the morning. Other popular snack foods included dairy and grains in the afternoon and baking and chocolate after dinner.

Agreement between the EHQ and WFR was greater than the recommended 50% for validation studies, ranging from 54.6% to 93.4% for all foods consumed. The high amount of agreement suggests objective three was met and thus the distribution of food intake can be determined from the EHQ.

The final objective of this study was:

> *"To investigate the ability of the eating habits questionnaire to determine combinations of foods eaten at each meal".*

Overall agreement between the EHQ and WFR was greater than the recommendations (>50%) (Masson et al., 2003) for all food combinations consumed for main meal and snack periods, with agreement much greater than this for most food combinations. For main meals the range of agreement for the top two food combinations consumed was as follows for breakfast (69.5% to 87.9%), lunch (51.8% to 94.4%) and dinner (56.4% to 73.1%). Agreement at snack periods for the food combination 'dairy + grain' tended to be higher than main meals, and ranged from 83.3% to 99.0%.

At **breakfast** 'dairy + grains' was the most popular food combination followed by 'dairy + grain + fruit', with 'bread-based foods' more common on weekends. 'Bread-based foods' were the most common combination eaten for **lunch**, with 'leftover combinations' more common on weekdays and 'takeaway

combinations' on weekends. At **dinner** 'meat + grain + NSV' and 'meat + SV + NSV' were the most common food combinations, and similar to lunch 'takeaway combinations' were more common on weekends. As expected, these food combinations aligned with the most common individual foods consumed for breakfast, lunch and dinner. The only food combination that was frequently consumed for **snacks** was 'dairy + grain', which tended to comprise cheese on crackers. This was particularly common between lunch and dinner, which aligned with dairy and grains being common individual foods during this period.

The EHQ was able to correctly determine the distribution of food combinations across the day as shown by the high amount of agreement between the EHQ and WFR, which ranged from 51.8% to 99.0%. These results suggest objective four was met and thus the EHQ can be used to determine the combination of foods eaten at each meal.

The primary aim of this study was:

> *"To validate a newly developed eating habits questionnaire, which assesses the usual dietary habits of New Zealand women aged 16-45 years living in Auckland, New Zealand".*

Overall this study successfully developed an EHQ that could be used in NZ women aged 16-45 years. Validation results, as discussed in the study objectives above, found the EHQ to be valid overall. Therefore future studies can use this questionnaire knowing that they are indeed assessing the usual eating habits of 16-45 year old NZ women.

6.2 Strengths

A key strength in this study was the use of a weighed food record, which was used to validate the EHQ. The weighed food record is considered the gold standard for dietary assessment (R. S. Gibson, 2005a) and therefore it was assumed that accurate information about dietary intake could reliably be obtained. However errors can still arise from recording food intake as participants may not record certain foods that are less healthy (e.g. alcohol or sweets) or may change their food intake to reduce the burden placed on them

(Nelson & Bingham, 1997). To help minimise these errors, participants watched a DVD that explained how to complete the food record and were provided with a paper copy of the food record that contained detailed written instructions. Participants were also provided with electronic scales and a photographic portion size booklet to help with recording their food intake. Administering the EHQ prior to the WFR also minimised errors by ensuring both methods were encountered separately. This meant participants were not more conscious of their diet prior to completing the EHQ and were less likely to make adjustments to their responses (Cade et al., 2002; Nelson, 1997). Assessing intake over a period of four days allowed dietary intake to be assessed over both weekdays and weekends. However usual intake, especially for foods that are only consumed occasionally may not be able to be reliably assessed from four days of dietary data. Despite this, collecting dietary intake over a longer time period, such as seven days, may not be feasible, as it places a larger burden on participants who may consequently alter their diet. This study attempted to overcome this potential problem of assessing usual intake by ensuring all days of the week were covered when women were allocated days to complete the WFR.

Another strength was the sample size used of 108 women. This aligns with other studies that suggest a sample size of more than 100 participants is suitable for validation studies (Serra-Majem et al., 2009; Willett, 1998).

A third strength was the use of an EHQ to assess eating habits. No other validated EHQ was identified that assessed the eating habits that contribute to obesity and body fatness in pre-menopausal NZ women. Therefore this study developed and validated a qualitative tool that can be used to assess various eating habits associated with obesity and body fatness in NZ women. The use of an online questionnaire standardised how it was administered and meant consistent instructions were given to participants. Use of an EHQ also placed less of a burden on participants than other methods (e.g. diet history and 24-hour recall) by being less time consuming (Thompson & Subar, 2013).

Using open-ended questions for the description of food intake allowed participants to describe what they usually ate without being limited by a list of set responses. This further allowed data to be analysed according to what foods were actually eaten, rather than being based on pre-determined foods for each meal and snack period. However this meant participants' responses were reliant on their memory and they may not have listed all they foods they usually ate. This was evident as participants provided varying amounts of detail and did not always record their intake of certain foods such as for tea, coffee and alcohol. Despite this there was a very high level of agreement between the EHQ and WFR for the majority of foods.

6.3 Limitations

A limitation of this study was that some participants only completed the WFR on one weekend day. For these participants there were fewer eating occasions to compare to the EHQ on weekend days, which may lessen the questionnaire's validity. However this study was designed to include all days of the week with proportionately more weekdays recorded for the WFR.

In this study there were more New Zealand European (NZE) women who participated than those of Māori or Pacific ethnicity, which is similar to the distribution of ethnicities in NZ, where there are more women of NZE ethnicity. As this study was conducted in pre-menopausal women, it cannot be generalised to other population groups (e.g. males and children) and therefore is unable to assess eating habits in these groups. However this study was only designed to assess the eating habits of pre-menopausal women.

This study did not specifically ask women about their marital status or living arrangements, which may influence eating habits. It is possible that these factors may have influenced women's eating habits in this study. However, a wide range of ages (16-45 yrs) was incorporated, which would likely include a variety of different marital statuses and living arrangements. Similarly, this study did not assess the socioeconomic status (SES) of women. As SES has been shown to influence eating habits negatively (Utter et al., 2011), it is possible this may have influenced the eating habits of women in this study. While it may

have been beneficial to look further into the many different factors that influence eating habits, this was not the focus of this research. Rather, we aimed to develop and validate an EHQ.

A limitation of this study is that eating habits were not considered in relation to BMI status, despite the fact that obese individuals are more likely to under report their intake (Gibney & Wolever, 1997). However the EHQ was designed to look at usual eating habits, rather than absolute intake, and therefore underreporting may have been seen to a lesser degree. Future research, such as results from the complete women's EXPLORE study could look at eating habits of women in relation to both BMI and BF%.

Validation results from this study were not specifically analysed in terms of whether participants had been weight stable in the past year. This analysis may have been beneficial as participating in a weight loss diet may impact on the reporting of eating habits and therefore the validity of the EHQ. As participants were asked whether they had gained, lost or remained the same weight over the past year, the extent of these weight changes and the reason why, could be investigated further.

The use of this EHQ may have greater validity in participants who have more consistent eating habits. Usual eating habits may be easier to describe and remember (Nelson & Bingham, 1997; Yaroch et al., 2000) and are therefore more likely to reflect participants' food consumption in the WFR. For example, women who do shift work may have difficulty in describing their eating habits, as these may not show a regular pattern.

Another limitation was due to how women viewed the responses to the questions on eating behaviours and low fat alternatives. The responses given for eating behaviours were not specifically defined in terms of frequency. Therefore participants may have answered inconsistently when compared to each other due to having a different perspective on what the answer meant. In addition, participants' responses may have differed from how the WFR was coded for comparison with the EHQ. However responses were merged together for statistical analysis, which would limit the variability seen in women's

responses. There was also uncertainty on why women responded 'not applicable' (n/a) for the questions on low fat alternatives. Women were not asked why they answered this way and reasons for answering n/a may have differed. To account for this, nutrient intakes from the WFR for women who responded n/a were not compared to other responses.

Finally using categories to assess eating habits has limitations, as the researcher must decide on how foods are going to be classified for analysis. Classifying individual foods into broader categories can remove some of the more subtle aspects of food choices (Jaeger et al., 2009). However analysing individual foods may provide too much information for meaningful results to be obtained. In this study foods were classified so that patterns could be seen for food intake throughout the day. For example grains included rice, pasta and noodles. This is similar to how foods were classified for the 2008/09 Adult Nutrition Survey (University of Otago & Ministry of Health, 2011b).

6.4 Application of eating habits to the ecological model

This study aimed to validate an eating habits questionnaire that assesses the usual dietary habits of women. By applying women's eating habits to the ecological model, the results from this study can be used to further understand how women's eating habits are influenced across the different levels of the ecological model. This information can be used to identify areas where more nutrition education may be beneficial, such as by increasing awareness of key unhealthy eating habits. Figure 6.1 shows how women's eating habits in this study were integrated into the four levels (society, community, social environment and individual factors) of the ecological model.

6.4.1 Society

This study provided insight into the eating habits of NZ women living in Auckland. Women in this study were of NZE, Māori and Pacific ethnicities, which is representative of the ethnicities seen nationally (Statistics New Zealand, 2013a). When the eating habits of these women are assessed as a whole they reflect the societal and cultural norms that are unique to NZ women, being part of a multicultural society.

6.4.2 Community

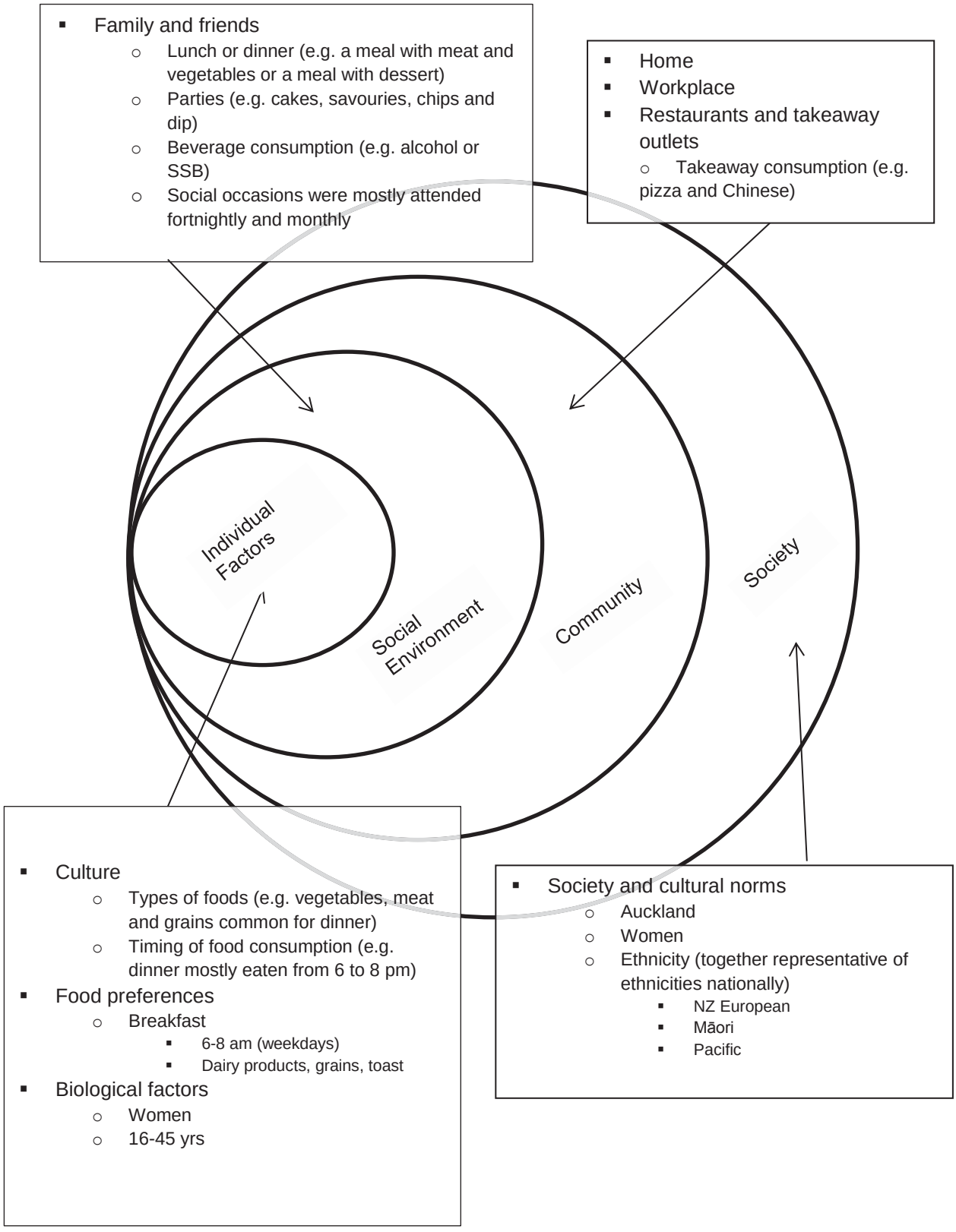
Aspects of the community that can influence eating habits were not specifically assessed in this study. However access to and the availability of foods in locations in the community, such as the home, workplace, restaurants and fast food outlets can influence women's food choices and therefore eating habits. Women were asked about their consumption of takeaways, with the greatest proportion (54.6%) of women consuming these sometimes. Takeaways (e.g. pizza, burgers, Chinese and Thai) were most commonly consumed for lunch and dinner on weekends. Takeaway consumption, especially during these meal periods, is one area where nutrition education could be targeted, as takeaways contribute to poor eating habits.

6.4.3 Social environment

Social occasions can influence women's eating habits by altering what foods and beverages are consumed. For example unhealthier foods may be consumed at parties such as snack foods including cakes, savouries and chips and dip. Having lunch or dinner with family or friends can impact eating habits both positively such as having a meal that contains meat and vegetables, and negatively such as including a dessert with the meal. The types of beverages consumed can also impact on eating habits such as from an increased consumption of alcohol and SSBs. The frequency different social occasions are attended will also influence eating habits with occasions that are attended more frequently impacting eating habits to a greater extent. For example in this study social occasions were mostly attended fortnightly or monthly, so would have had less impact on eating habits than occasions that were attended weekly or more often. This highlights that women tend to have unhealthier eating habits during social occasions (e.g. consumption of alcohol, SSBs and cakes). Therefore nutrition education with a focus on this would be beneficial, as social occasions can contribute to poor eating habits, especially when they are attended frequently.

6.4.4 Individual factors

In this study the eating habits that were assessed were largely at the individual level. All the participants in this study were NZ women aged between 16-45 years. As eating habits are influenced by biological factors, such as age and gender, it is likely the eating habits of women in this study will differ to other population groups, such as older males. A key factor that will determine eating habits is food preferences. This study assessed the usual dietary habits and what foods and food combinations were eaten at different meal and snack periods throughout the day in NZ women. For example on weekdays breakfast was mostly consumed between 6-8 am and popular foods were dairy products (e.g. milk and yoghurt), grains (e.g. breakfast cereal or porridge), and toast. As these foods were consumed by a large number of women in this study, they likely reflect the food preferences of this population group. Environmental cues such as the timing of meals and snacks may further influence what foods are eaten and therefore the eating habits of these women. Analysis of the eating habits of these women as a group allows a picture of the food culture of NZ women to be formed, including foods consumed (e.g. vegetables, meat and grains were common for dinner) and the times (e.g. dinner was mostly consumed from 6-8 pm) these are eaten.



NZ: New Zealand; SSB: Sugar Sweetened Beverages; yrs: years

Figure 6.1 Application of the Ecological Model to participants' eating habits (adapted from (Story et al., 2008))

6.5 Future research recommendations

The EHQ validated in this study investigates a wide range of eating habits that contribute to obesity and body fatness. However information may not always be required on all of these eating habits for different studies. Therefore relevant aspects of the questionnaire in this study can be used to create focused tools that investigate the eating habits of interest. For these focused tools, validation results specific to the eating habits being looked at should be used to determine how valid the focused tool is. Examples of these tools are as follows:

- A tool that investigates perceptions of WEight STatus (WEST).
- A tool that investigates general eating habits including appetite perception and dietary composition.
- Tools that investigate the usual eating habits of NZ women. These include the questions regarding whether foods are usually consumed, the timing and a description of the foods consumed for these eating occasions. Examples of these tools are:
    - B-EAT: A Breakfast Eating Assessment Tool
    - L-EAT: A Lunch Eating Assessment Tool
    - D-EAT: A Dinner Eating Assessment Tool
    - S-EAT: A Snack Eating Assessment Tool
- A tool that investigates eating habits at social occasions
- A tool that investigates Healthy and Unhealthy eating Behaviours (HUB).
- A Low Fat Alternatives Tool (L-FAT).

Further detail on the aspects of the EHQ included in these tools, along with recommended changes are provided in Appendix J.

This research highlights the lack of studies that investigate eating habits in NZ women, particularly from short qualitative questionnaires such as the EHQ developed in this study. As this study validated an EHQ in a small sub-population, future studies should investigate the eating habits of a larger group of women. For example, the eating habits of all participants in the women's EXPLORE study should be investigated. Eating habits should also be assessed further in these women to see if they differ by characteristics such as body fatness, body mass index and age. Understanding the eating habits of women is important as this will allow future studies to focus on key habits, particularly those that may contribute to obesity and excess body fat.

The EHQ described in this thesis focused on a wide variety of women's eating habits. It may also be beneficial to assess other factors that could influence eating habits alongside the EHQ. For example women also completed the Three Factor Eating Questionnaire (not reported in this thesis). This could be used in conjunction with the EHQ to see if and how other behaviours may influence eating habits.

The EHQ in this study identified a number of habits that were also assessed in the NNS. The eating habit questions in the NNS were not specifically validated, only cognitively tested in a small group to assess their understanding of questions. Therefore the EHQ could be used to quickly assess eating habits in a national sample of women. However as this EHQ was validated in pre-menopausal women, it is unable to be used with confidence in other population groups (e.g. men).

As this study had a cross-sectional design, it was only able to assess eating habits at one point in time and was unable to show the causality of the investigated eating habits. Future studies could use the EHQ validated in this study to explore eating habits over time to see how they may change.

Another recommendation is to assess the reproducibility of the EHQ. This will determine the extent to which participants provide the same response when the EHQ is repeated at a later date (e.g. one month later). Ideally participants would provide the same answer on repeating the questionnaire.

6.6 Conclusion

Results from this study suggest the EHQ is a valid tool for assessing the eating habits that can contribute to obesity and body fatness in women aged 16-45 years living in Auckland, NZ. A habit was defined as being valid when participants reported a habit in the EHQ and actually practiced this, as seen by the recording of that habit in the WFR. Validity was assessed from the statistical tests of cross-classification analysis and the weighted kappa statistic.

Findings from this study identified both healthy and unhealthy eating habits that were practiced by this group of women. Healthy habits practiced included choosing lower fat options such as for meat and milk, infrequently eating fried foods, snacking on fruit and consuming water between meals. Most women also had a regular meal pattern, with particular foods more typical for different meal and snack periods. Unhealthy habits included the consumption of takeaways, particularly for lunch and dinner on weekends, and the consumption of alcohol and SSB during social occasions. Therefore key aspects of the diets of NZ women were identified, including unhealthy habits where nutrition education could be targeted.

Validation of the EHQ identified key eating habits that the questionnaire was able to correctly assess, when compared to the WFR. These habits would be useful to assess in future studies and are described as follows:

- General eating habits (e.g. snack choices, beverage consumption between meals).
- Eating behaviours (e.g. fried foods and takeaways).
- Low fat alternatives (e.g. milk, meat and cheese).
- Eating habits during meal and snack periods including the timing and consumption of foods and food combinations.

Although several questions were unable to be validated (e.g. participants' views on their weight status, appetite perception and social occasions), it would be

beneficial to include these questions in future studies. Despite the EHQ being valid overall, some eating habits appeared less valid when compared with the WFR. One of these habits was the consumption of tea and coffee, which in future versions of the EHQ could be included under the question on beverage consumption between meals. Another habit, which was not as valid, was alcohol consumption. Although one question assessed alcohol consumption at meals, agreement was not as high as other questions. Validity for this question, as well as the questions regarding eating behaviours, could be improved by defining the response options in terms of frequency (e.g. 'sometimes' as once a week). Further detail on how the EHQ can be improved, such as for these questions is provided in Appendix J.

Overall the findings from this study show the EHQ is a valid tool for assessing the eating habits of NZ women. Assessing a range of different eating habits can help to form a picture of the major eating habits that contribute to obesity and excess body fat. The use of this tool may be more appropriate than traditional methods (e.g. 24-hour recall, food record) as it is quicker and easier to use and is appropriate for NZ women. Therefore this questionnaire could be used in future studies to measure the eating habits of a larger group of NZ women and identify key areas where nutrition education could be targeted and associations with health and chronic disease.

References:

Almoosawi, S., Winter, J., Prynne, C. J., Hardy, R., & Stephen, A. M. (2012). Daily profiles of energy and nutrient intakes: are eating profiles changing over time? *European Journal of Clinical Nutrition, 66*(6), 678-686. doi:10.1038/ejcn.2011.210

Altman, D. G. (1991). *Practical Statistics for Medical Research*. London: Chapman and Hall.

Ashfield-Watt, P. A. L. (2006). Fruits and vegetables, 5+a day: are we getting the message across? *Asia Pacific Journal of Clinical Nutrition, 15*(2), 245-252. Retrieved from <Go to ISI>://WOS:000237439700017

Axelsen, M., Danielsson, M., Norberg, M., & Sjoberg, A. (2012). Eating habits and physical activity Health in Sweden: The National Public Health Report 2012. *Scandinavian Journal of Public Health, 40*, 164-175. doi:10.1177/1403494812459473

Axelson, M. L. (1986). The impact of culture on food-related behavior. *Annual Review of Nutrition, 6*, 345-363. Retrieved from <Go to ISI>://WOS:A1986D346300016

Axelson, M. L., & Penfield, M. P. (1983). Food-related and nutrition-related attitudes of elderly persons living alone. *Journal of Nutrition Education, 15*(1), 23-27. Retrieved from <Go to ISI>://WOS:A1983QG30700010

Baecke, J. A. H., Vanstaveren, W. A., & Burema, J. (1983). Food Consumption, Habitual Physical Activity and Body Fatness in Young Dutch Adults. *American Journal of Clinical Nutrition, 37*(2), 278-286. Retrieved from http://ajcn.nutrition.org/content/37/2/278.full.pdf

Baghurst, K. I., Baghurst, P. A., & Record, S. J. (1994). Demographic and dietary profiles of high and low fat consumers in Australia. *Journal of Epidemiology and Community Health, 48*(1), 26-32. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0028212545&partnerID=40&md5=85cfe65eb2def8d66fe1c06470e9ffb7

Balcells, E., Delgado-Noguera, M., Pardo-Lozano, R., Roig-González, T., Renom, A., González-Zobl, G., . . . Schröder, H. (2011). Soft drinks consumption, diet quality and BMI in a Mediterranean population. *Public Health Nutrition, 14*(5), 778-784. doi:10.1017/S1368980010002788

Ball, K., Jeffery, R. W., Abbott, G., McNaughton, S. A., & Crawford, D. (2010). Is healthy behaviour contagious: associations of social norms with physical activity and healthy eating. *International Journal of Behavioral Nutrition and Physical Activity, 7*(Dec.). Retrieved from <Go to ISI>://FSTA:2011-04-Aj1705

Barbieri, H. E., & Lindvall, C. (2003). Swedish nutrition recommendations objectified (SNO). *Uppsala, National Food Administration*.

Basdevant, A., Craplet, C., & Guy-Grand, B. (1993). Snacking Patterns in Obese French Women. *Appetite, 21*(1), 17-23. doi:http://dx.doi.org/10.1006/appe.1993.1033

Basiotis, P. P., Welsh, S. O., Cronin, F. J., Kelsay, J. L., & Mertz, W. (1987). Number of days of food intake records required to estimate individual and group nutrient intakes with defined confidence. *Journal of Nutrition, 117*(9), 1638-1641.

Beardsworth, A., & Bryman, A. (1999). Meat consumption and vegetarianism among young adults in the UK: an empirical study. *British Food Journal, 101*(4), 289-300.

Beardsworth, A., & Keil, T. (1991). Health-related beliefs and dietary practices among vegetarians and vegans: a qualitative study. *Health Education Journal, 50*(1), 38-42.

Beck, K. (2013). *Iron Deficiency in Young Women: Causes, Consequences and Solutions.* (Doctor of Philosopy), Massey University.

Bel-Serrat, S., Mouratidou, T., Pala, V., Huybrechts, I., Börnhorst, C., Fernández-Alvira, J. M., . . . Moreno, L. A. (2014). Relative validity of the Children's Eating Habits Questionnaire–food frequency section among young European children: the IDEFICS Study. *Public Health Nutrition, 17*(02), 266-276. doi:doi:10.1017/S1368980012005368

Bellisle, F., Dalix, A. M., Mennen, L., Galan, P., Hercberg, S., De Castro, J. M., & Gausseres, N. (2003). Contribution of snacks and meals in the diet of French adults: A diet-diary study. *Physiology and Behavior, 79*(2), 183-189. Retrieved from http://ac.els-cdn.com/S003193840300088X/1-s2.0-S003193840300088X-main.pdf?_tid=e0b15678-32ef-11e4-8ab7-00000aab0f27&acdnat=1409696837_e9ffb9c1976532354c5677d323c796b6

Bellisle, F., de Assis, M. A. A., Fieux, B., Preziosi, P., Galan, P., Guy-Grand, B., & Hercberg, S. (2001). Use of 'light' foods and drinks in French adults: biological, anthropometric and nutritional correlates. *Journal of Human Nutrition and Dietetics, 14*(3), 191-206. doi:10.1046/j.1365-277X.2001.00289.x

Bellisle, F., McDevitt, R., & Prentice, A. M. (1997). Meal frequency and energy balance. *British Journal of Nutrition, 77*(S1), S57-S70.

Bellisle, F., Rollandcachera, M. F., Deheeger, M., Preziosi, P., & Hercberg, S. (1994). Intake of Low-Fat Food in a Representative Sample of the Paris Area: Anthropometric, Nutritional and Sociodemographic Correlates. *Journal of Human Nutrition and Dietetics, 7*(5), 335-346. doi:10.1111/j.1365-277X.1994.tb00276.x

Benton, D., & Parker, P. Y. (1998). Breakfast, blood glucose, and cognition. *American Journal of Clinical Nutrition, 67*(4), 772S-778S. Retrieved from <Go to ISI>://WOS:000072783800030

Berg, C., Lappas, G., Wolk, A., Strandhagen, E., Torén, K., Rosengren, A., . . . Lissner, L. (2009). Eating patterns and portion size associated with obesity in a Swedish population. *Appetite, 52*(1), 21-26. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-56449104996&partnerID=40&md5=b518c7f711c89db4aa607e0b30f83b6d

Bertéus Forslund, H., Lindroos, A. K., Sjöström, L., & Lissner, L. (2002). Meal patterns and obesity in Swedish women - a simple instrument describing usual meal types, frequency and temporal distribution. *European Journal of Clinical Nutrition, 56*(8), 740-747. Retrieved from http://europepmc.org/abstract/MED/12122550

Biro, G., Hulshof, K., Ovesen, L., & Amorim, C. J. (2002). Selection of methodology to assess food intake. *European Journal of Clinical Nutrition, 56*, S25-32.

Block, G., Clifford, C., Naughton, M. D., Henderson, M., & McAdams, M. (1989). A brief dietary screen for high fat intake. *Journal of Nutrition Education, 21*(5), 199-207. doi:http://dx.doi.org/10.1016/S0022-3182(89)80003-2

Block, G., Gillespie, C., Rosenbaum, E. H., & Jenson, C. (2000). A rapid food screener to assess fat and fruit and vegetable intake. *American Journal of Preventive Medicine, 18*(4), 284-288. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0034052969&partnerID=40&md5=5dbf8821e5778cbef2af0775332d8e81

Bogue, J., Coleman, T., & Sorenson, D. (2005). Determinants of consumers' dietary behaviour for health-enhancing foods. *British Food Journal, 107*(1), 4-16. doi:10.1108/00070700510573168

Bottoni, A., Cannella, C., & Del Balzo, V. (1997). Lifestyle and dietary differences in smokers and non-smokers from an Italian employee population. *Public Health, 111*(3), 161-164. doi:http://dx.doi.org/10.1016/S0033-3506(97)00576-3

Bowman, S. A., & Vinyard, B. T. (2004). Fast food consumption of US adults: Impact on energy and nutrient intakes and overweight status. *Journal of the American College of Nutrition, 23*(2), 163-168. Retrieved from <Go to ISI>://WOS:000220523600010

Branca, F., Nikogosian, H., & Lobstein, T. (2007). *The challenge of obesity in the WHO European Region and the strategies for response: summary*: World Health Organization.

Briefel, R. R., Sempos, C. T., McDowell, M. A., Chien, S., & Alaimo, K. (1997). Dietary methods research in the third National Health and Nutrition Examination Survey: Underreporting of energy intake. *American Journal of Clinical Nutrition, 65*(4 SUPPL.), 1203S-1209S. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0030970795&partnerID=40&md5=fd1d6972742664dec1ea2a9a9de69748

Brisbois, T. D., Farmer, A. P., & McCargar, L. J. (2012). Early markers of adult obesity: A review. *Obesity Reviews, 13*(4), 347-367. doi:10.1111/j.1467-789X.2011.00965.x

Bronfenbrenner, U. (2009). *The ecology of human development: Experiments by nature and design*: Harvard University Press.

Brown, P., Guy, M., & Broad, J. (2005). Individual socio-economic status, community socio-economic status and stroke in New Zealand: A case control study. *Social Science & Medicine, 61*(6), 1174-1188. doi:http://dx.doi.org/10.1016/j.socscimed.2005.02.003

Brown, W. J., & Trost, S. G. (2003). Life transitions and changing physical activity patterns in young women. *American Journal of Preventive Medicine, 25*(2), 140-143. doi:http://dx.doi.org/10.1016/S0749-3797(03)00119-3

Burke, S. J., McCarthy, S. N., O'Dwyer, N. A., & Gibney, M. J. (2005). Analysis of the temporal intake of cereal and dairy products in Irish adults: Implications for developing food-based dietary guidelines. *Public Health Nutrition, 8*(3), 238-248. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-18844374451&partnerID=40&md5=3feb0901f6a726d4c80da4d93bb95f43

Buttriss, J. (2002). Findings of the National Food Survey for 2000. *Nutrition Bulletin, 27*(1), 37-40. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0036085553&partnerID=40&md5=6edf0cb8d2f841c8ff684e9c35f34342

Caan, B., Coates, A., & Schaffer, D. (1995). Variations in Sensitivity, Specificity, and Predictive Value of a Dietary Fat Screener Modified From Block et al. *Journal of the American Dietetic Association, 95*(5), 564-568. doi:http://dx.doi.org/10.1016/S0002-8223(95)00153-0

Cade, J., Thompson, R., Burley, V., & Warm, D. (2002). Development, validation and utilisation of food-frequency questionnaires–a review. *Public Health Nutrition, 5*(04), 567-587.

Capps, O., Cleveland, L., & Park, J. (2002). Dietary behaviors associated with total fat and saturated fat intake. *Journal of the American Dietetic Association, 102*(4), 490-+. doi:10.1016/s0002-8223(02)90114-8

Cashel, K., Crawford, D., & Deakin, V. (2000). Milk choices made by women: what influences them, and does it impact on calcium intake? *Public Health Nutrition, 3*(4), 403-410. Retrieved from <Go to ISI>://MEDLINE:11135794

Chand, A., Eyles, H., & Mhurchu, C. N. (2012). Availability and accessibility of healthier options and nutrition information at New Zealand fast food restaurants. *Appetite, 58*(1), 227-233. doi:10.1016/j.appet.2011.10.006

Chandon, P., & Wansink, B. (2012). Does food marketing need to make us fat? A review and solutions. *Nutrition Reviews, 70*(10), 571-593. doi:10.1111/j.1753-4887.2012.00518.x

Cho, S., Dietrich, M., Brown, C. J. P., Clark, C. A., & Block, G. (2003). The effect of breakfast type on total daily energy intake and body mass index: Results from the Third National Health and Nutrition Examination Survey (NHANES III). *Journal of the American College of Nutrition, 22*(4), 296-302. Retrieved from <Go to ISI>://WOS:000184524100007

Conti, S., Masocco, M., Meli, P., Minelli, G., Solimini, R., Toccaceli, V., & Vichi, M. (2004). Eating habits and lifestyles: a multivariate analysis of the data from an Italian population-based survey. *Nutrition Research, 24*(7), 495-507. doi:10.1016/j.nutres.2003.11.014

Cooper, J., & Croyle, R. T. (1984). Attitudes and attitude change. *Annual Review of Psychology, 35*(1), 395-426.

Dattilo, M., Crispim, C. A., Zimberg, I. Z., Tufik, S., & de Mello, M. T. (2011). Meal distribution across the day and its relationship with body composition. *Biological Rhythm Research, 42*(2), 119-129.

de Castro, J. M. (1987). Circadian rhythms of the spontaneous meal pattern, macronutrient intake and mood of humans. *Physiology & Behavior, 40*(4), 437-446. doi:10.1016/0031-9384(87)90028-x

de Castro, J. M. (1991). Weekly rhythms of spontaneous nutrient intake and meal pattern of humans. *Physiology and Behavior, 50*(4), 729-738. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0026044916&partnerID=40&md5=0ddabe6362c1573064afebc57fecbde5

de Castro, J. M. (2002). Age-related changes in the social, psychological, and temporal influences on food intake in free-living, healthy, adult humans. *Journals of Gerontology - Series A Biological Sciences and Medical Sciences, 57*(6), M368-M377. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0036262756&partnerID=40&md5=d83033c0b9688aa4a186e4ba745902dd

de Castro, J. M. (2009). When, how much and what foods are eaten are related to total daily food intake. *British Journal of Nutrition, 102*(8), 1228-1237. doi:10.1017/s0007114509371640

de Castro, J. M., Bellisle, F., Feunekes, G. I. J., Dalix, A. M., & DeGraaf, C. (1997). Culture and meal patterns: A comparison of the food intake of free-living American, Dutch, and French students. *Nutrition Research, 17*(5), 807-829. doi:10.1016/s0271-5317(97)00050-x

de Krom, M., Bauer, F., Collier, D., Adan, R. A. H., & la Fleur, S. E. (2009). Genetic Variation and Effects on Human Eating Behavior *Annual Review of Nutrition* (Vol. 29, pp. 283-304).

De Ridder, D., De Vet, E., Stok, M., Adriaanse, M., & De Wit, J. (2013). Obesity, overconsumption and self-regulation failure: the unsung role of eating appropriateness standards. *Health Psychology Review, 7*(2), 146-165. doi:10.1080/17437199.2012.706987

De Vogli, R., Kouvonen, A., & Gimeno, D. (2014). The influence of market deregulation on fast food consumption and body mass index: a cross-national time series analysis. *Bulletin of the World Health Organization, 92*(2), 99-107A.

Demory-Luce, D., Morales, M., Nicklas, T., Baranowski, T., Zakeri, I., & Berenson, G. (2004). Changes in food group consumption patterns from childhood to young adulthood: The Bogalusa Heart Study. *Journal of the American Dietetic Association, 104*(11), 1684-1691. doi:http://dx.doi.org/10.1016/j.jada.2004.07.026

Di Noia, J., Contento, I. R., & Schinke, S. P. (2008). Fat avoidance and replacement behaviors predict low-fat intake among urban African American adolescents. *Nutrition Research, 28*(6), 358-363. doi:http://dx.doi.org/10.1016/j.nutres.2008.03.005

Díaz-Méndez, C., & Callejo, J. (2014). Homogenization of eating times in the United Kingdom and Spain. *British Food Journal, 116*(5), 734-752. doi:10.1108/BFJ-05-2012-0121

dos Santos, L. C., Pascoal, M. N., Fisberg, M., Cintra, I. D. P., & Martini, L. A. (2010). Misreporting of dietary energy intake in adolescents. *Jornal de Pediatria, 86*(5), 400-404. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-78649656283&partnerID=40&md5=fd88f6dd9b4d7109c95113ea0f7e193c

Drewnowski, A. (2010). The cost of US foods as related to their nutritive value. *American Journal of Clinical Nutrition, 92*(5), 1181-1188. doi:10.3945/ajcn.2010.29300

Duffey, K. J., Gordon-Larsen, P., Jacobs Jr, D. R., Williams, O. D., & Popkin, B. M. (2007). Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: The coronary artery risk development in young adults study. *American Journal of Clinical Nutrition, 85*(1), 201-208. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-33846075342&partnerID=40&md5=be09d16c7897cf23a5ae23d53645993d

Duffey, K. J., Pereira, R. A., & Popkin, B. M. (2013). Prevalence and energy intake from snacking in Brazil: Analysis of the first nationwide individual survey. *European Journal of Clinical Nutrition, 67*(8), 868-874. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84881480584&partnerID=40&md5=09c135f596f870db17933eb0f2e9df00

Duncan, E. K., Schofield, G., Duncan, S., Kolt, G., & Rush, E. (2004). Ethnicity and body fatness in New Zealanders. *New Zealand Medical Journal, 117*(1195). Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-3543035217&partnerID=40&md5=bab3090222e86b4a5c4a80b3227673e0

Einstein, M. A., & Hornstei, I. (1970). Food preferences of college students and nutritional implications. *Journal of Food Science, 35*(4), 429-&. doi:10.1111/j.1365-2621.1970.tb00950.x

Enns, C. W., Goldman, J. D., & Cook, A. (1997). Trends in food and nutrient intakes by adults: NFCS 1977-78, CSFII 1989-91, and CSFII 1994-95. *Family Economics and Nutrition Review, 10*(4), 2-15.

Esmaillzadeh, A., Entezari, M., Paknahad, Z., Safavi, M., Jalali, M., Ghiasvand, R., . . . Azadbakht, L. (2008). Identification of diet-disease relations through dietary pattern approach: A review. *Journal of Research in Medical Sciences, 13*(6), 337-348. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-63249113025&partnerID=40&md5=2974d08e30500cc0a71e54a6612a091b

European Vegetarian Union. (2007). How Many Veggies...? Retrieved from http://www.euroveg.eu/lang/en/info/howmany.php.

Faber, M., Wenhold, F. A. M., MacIntyre, U. E., Wentzel-Viljoen, E., Steyn, N. P., & Oldewage-Theron, W. H. (2013). Presentation and interpretation of food intake data: Factors affecting comparability across studies. *Nutrition, 29*(11-12), 1286-1292. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84884983854&partnerID=40&md5=9e11619781e0f324bb499923b9d85791

Fayet, F., Mortensen, A., & Baghurst, K. (2012). Energy distribution patterns in Australia and its relationship to age, gender and body mass index among children and adults. *Nutrition and Dietetics, 69*(2), 102-110. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84861945888&partnerID=40&md5=5515c4a8bcf197e11a007847bfcf80a9

Field, A. (2009). *Discovering Statistics Using SPSS* (3rd ed.). London: SAGE Publications Ltd.

Fiske, S. T. (2009). *Social beings: Core motives in social psychology*: John Wiley & Sons.

Fitt, E., Prynne, C. J., Teucher, B., Swan, G., & Stephen, A. M. (2009). National Diet and Nutrition Survey: Assigning mixed dishes to food groups in the nutrient databank. *Journal of Food Composition and Analysis, 22*, S52-S56. doi:10.1016/j.jfca.2009.01.012

Food and Agriculture Organization, & World Health Organization. (1998). *Preparation and use of food-based dietary guidelines*. Geneva: WHO.

Food Standards Agency. (2007). *FSA nutrient and food based guidelines for UK institutions*.

Fortin, B., & Yazbeck, M. (2015). Peer effects, fast food consumption and adolescent weight gain. *Journal of Health Economics, 42*(0), 125-138. doi:http://dx.doi.org/10.1016/j.jhealeco.2015.03.005

Fox, N., & Ward, K. (2008). Health, ethics and environment: A qualitative study of vegetarian motivations. *Appetite, 50*(2–3), 422-429. doi:http://dx.doi.org/10.1016/j.appet.2007.09.007

Garriguet, D. (2007). Canadians' eating habits. *Health reports / Statistics Canada, Canadian Centre for Health Information = Rapports sur la santé / Statistique Canada, Centre canadien d'information sur la santé, 18*(2), 17-32. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-34547850842&partnerID=40&md5=4117527ec9ea77693b533170946d3a45

Gatenby, S. J. (1997). Eating Frequency: Methodological and Dietary Aspects. *British Journal of Nutrition, 77*(SupplementS1), S7-S20. doi:doi:10.1079/BJN19970100

Gerber, N., Scheeder, M. R. L., & Wenk, C. (2009). The influence of cooking and fat trimming on the actual nutrient intake from meat. *Meat Science, 81*(1), 148-154. doi:http://dx.doi.org/10.1016/j.meatsci.2008.07.012

Gibney, M. J., & Wolever, T. M. S. (1997). Periodicity of eating and human health: Present perspective and future directions. *British Journal of Nutrition, 77*, S3-S5. doi:10.1079/bjn19970099

Gibson, R. S. (2005a). *Principles of Nutritional Assessment*: Oxford University Press.

Gibson, R. S. (2005b). Validity in dietary assessment methods. In R. S. Gibson (Ed.), *Principles of Nutritional Assessment* (2nd ed., pp. 149-198). New York: Oxford University Press.

Gibson, S., Gunn, P., & Maughan, R. J. (2012). Hydration, water intake and beverage consumption habits among adults. *Nutrition Bulletin, 37*(3), 182-192. Retrieved from <Go to ISI>://FSTA:2012-11-Ha6250

Gibson, S., & Shirreffs, S. M. (2013). Beverage consumption habits "24/7" among British adults: association with total water intake and energy intake. *Nutrition Journal, 12*. doi:10.1186/1475-2891-12-9

Gibson, S. A., & Gunn, P. (2011). What's for breakfast? Nutritional implications of breakfast habits: insights from the NDNS dietary records. *Nutrition Bulletin, 36*(1), 78-86. doi:10.1111/j.1467-3010.2010.01873.x

Glanz, K., Rimer, B. K., & Viswanath, K. (2008). *Health behavior and health education: theory, research, and practice*: John Wiley & Sons.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: Concepts and measures. *American Journal of Health Promotion, 19*(5), 330-333. Retrieved from <Go to ISI>://WOS:000228957400003

Goto, M., Kiyohara, K., & Kawamura, T. (2010). Lifestyle risk factors for overweight in Japanese male college students. *Public Health Nutrition, 13*(10), 1575-1580. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-77957220073&partnerID=40&md5=267f1f5d76c1fc992a183dd3cc6415ad

Gunes, F. E., Bekiroglu, N., Imeryuz, N., & Agirbasli, M. (2012). Relation between eating habits and a high body mass index among freshman students: A cross-sectional study. *Journal of the American College of Nutrition, 31*(3), 167-174. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84871817824&partnerID=40&md5=769a73c53a7636f25421a9aa45e2e2fe

Guo, S. S., & Chumlea, W. C. (1999). Tracking of body mass index in children in relation to overweight in adulthood. *American Journal of Clinical Nutrition, 70*(1), 145S-148S. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0032872587&partnerID=40&md5=b21a4ade94910365bfe01d6daf3bf271

Guthrie, J. F., & Morton, J. F. (2000). Food sources of added sweeteners in the diets of Americans. *Journal of the American Dietetic Association, 100*(1), 43-51. doi:10.1016/s0002-8223(00)00018-3

Haines, P. S., Hama, M. Y., Guilkey, D. K., & Popkin, B. M. (2003). Weekend eating in the united states is linked with greater energy, fat, and alcohol intake. *Obesity Research, 11*(8), 945-949. doi:10.1038/oby.2003.130

Hall, J. N., Moore, S., Harper, S. B., & Lynch, J. W. (2009). Global Variability in Fruit and Vegetable Consumption. *American Journal of Preventive Medicine, 36*(5), 402-409.e405. doi:http://dx.doi.org/10.1016/j.amepre.2009.01.029

Hamilton, S., Mhurchu, C. N., & Priest, P. (2007). Food and nutrient availability in New Zealand: an analysis of supermarket sales data. *Public Health Nutrition, 10*(12), 1448-1455. doi:10.1017/s1368980007000134

Hammarstrom, A., Wiklund, A. F., Lindahl, B., Larsson, C., & Ahlgren, C. (2014). Experiences of barriers and facilitators to weight-loss in a diet intervention - a qualitative study of women in Northern Sweden. *BMC Womens Health, 14*. doi:10.1186/1472-6874-14-59

Harnack, L., Stang, J., & Story, M. (1999). Soft drink consumption among US children and adolescents: Nutritional consequences. *Journal of the American Dietetic Association, 99*(4), 436-441. doi:10.1016/s0002-8223(99)00106-6

Haslam, D. W., & James, W. P. (2005). Obesity. *Lancet, 366*(9492), 1197-1209. doi:10.1016/s0140-6736(05)67483-1

Health Sponsorship Council. (2007). *Healthy Eating in New Zealand Families and Whanau*.

Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on food intake: A normative interpretation. *Psychological Bulletin, 129*(6), 873-886. doi:10.1037/0033-2909.129.6.873

Hill, D. S., Knox, B., Hamilton, J., Parr, H., & Stringer, M. (2002). Reduced-fat foods: the shopper's viewpoint. *International Journal of Consumer Studies, 26*(1), 44-57. doi:10.1046/j.1470-6431.2002.00198.x

Holmback, U., Lowden, A., Akerfeldt, T., Lennernas, M., Hambraeus, L., Forslund, J., . . . Forslund, A. (2003). The human body may buffer small differences in meal size and timing during a 24-h wake period provided energy balance is maintained. *Journal of Nutrition, 133*(9), 2748-2755.

Holt, S. H. A., Delargy, H. J., Lawton, C. L., & Blundell, J. E. (1999). The effects of high-carbohydrate vs high-fat breakfasts on feelings of fullness and alertness, and subsequent food intake. *International Journal of Food Sciences and Nutrition, 50*(1), 13-28. doi:10.1080/096374899101382

Hu, F. B. (2002). Dietary pattern analysis: a new direction in nutritional epidemiology. *Current Opinion in Lipidology, 13*(1), 3-9.

Hu, F. B., Rimm, E., Smith-Warner, S. A., Feskanich, D., Stampfer, M. J., Ascherio, A., . . . Willett, W. C. (1999). Reproducibility and validity of dietary patterns assessed with a food- frequency questionnaire. *American Journal of Clinical Nutrition, 69*(2), 243-249. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0032946298&partnerID=40&md5=a97a77a317ca4adec000925d1f61f695

Hunt, W. A., Matarazzo, J. D., Weiss, S. M., & Gentry, W. D. (1979). Associative learning, habit, and health behavior. *Journal of Behavioral Medicine, 2*(2), 111-124. doi:10.1007/bf00846661

International Food Information Council. (1995). *Uses and nutritional impact of fat reduction ingredients*. Washington DC: International Food Information Council.

Jaeger, S. R., Marshall, D. W., & Dawson, J. (2009). A quantitative characterisation of meals and their contexts in a sample of 25 to 49-year-old Spanish people. *Appetite, 52*(2), 318-327. doi:10.1016/j.appet.2008.11.004

Jahoda, G. (2012). Critical reflections on some recent definitions of "culture". *Culture and Psychology, 18*(3), 289-303. doi:10.1177/1354067X12446229

Jula, A., Seppänen, R., & Alanen, E. (1999). Influence of days of the week on reported food, macronutrient and alcohol intake among an adult population in south western Finland. *European Journal of Clinical Nutrition, 53*(10), 808-812. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0344994705&partnerID=40&md5=444a440b1888f8287d824860043b04d6

Kaiser, M., & Lien, M. E. (2006). *Ethics and the politics of food* (Vol. 6). Wageningen: Wageningen Academic Publishers

Kanter, R., & Caballero, B. (2012). Global gender disparities in obesity: A review. *Advances in Nutrition, 3*(4), 491-498. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84871889876&partnerID=40&md5=816cfe78a62c934e7e0ad6bc96a50a94

Kearney, J. M., Hulshof, K., & Gibney, M. J. (2001). Eating patterns - Temporal distribution, converging and diverging foods, meals eaten inside and outside of the home - Implications for developing FBDG. *Public Health Nutrition, 4*(2 B), 693-698. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0034982709&partnerID=40&md5=f873488adbe5cf9bccb1b7eb1138b9f1

Kelly, B., Halford, J. C. G., Boyland, E. J., Chapman, K., Bautista-Castano, I., Berg, C., . . . Summerbell, C. (2010). Television Food Advertising to Children: A Global Perspective. *American Journal of Public Health, 100*(9), 1730-1736. doi:10.2105/ajph.2009.179267

Kerver, J. M., Yang, E. J., Obayashi, S., Bianchi, L., & Song, W. O. (2006). Meal and snack patterns are associated with dietary intake of energy and nutrients in US adults. *Journal of the American Dietetic Association, 106*(1), 46-53. doi:10.1016/j.jada.2005.09.045

Keski-Rahkonen, A., Kaprio, J., Rissanen, A., Virkkunen, M., & Rose, R. J. (2003). Breakfast skipping and health-compromising behaviors in adolescents and adults. *European Journal of Clinical Nutrition, 57*(7), 842-853.

Keskitalo, K., Silventoinen, K., Tuorila, H., Perola, M., Pietiläinen, K. H., Rissanen, A., & Kaprio, J. (2008). Genetic and environmental contributions to food use patterns of young adult twins. *Physiology & Behavior, 93*(1–2), 235-242. doi:http://dx.doi.org/10.1016/j.physbeh.2007.08.025

Kohlmeier, L. (1994). Gaps in dietary assessment methodology: Meal- vs. list-based methods. *American Journal of Clinical Nutrition, 59*(1), S175-S179. Retrieved from <Go to ISI>://WOS:A1994MQ07900008

Kristal, A. R., Beresford, S. A. A., & Lazovich, D. (1994). Assessing change in diet-intervention research. *American Journal of Clinical Nutrition, 59*(1 SUPPL.), 185S-189S. Retrieved from http://ajcn.nutrition.org/content/59/1/185S.full.pdf

Kristal, A. R., & Potter, J. D. (2006). Not the time to abandon the food frequency questionnaire: Counterpoint. *Cancer Epidemiology Biomarkers and Prevention, 15*(10), 1759-1760. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-33750506462&partnerID=40&md5=b2a7fd3b6d2b3e9a75b99ac638eb2a6a

Kristal, A. R., Shattuck, A. L., & Henry, H. J. (1990). Patterns of dietary behavior associated with selecting diets low in fat: reliability and validity of a behavioral approach to dietary assessment. *Journal of the American Dietetic Association, 90*(2), 214-220. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA8543187&v=2.1&u=learn&it=r&p=AONE&sw=w&asid=7474fe1974b539431fdb2ccb509a634e

Kruger, R., Shultz, S. P., McNaughton, S. A., Russell, A. P., Firestone, R. T., George, L., . . . Stonehouse, W. (2015). Predictors and risks of body fat profiles in young New Zealand European, Māori and Pacific women: study protocol for the women's EXPLORE study. *SpringerPlus, 4*(1), 1-11. doi:10.1186/s40064-015-0916-8

Kruger, R., Stonehouse, W., von Hurst, P. R., & Coad, J. (2012). Combining food records with in-depth probing interviews improves quality of dietary intake reporting in a group of South Asian women. *Aust N Z J Public Health, 36*(2), 135-140. doi:10.1111/j.1753-6405.2011.00809.x

Kruse, K. (2013a). *Consumption of juice and fruit drinks among children and their parents and caregivers*. Wellington: Health Promotion Agency Research and Evaluation Unit.

Kruse, K. (2013b). *Consumption of sugary drinks among children and their parents or caregivers*. Wellington: Health Promotion Agency Research and Evaluation Unit.

Kuhnlein, H. V., & Receveur, O. (1996). Dietary change and traditional food systems of indigenous peoples. *Annual Review of Nutrition, 16*, 417-442. doi:10.1146/annurev.nu.16.070196.002221

Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review, 25*(7), 841-861. doi:http://dx.doi.org/10.1016/j.cpr.2005.06.002

Larson, N. I., Neumark-Sztainer, D. R., Story, M. T., Wall, M. M., Harnack, L. J., & Eisenberg, M. E. (2008). Fast Food Intake: Longitudinal Trends during the Transition to Young Adulthood and Correlates of Intake. *Journal of Adolescent Health, 43*(1), 79-86. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-51749125842&partnerID=40&md5=0c26b9d69c5e7ba38d3ab440e9493319

Leblanc, V., Provencher, V., Bégin, C., Gagnon-Girouard, M. P., Corneau, L., Tremblay, A., & Lemieux, S. (2012). Associations between eating patterns, dietary intakes and eating behaviors in premenopausal overweight women. *Eating Behaviors, 13*(2), 162-165. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84857279055&partnerID=40&md5=2c70609fdabbe5349042b9aab374b768

Lee, D. (1957). Cultural factors in dietary choice. *American Journal of Clinical Nutrition, 5*(2), 166-170. Retrieved from <Go to ISI>://WOS:A1957WE13800014

Lee, R. D., & Nieman, D. C. (2010). *Nutritional Assessment* (5th ed.): McGraw-Hill.

Leitzmann, C. (2014). Vegetarian nutrition: Past, present, future. *American Journal of Clinical Nutrition, 100*(SUPPL. 1), 496S-502S. doi:10.3945/ajcn.113.071365

Lobstein, T., & Leach, R. J. (2007). *Tackling obesities: Future choices-International comparisons of obesity trends, determinants and responses: Evidence review*. Foresight: Government Office for Science Retrieved from http://foresight.govt.uk.

Logue, A. W., & Smith, M. E. (1986). Predictors of food preferences in adult humans. *Appetite, 7*(2), 109-125. Retrieved from <Go to ISI>://WOS:A1986C526300001

Lowenberg, M., Todhunter, E., Wilson, E., Savage, J., & Lubawski, J. (1974). *Food and Man* (Second ed.). New York, NY: John Wiley & Sons.

Ludwig, D. S., Peterson, K. E., & Gortmaker, S. L. (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet, 357*(9255), 505-508. doi:10.1016/s0140-6736(00)04041-1

Lytle, L. A., Himes, J. H., Feldman, H., Zive, M., Dwyer, J., Hoelscher, D., . . . Yang, M. (2002). Nutrient intake over time in a multi-ethnic sample of youth. *Public Health Nutrition, 5*(2), 319-328. doi:10.1079/phn2002255

Maher, A., Wilson, N., Signal, L., & Thomson, G. (2006). Patterns of sports sponsorship by gambling, alcohol and food companies: An Internet survey. *BMC Public Health, 6*. doi:10.1186/1471-2458-6-95

Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: a systematic review. *American Journal of Clinical Nutrition, 84*(2), 274-288. Retrieved from <Go to ISI>://WOS:000239674300003

Martinez-Gonzalez, M. A., & Martin-Calvo, N. (2013). The major European dietary patterns and metabolic syndrome. *Reviews in Endocrine & Metabolic Disorders, 14*(3), 265-271. doi:10.1007/s11154-013-9264-6

Masson, L. F., McNeill, G., Tomany, J. O., Simpson, J. A., Peace, H. S., Wei, L., . . . Bolton-Smith, C. (2003). Statistical approaches for assessing the relative validity of a food-frequency questionnaire: use of correlation coefficients and the kappa statistic. *Public Health Nutrition, 6*(3), 313-321. doi:10.1079/phn2002429

McCrory, M. A., & Campbell, W. W. (2011). Effects of Eating Frequency, Snacking, and Breakfast Skipping on Energy Regulation: Symposium Overview. *Journal of Nutrition, 141*(1), 144-147. doi:10.3945/jn.109.114918

McKinney, S. (2014). The relationship of child poverty to school education. *Improving Schools, 17*(3), 203-216. doi:10.1177/1365480214553742

McNaughton, S. A. (2012). Understanding food and nutrition-related behaviours: Putting together the pieces of the puzzle. *Nutrition & Dietetics, 69*(2), 80-83. doi:10.1111/j.1747-0080.2012.01595.x

Mesas, A. E., Munoz-Pareja, M., Lopez-Garcia, E., & Rodriguez-Artalejo, F. (2012). Selected eating behaviours and excess body weight: a systematic review. *Obesity Reviews, 13*(2), 106-135. doi:10.1111/j.1467-789X.2011.00936.x

Mikkelsen, B. E. (2005). Declining role of governments in promoting healthy eating: time to rethink the role of the food industry? *Scandinavian Journal of Nutrition, 49*(3), 127-130. doi:10.1080/11026480500237640

Miller, R., Benelam, B., Stanner, S. A., & Buttriss, J. L. (2013). Is snacking good or bad for health: an overview. *Nutrition Bulletin, 38*(3), 302-322. doi:10.1111/nbu.12042

Ministry of Health. (1999). *NZ Food: NZ People: Key results of the 1997 National Nutrition Survey*. Wellington: Minsitry of Health.

Ministry of Health. (2003). *Food and Nutrition Guidelines for Healthy Adults: A background paper*. Wellington: Ministry of Health.

Ministry of Health. (2004a). *A Portrait of Health: Key Results of the 2002/03 New Zealand Health Survey*. Wellington: Ministry of Health.

Ministry of Health. (2004b). *Tracking the Obesity Epidemic: New Zealand 1977-2003*. Wellington: Ministry of Health.

Ministry of Health. (2008a). *Body Size Technical Report: Measurements and classifications in the 2006/07 New Zealand Health Survey*. Wellington: Ministry of Health.

Ministry of Health. (2008b). *A Portrait of Health: Key Results of the 2006/07 New Zealand Health Survey*. Wellington: Ministry of Health.

Ministry of Health. (2012). *The Health of New Zealand Adults 2011/12: Key Findings of the New Zealand Health Survey*. Wellington: Ministry of Health.

Ministry of Health. (2013). *New Zealand Health Survey: Annual update of key findings 2012/13*. Wellington: Ministry of Health.

Ministry of Health. (2014). *Annual Update of Key Results 2013/14: New Zealand Health Survey*. Wellington: Ministry of Health.

Ministry of Health. (2015). Alcohol. Retrieved from http://www.health.govt.nz/your-health/healthy-living/addictions/alcohol-and-drugs/alcohol

Moeller, S. M., Reedy, J., Millen, A. E., Dixon, L. B., Newby, P. K., Tucker, K. L., . . . Guenther, P. M. (2007). Dietary Patterns: Challenges and Opportunities in Dietary Patterns Research. An Experimental Biology Workshop, April 1, 2006. *Journal of the American Dietetic Association, 107*(7), 1233-1239. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-34250844375&partnerID=40&md5=a232fd250fffa24737884eb40804e592

Molarius, A., Seidell, J. C., Sans, S., Tuomilehto, J., & Kuulasmaa, K. (2000). Educational level, relative body weight, and changes in their association over 10 years: An international perspective from the WHO MONICA Project. *American Journal of Public Health, 90*(8), 1260-1268. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0033931880&partnerID=40&md5=2ca80e8d81a889ef3d2aa6af56ffdcae

Morrill, A. C., & Chinn, C. D. (2004). The obesity epidemic in the United States. *Journal of Public Health Policy, 25*(3-4), 353-366. doi:10.1057/palgrave.jphp.3190035

Moy, F., Surin, J., Ismail, Y., Mahad, R., Tie, F., & Wan Ismail, W. (2009). Breakfast skipping and its associated factors among undergraduates in a public university in Kuala Lumpur. *Malaysian Journal of Nutrition, 15*(2), 165-174.

Mullan, B. A., & Monika, S. (2010). A systematic review of the quality, content, and context of breakfast consumption. *Nutrition & Food Science, 40*(1), 81-114. doi:10.1108/00346651011015953

Mullie, P., Clarys, P., Ridder, D. d., Deriemaeker, P., Duvigneaud, N., Hebbelinck, M., . . . Autier, P. (2006). Breakfast frequency and fruit and vegetable consumption in Belgian adolescents: a cross-sectional study. *Nutrition & Food Science, 36*(5), 315-326. doi:10.1108/00346650610703162

Muñoz-Pareja, M., Guallar-Castillón, P., Mesas, A. E., López-García, E., & Rodríguez-Artalejo, F. (2013). Obesity-Related Eating Behaviors Are Associated with Higher Food Energy Density and Higher Consumption of Sugary and Alcoholic Beverages: A Cross-Sectional Study. *PLOS ONE, 8*(10), e77137.

Neal, D. T., Wood, W., & Quinn, J. M. (2006). Habits: A repeat performance. *Current Directions in Psychological Science, 15*(4), 198-202. doi:10.1111/j.1467-8721.2006.00435.x

Nelson, M. (1997). The validation of dietary assessment. In B. M. Margetts & M. Nelson (Eds.), *Design Concepts in Nutritional Epidemiology* (2nd ed.). Oxford: Oxford University Press.

Nelson, M., Atkinson, M., & Meyer, J. (2002). *A Photographic Atlas of Food Portion Sizes*. London (UK): Food Standards Agency Publications.

Nelson, M., & Bingham, S. A. (1997). Assessment of food consumption and nutrient intake. In B. M. Margetts & M. Nelson (Eds.), *Design Concepts in Nutritional Epidemiology* (Vol. 2nd). Oxford: Oxford University Press.

Newby, P. K., & Tucker, K. L. (2004). Empirically derived eating patterns using factor or cluster analysis: A review. *Nutrition Reviews, 62*(5), 177-203. doi:10.1301/rn.2004.may.177-203

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., . . . Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet, 384*(9945), 766-781. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84906882822&partnerID=40&md5=3c2962e5d354eb32cad69e8ef094ceab

Nguyen, D. M., & El-Serag, H. B. (2010). The Epidemiology of Obesity. *Gastroenterology Cinics of North America, 39*(1), 1-7. doi:10.1016/j.gtc.2009.12.014

NHMRC. (2006). *Nutrient Reference Values for Australia and New Zealand*. Canberra: National Health and Medical Research Council.

Nicklas, T. A., Myers, L., Reger, C., Beech, B., & Berenson, G. S. (1998). Impact of breakfast consumption on nutritional adequacy of the diets of young adults in Bogalusa, Louisiana: Ethnic and gender contrasts. *Journal of the American Dietetic Association, 98*(12), 1432-1438. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0031672518&partnerID=40&md5=dc3dd9895014851174a5140a9dcc5529

Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in Food Locations and Sources among Adolescents and Young Adults. *Preventive Medicine, 35*(2), 107-113. doi:http://dx.doi.org/10.1006/pmed.2002.1037

Nikolaou, C. K., Hankey, C. R., & Lean, M. E. (2015). Weight changes in young adults: a mixed-methods study. *International Journal of Obesity, 39*(3), 508-513. doi:10.1038/ijo.2014.160

Nowak, M., & Speare, R. (1996). Gender differences in food-related concerns, beliefs and behaviours of North Queensland adolescents. *Journal of Paediatrics and Child Health, 32*(5), 424-427. doi:10.1111/j.1440-1754.1996.tb00943.x

O'Dwyer, N. A., McCarthy, S. N., Burke, S. J., & Gibney, M. J. (2005). The temporal pattern of the contribution of fat to energy and of food groups to fat at various eating locations: Implications for developing food-based dietary guidelines. *Public Health Nutrition, 8*(3), 249-257. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-18844448153&partnerID=40&md5=139fd9db6eaac9860d6c0834043b5a30

O'Neil, C. E., Byrd-Bredbenner, C., Hayes, D., Jana, L., Klinger, S. E., & Stephenson-Martin, S. (2014). The Role of Breakfast in Health: Definition and Criteria for a Quality Breakfast. *Journal of the Academy of Nutrition and Dietetics, 114*(12, Supplement), S8-S26. doi:http://dx.doi.org/10.1016/j.jand.2014.08.022

Oliveros, E., Somers, V. K., Sochor, O., Goel, K., & Lopez-Jimenez, F. (2014). The Concept of Normal Weight Obesity. *Progress in Cardiovascular Diseases, 56*(4), 426-433. doi:10.1016/j.pcad.2013.10.003

Oltersdorf, U., Schlettwein-Gsell, D., & Winkler, G. (1999). Assessing eating patterns - An emerging research topic in nutritional sciences: Introduction to the symposium. *Appetite, 32*(1), 1-7. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0033082957&partnerID=40&md5=ba4726a8b54497126413cca29a748578

Ovaskainen, M. L., Reinivuo, H., Tapanainen, H., Hannila, M. L., Korhonen, T., & Pakkala, H. (2006). Snacks as an element of energy intake and food consumption. *European Journal of Clinical Nutrition, 60*(4), 494-501. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-33645634416&partnerID=40&md5=e12a9041eb11a557f2676985c8398c2d

Pearce, J., Blakely, T., Witten, K., & Bartie, P. (2007). Neighborhood deprivation and access to fast-food retailing - A national study. *American Journal of Preventive Medicine, 32*(5), 375-382. doi:10.1016/j.amepre.2007.01.009

Pearce, J., Hiscock, R., Blakely, T., & Witten, K. (2008). The contextual effects of neighbourhood access to supermarkets and convenience stores on individual fruit and vegetable consumption. *Journal of Epidemiology and Community Health, 62*(3), 198-201. doi:10.1136/jech.2006.059196

Peeters, A., Barendregt, J. J., Willekens, F., Mackenbach, J. P., Al Mamun, A., Bonneux, L., . . . Nusselder, W. (2003). Obesity in adulthood and its consequences for life expectancy: A life-table analysis. *Annals of Internal Medicine, 138*(1), 24-32. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0037422846&partnerID=40&md5=281de343adf00a0abbab6fdac2608f75

Pereira, M. A., Kartashov, A. I., Ebbeling, C. B., Van Horn, L., Slattery, M. L., Jacobs Jr, P. D. R., & Ludwig, D. S. (2005). Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet, 365*(9453), 36-42. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-11444266163&partnerID=40&md5=00b773013b480b460b6f13b1c83ca58c

Peterson, S., Sigman-Grant, M., Eissenstat, B., & Kris-Etherton, P. (1999). Impact or adopting lower-fat food choices on energy and nutrient intakes of American adults. *Journal of the American Dietetic Association, 99*(2), 177-183. doi:10.1016/s0002-8223(99)00043-7

Plant and Food Research. (2010). New Zealand Food Composition Database. Retrieved from http://www.foodcomposition.co.nz

Poppitt, S. D., Swann, D., Black, A. E., & Prentice, A. M. (1998). Assessment of selective under-reporting of food intake by both obese and non-obese women in a metabolic facility. *International Journal of Obesity, 22*(4), 303-311. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0031884848&partnerID=40&md5=eb9f513afc44afefc8ffcc483d157426

Power, E. M. (2005). Determinants of healthy eating among low-income Canadians. *Canadian Journal of Public Health, 96*(SUPPL. 3), S37-S42. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-23444448444&partnerID=40&md5=6c130a150d30273bd49f7536df83b585

Prescott, J., Young, O., O'Neill, L., Yau, N. J. N., & Stevens, R. (2002). Motives for food choice: A comparison of consumers from Japan, Taiwan, Malaysia and New Zealand. *Food Quality and Preference, 13*(7-8), 489-495. doi:10.1016/S0950-3293(02)00010-1

Pridgeon, A., & Whitehead, K. (2013). A qualitative study to investigate the drivers and barriers to healthy eating in two public sector workplaces. *Journal of Human Nutrition and Dietetics, 26*(1), 85-95. doi:10.1111/j.1365-277X.2012.01281.x

Prinsen, S., de Ridder, D. T. D., & de Vet, E. (2013). Eating by example. Effects of environmental cues on dietary decisions. *Appetite, 70*, 1-5. doi:10.1016/j.appet.2013.05.023

Quigley, R., & Watts, C. (1997). *Food Comes First: Methodologies for the National Nutrition Survey of New Zealand*. Wellington: Ministry of Health.

Raine, K. D. (2005). Determinants of healthy eating in Canada - An overview and synthesis. *Canadian Journal of Public Health, 96*, S8-S14. Retrieved from <Go to ISI>://WOS:000230897600004

Raman, V. V. (2014). Food: Its many aspects in science, religion and culture. *Zygon, 49*(4), 958-976. doi:10.1111/zygo.12137

Ranjani, H., Pradeepa, R., Mehreen, T., Anjana, R. M., Anand, K., Garg, R., & Mohan, V. (2014). Determinants, consequences and prevention of childhood overweight and obesity: An Indian context. *Indian Journal of Endocrinology and Metabolism, 18*(Suppl 1), S17.

Reddan, J., Wahlstrom, K., & Reicks, M. (2002). Children's perceived benefits and barriers in relation to eating breakfast in schools with or without universal school breakfast. *Journal of Nutrition Education and Behavior, 34*(1), 47-52. doi:10.1016/s1499-4046(06)60226-1

Risica, P. M., Burkholder, G., Gans, K. M., Lasater, T. M., Acharyya, S., Davis, C., & Kirtania, U. (2007). Assessing Fat-related Dietary Behaviors among Black Women: Reliability and Validity of a New Food Habits Questionnaire. *Journal of Nutrition Education and Behavior, 39*(4), 197-204. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-34250879156&partnerID=40&md5=908ca743a2cfa3eb6861032cf9671690

Robinson, E., Blissett, J., & Higgs, S. (2013). Social influences on eating: implications for nutritional interventions. *Nutrition Research Reviews, 26*(2), 166-176. doi:10.1017/s0954422413000127

Robinson, E., Thomas, J., Aveyard, P., & Higgs, S. (2014). What Everyone Else Is Eating: A Systematic Review and Meta-Analysis of the Effect of Informational Eating Norms on Eating Behavior. *Journal of the Academy of Nutrition and Dietetics, 114*(3), 414-429. doi:10.1016/j.jand.2013.11.009

Rogers, P. J. (1999). Eating habits and appetite control: a psychobiological perspective. *Proceedings of the Nutrition Society, 58*(1), 59-67. doi:10.1079/pns19990009

Rohrmann, S., & Klein, G. (2003). Development and validation of a short food list to assess the intake of total fat, saturated, mono-unsaturated, polyunsaturated fatty acids and cholesterol. *European Journal of Public Health, 13*(3), 262-268. doi:10.1093/eurpub/13.3.262

Rousset, S., Mirand, P. P., Brandolini, M., Martin, J. F., & Boirie, Y. (2003). Daily protein intakes and eating patterns in young and elderly French. *British Journal of Nutrition, 90*(6), 1107-1115. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0348108337&partnerID=40&md5=a57790dfc0db50b290db54597072c195

Rydell, S. A., Harnack, L. J., Oakes, J. M., Story, M., Jeffery, R. W., & French, S. A. (2008). Why Eat at Fast-Food Restaurants: Reported Reasons

among Frequent Consumers. *Journal of the American Dietetic Association, 108*(12), 2066-2070. doi:10.1016/j.jada.2008.09.008

Sacks, G., Swinburn, B. A., & Lawrence, M. A. (2008). A systematic policy approach to changing the food system and physical activity environments to prevent obesity. *Australia and New Zealand Health Policy, 5*. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-45549090151&partnerID=40&md5=275bc8d180032b7602cd70ccd2cc8a42

Schlundt, D. G., Hargreaves, M. K., & Buchowski, M. S. (2003). The Eating Behavior Patterns Questionnaire predicts dietary fat intake in African American women. *Journal of the American Dietetic Association, 103*(3), 338-345. doi:10.1053/jada.2003.50049

Scully, M., Wakefield, M., Niven, P., Chapman, K., Crawford, D., Pratt, I. S., . . . Na, S. S. T. (2012). Association between food marketing exposure and adolescents' food choices and eating behaviors. *Appetite, 58*(1), 1-5. doi:10.1016/j.appet.2011.09.020

Serra-Majem, L., Frost Andersen, L., Henríque-Sánchez, P., Doreste-Alonso, J., Sánchez-Villegas, A., Ortiz-Andrelluchi, A., . . . La Vecchia, C. (2009). Evaluating the quality of dietary intake validation studies. *The British Journal of Nutrition, 102 Suppl 1*, S3-9. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-77449152571&partnerID=40&md5=c8354ba0e8f326e254b740e55c864ffc

Shannon, J., Kristal, A. R., Curry, S. J., & Beresford, S. A. A. (1997). Application of a behavioral approach to measuring dietary change: The fat- and fiber-related diet behavior questionnaire. *Cancer Epidemiology Biomarkers and Prevention, 6*(5), 355-361. Retrieved from http://cebp.aacrjournals.org/content/6/5/355.full.pdf

Shatenstein, B., & Ghadirian, P. (1998). Influences on diet, health behaviours and their outcome in select ethnocultural and religious groups. *Nutrition, 14*(2), 223-230. doi:10.1016/s0899-9007(97)00425-5

Shaw, M. E. (1998). Adolescent breakfast skipping: An Australian study. *Adolescence, 33*(132), 851-861. Retrieved from <Go to ISI>://WOS:000077852600014

Sjöberg, A., Hallberg, L., Höglund, D., & Huithén, L. (2003). Meal pattern, food choice, nutrient intake and lifestyle factors in The Göteborg Adolescence Study. *European Journal of Clinical Nutrition, 57*(12), 1569-1578. doi:10.1038/sj.ejcn.1601726

Song, W. O., Chun, O. K., Obayashi, S., Cho, S., & Chung, C. E. (2005). Is consumption of breakfast associated with body mass index in US adults? *Journal of the American Dietetic Association, 105*(9), 1373-1382. doi:10.1016/j.jada.2005.06.002

Spronk, I., Kullen, C., Burdon, C., & O'Connor, H. (2014). Relationship between nutrition knowledge and dietary intake. *British Journal of Nutrition, 111*(10), 1713-1726. doi:10.1017/s0007114514000087

Statistics New Zealand. (2007). National Population Estimates: June 2007 Quarter.

Statistics New Zealand. (2013a). 2013 Census - Major ethnic groups in New Zealand. Retrieved from http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/infographic-culture-identity.aspx

Statistics New Zealand. (2013b). Religious Affiliation. Retrieved from http://www.stats.govt.nz/Census/2013-census/data-tables/total-by-topic.aspx

Stender, S., Dyerberg, J., & Astrup, A. (2007). Fast food: unfriendly and unhealthy. *International Journal of Obesity, 31*(6), 887-890. doi:10.1038/sj.ijo.0803616

Stewart-Knox, B., Hamilton, J., Parr, H., & Bunting, B. (2005). Dietary strategies and uptake of reduced fat foods. *Journal of Human Nutrition and Dietetics, 18*(2), 121-128. doi:10.1111/j.1365-277X.2005.00595.x

Steyn, K., Fourie, J., & Temple, N. (2006). *Chronic Diseases of Lifestyle in South Africa: 1995-2005. Technical Report*. Cape Town: South African Medical Research Council.

Stokols, D. (1992). Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist, 47*(1), 6-22. doi:10.1037/0003-066x.47.1.6

Storey, K. E., Hanning, R. M., Lambraki, I. A., Driezen, P., Fraser, S. N., & McCargar, L. J. (2009). Determinants of Diet quality among Canadian adolescents. *Canadian Journal of Dietetic Practice and Research, 70*(2), 58-65. doi:10.3148/70.2.2009.58

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: policy and environmental approaches. *Annual Review of Public Health, 29*, 253-272.

Szucs, E., Geers, R., Jezierski, T., Sossidou, E. N., & Broom, D. M. (2012). Animal welfare in different human cultures, traditions and religious faiths. *Asian-Australasian Journal of Animal Sciences, 25*(11), 1499-1506. doi:10.5713/ajas.2012.r.02

Taylor, J. P., Evers, S., & McKenna, M. (2005). Determinants of healthy eating in children and youth. *Canadian Journal of Public Health, 96*, S20-S26. Retrieved from <Go to ISI>://WOS:000230897600006

Thompson, F. E., & Byers, T. (1994). Dietary Assessment Resource Manual. *Journal of Nutrition, 124*(11), S2245-S2317. Retrieved from <Go to ISI>://WOS:A1994PT28000002

Thompson, F. E., & Subar, A. F. (2013). Chapter 1 - Dietary Assessment Methodology. In A. M. C. J. B. G. Ferruzzi (Ed.), *Nutrition in the Prevention and Treatment of Disease (Third Edition)* (pp. 5-46): Academic Press.

Thompson, F. E., Willis, G. B., Thompson, O. M., & Yaroch, A. L. (2011). The meaning of 'fruits' and 'vegetables'. *Public Health Nutrition, 14*(7), 1222-1228. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-79960120759&partnerID=40&md5=33395ade282387d6f7a06795325ccf10

Timlin, M. T., & Pereira, M. A. (2007). Breakfast frequency and quality in the etiology of adult obesity and chronic diseases. *Nutrition Reviews, 65*(6), 268-281. doi:10.1301/nr.2007.jun.268-281

Torstveit, M. K., & Sundgot-Borgen, J. (2012). Are under-and overweight female elite athletes thin and fat? A controlled study. *Medicine and Science in Sports and Exercise, 44*(5), 949-957. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84859915573&partnerID=40&md5=fd0f68af448f3bd8c8ee0f385a492a6a

Trepanowski, J. F., & Bloomer, R. J. (2010). The impact of religious fasting on human health. *Nutrition Journal, 9*(57).

Ucan, O., & Ovayolu, N. (2010). Relationship between diabetes mellitus, hypertension and obesity, and health-related quality of life in Gaziantep, a central south-eastern city in Turkey. *Journal of Clinical Nursing, 19*(17-

18), 2511-2519. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-77955986834&partnerID=40&md5=8d61094dda41dcd65cc45be7addd778d

Ucar, A., Ozdogan, Y., & Ozcelik, A. O. (2012). Does Nutrition Knowledge Change Nutrition Behavior? *Healthmed, 6*(6), 2023-2029. Retrieved from <Go to ISI>://WOS:000308021500022

United States Department of Agriculture. (2014a). Breakfast: Percentages of Selected Nutrients Contributed by Food and Beverages Consumed at Breakfast by Gender and Age. *What We Eat in America, NHANES 2011-2012*.

United States Department of Agriculture. (2014b). *Dinner: Percentages of Selected Nutrients Contributed by Food and Beverages Consumed at Dinner, by Gender and Age*. What We Eat in America.

United States Department of Agriculture. (2014c). Energy Intakes: Percentages of Energy from Protein, Carbohydrate, Fat and Alcohol, by Gender and Age. from What We Eat in America

United States Department of Agriculture. (2014d). *Lunch: Percentages of Selected Nutrients Contributed by Food and Beverages Consumed at Lunch, by Gender and Age*. What We Eat in America.

United States Department of Agriculture. (2014e). *Snacks: Percentages of Selected Nutrients Contributed by Food and Beverages Consumed at Snack Occasions, by Gender and Age*. What We Eat in America.

University of Otago, & Ministry of Health. (2011a). *Key findings of the 2008/09 New Zealand Adult Nutrition Survey.* Wellington: Ministry of Health.

University of Otago, & Ministry of Health. (2011b). *Methodology Report for the 2008/09 New Zealand Adult Nutrition Survey.* Wellington: Ministry of Health.

Utter, J., Denny, S., Crengle, S., Ameratunga, S., Clark, T., Maddison, R., & Percival, T. (2011). Socio-economic differences in eating-related attitudes, behaviours and environments of adolescents. *Public Health Nutrition, 14*(4), 629-634. doi:10.1017/S1368980010001898

Utter, J., Denny, S., Crengle, S., Ameratunga, S., Robinson, E., Clark, T., . . . Maddison, R. (2010). Overweight among New Zealand adolescents: Associations with ethnicity and deprivation. *International Journal of Pediatric Obesity, 5*(6), 461-466. doi:10.3109/17477160903568439

Utter, J., Scragg, R., Schaaf, D., Fitzgerald, E., & Wilson, N. (2007). Correlates of body mass index among a nationally representative sample of New Zealand children. *International Journal of Pediatric Obesity, 2*(2), 104-113. doi:10.1080/17477160601127988

Van Den Boom, A., Serra-Majem, L., Ribas, L., Ngo, J., Pérez-Rodrigo, C., Aranceta, J., & Fletcher, R. (2006). The contribution of ready-to-eat cereals to daily nutrient intake and breakfast quality in a Mediterranean setting. *Journal of the American College of Nutrition, 25*(2), 135-143. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-33747190914&partnerID=40&md5=ff29762d04600892d68e5b442c9af48d

Van Der Heijden, A. A. W. A., Hu, F. B., Rimm, E. B., & Van Dam, R. M. (2007). A prospective study of breakfast consumption and weight gain among U.S. men. *Obesity, 15*(10), 2463-2469. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-35648965628&partnerID=40&md5=3ed0b2c228cb4b6d16b263fa7c8e0518

van't Riet, J., Sijtsema, S. J., Dagevos, H., & De Bruijn, G.-J. (2011). The importance of habits in eating behaviour. An overview and

recommendations for future research. *Appetite, 57*(3), 585-596. doi:10.1016/j.appet.2011.07.010

Vandevijvere, S., Dominick, C., & Devi, A. (2015). The healthy food environment policy index: Findings of an expert panel in New Zealand. *Bulletin of the World Health Organization, 93*(5), 294-302. doi:10.2471/BLT.14.145540

Vartanian, L. R., Schwartz, M. B., & Brownell, K. D. (2007). Effects of soft drink consumption on nutrition and health: A systematic review and meta-analysis. *American Journal of Public Health, 97*(4), 667-675. doi:10.2105/ajph.2005.083782

Wang, J., Williams, M., Rush, E., Crook, N., Forouhi, N. G., & Simmons, D. (2010). Mapping the availability and accessibility of healthy food in rural and urban New Zealand - Te Wai o Rona: Diabetes Prevention Strategy. *Public Health Nutrition, 13*(7), 1049-1055. doi:10.1017/S1368980009991595

Wang, Y., Beydoun, M. A., Liang, L., Caballero, B., & Kumanyika, S. K. (2008). Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity (Silver Spring), 16*(10), 2323-2330. doi:10.1038/oby.2008.351

Wardle, J., Haase, A. M., Steptoe, A., Nillapun, M., Jonwutiwes, K., & Bellisle, F. (2004). Gender Differences in Food Choice: The Contribution of Health Beliefs and Dieting. *Annals of Behavioral Medicine, 27*(2), 107-116. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-1642296728&partnerID=40&md5=190d02f3bdd5bb7aaa25a06ace60ef06

Wardle, J., Parmenter, K., & Waller, J. (2000). Nutrition knowledge and food intake. *Appetite, 34*(3), 269-275. doi:10.1006/appe.1999.0311

Wetter, A. C., Goldberg, J. P., King, A. C., Sigman-Grant, M., Baer, R., Crayton, E., . . . Warland, R. (2001). How and why do individuals make food and physical activity choices? *Nutrition Reviews, 59*(3), S11-S20. Retrieved from <Go to ISI>://WOS:000168248900005

White, J., & Signal, L. (2012). Submissions to the Australian and New Zealand Review of Food Labelling Law and Policy support traffic light nutrition labelling. *Australian and New Zealand Journal of Public Health, 36*(5), 446-451. doi:10.1111/j.1753-6405.2012.00913.x

White, R., & Frank, E. (1994). Health effects and prevalence of vegetarianism. *Western Journal of Medicine, 160*(5), 465.

Wierzbicka, E., & Dqbrowska, B. (2009). Low-energy food intake in a group of adult women wishing to lose weight. *Polish Journal of Food and Nutrition Sciences, 59*(4), 361-366. Retrieved from <Go to ISI>://BIOABS:BACD201000050933

Willett, W. C. (1998). *Nutritional Epidemiology* (W. C. Willett Ed. 2nd ed.). New York: Oxford University Press.

Williams, L. K., Thornton, L., & Crawford, D. (2012). Optimising women's diets. An examination of factors that promote healthy eating and reduce the likelihood of unhealthy eating. *Appetite, 59*(1), 41-46. Retrieved from <Go to ISI>://FSTA:2012-09-Aj4705

Williamson, C. S. (2006). Nutrition in pregnancy. *Nutrition Bulletin, 31*(1), 28-59. doi:10.1111/j.1467-3010.2006.00541.x

Wilson, N., Signal, L., Nicholls, S., & Thomson, G. (2006). Marketing fat and sugar to children on New Zealand television. *Preventive Medicine, 42*(2), 96-101. doi:10.1016/j.ypmed.2005.11.009

World Health Organization. (2000). *Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation*. Geneva: World Health Organization.

Worsley, A., & Scott, V. (2000). Consumers' concerns about food and health in Australia and New Zealand. *Asia Pacific Journal of Clinical Nutrition, 9*(1), 24-32. doi:10.1046/j.1440-6047.2000.00130.x

Wu, H. W., & Sturm, R. (2013). What's on the menu? A review of the energy and nutritional content of US chain restaurant menus. *Public Health Nutrition, 16*(1), 87-96. doi:10.1017/s136898001200122x

Yaroch, A. L., Resnicow, K., & Khan, L. K. (2000). Validity and reliability of qualitative dietary fat index questionnaires: A review. *Journal of the American Dietetic Association, 100*(2), 240-244. doi:10.1016/s0002-8223(00)00073-0

Yatsuya, H., Ohwaki, A., Tamakoshi, K., Wakai, K., Koide, K., Otsuka, R., . . . Toyoshima, H. (2003). Reproducibility and validity of a simple checklist-type questionnaire for food intake and dietary behavior. *Journal of Epidemiology, 13*(5), 235-245. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0642278099&partnerID=40&md5=76108cb3745456ce544c4b466f486bfb

Zalilah, M. S., Mirnalini, K., Safiah, M. Y., Tahir, A., Siti, H. M. D., Siti, R. D., . . . Siti, F. A. (2008). Daily energy intake from meals and afternoon snacks: Findings from the Malaysian Adults Nutrition Survey (MANS). *Malays J Nutr, 14*(1), 41-55. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-57349124568&partnerID=40&md5=403c7163b35d3b4804280f3799897806

Zazpe, I., Bes-Rastrollo, M., Ruiz-Canela, M., Sánchez-Villegas, A., Serrano-Martínez, M., & Martínez-González, M. A. (2011). A brief assessment of eating habits and weight gain in a Mediterranean cohort. *British Journal of Nutrition, 105*(5), 765-775. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-79953137456&partnerID=40&md5=43c6921f3f2b249f93505b44a049aeec

Zizza, C., Siega-Riz, A. M., & Popkin, B. M. (2001). Significant increase in young adults' snacking between 1977-1978 and 1994-1996 represents a cause for concern! *Preventive Medicine, 32*(4), 303-310. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0035710302&partnerID=40&md5=4c05f4f63e454e1b788ec53a2f0039df

Appendix A: Eating habits questionnaire

*Please note all questions with an * require an answer*

EXPLORE Eating Habits

1. Dietary Habits

In this questionnaire we will ask you questions on your eating habits. Please call over a researcher if you have any problems completing the questions

When answering this questionnaire please consider your intake of food over the past month. To help you do this, please think of an event in your life that happened one month ago and think about your eating patterns since that date.

***1. Please enter your study identification number again**

Study identification number

2. How would you describe your appetite?

- ◯ Good (being able to eat and enjoy moderate sized meals without difficulty and being able to snack in-between meals)
- ◯ Fair (being able to eat moderate sized meals, but finding it hard to complete meals, and seldom snacking in-between meals)
- ◯ Poor (never feeling like eating OR being hungry but don't feel like eating food at all AND generally not enjoying eating at all)

3. Are you happy with your current weight?

- ◯ No
- ◯ Yes

4. If no, what would you like your weight to be?

- ◯ + 1 kg
- ◯ + 2 kg
- ◯ + 2 to 5 kg
- ◯ + 5 to 10 kg or more
- ◯ - 1 kg
- ◯ - 2 kg
- ◯ - 2 to 5 kg
- ◯ - 5 to 10 kg or more

5. Please give a reason for your choice

6. Has your weight changed in the past year?

- ◯ No (same)
- ◯ Gained
- ◯ Lost

EXPLORE Eating Habits

7. If yes, by how much has your weight changed?

8. Please tell us why you lost or gained weight

***9. Is your weight an issue for you?**

- ◯ No
- ◯ Yes

2.

1. If yes, how are you trying to control your weight?

- ◯ Dieting (energy restriction, using diets e.g. Atkins diet)
- ◯ Exercise (gym, jogging etc.)
- ◯ Healthy eating regime (making only healthy food choices)
- ◯ Combination of diets, exercise and healthy eating
- ◯ Don't know how to do it

Other (please specify)

3. Food Habits

1. Please tell us a bit about your food habits:

Your diet is:

- ◯ Different every day
- ◯ Different only sometimes during a week
- ◯ Different only during weekend days
- ◯ Very monotonous

EXPLORE Eating Habits

2. Your diet is mainly based on:

- ◯ High protein content foods (meat, fish, eggs, cheese, dried legumes)
- ◯ High fat content foods (sausages, pizza bread, fried potatoes, cakes with butter and cream)
- ◯ High carbohydrate content foods (bread, pasta, rice, potatoes, biscuits)
- ◯ Different foods every day

3. Your snacks are mainly based on: (you may chose more than one option)

- ☐ Fruit, fruit juice, fruit and milk shakes, yoghurt
- ☐ Biscuits, crackers, bread, stick bread
- ☐ Hot chips, pop corn, peanuts, chips, soft drinks
- ☐ Sweets, chocolates, ice cream, cakes

4. Do you usually drink alcohol, eg. wine or beer at meals?

- ◯ Always
- ◯ Often
- ◯ Sometimes
- ◯ Never

5. Which beverages do you usually drink between meals?

- ◯ Mineral water or tap water
- ◯ Soft drinks (cola, orange, soda, iced tea, tonic water, energy drinks)
- ◯ Wine, beer, other alcoholic beverages
- ◯ Fruit, fruit juice, fruit and milk shakes

4. This part refers to food/eating habits on week days (Monday - Friday)

1. What time do you usually wake up on week days?

2. Do you usually eat breakfast on week days?

- ◯ No
- ◯ Yes

EXPLORE Eating Habits

3. What time do you usually eat breakfast on week days?

- ◯ Before 6am
- ◯ 6-8am
- ◯ 8-10am
- ◯ Don't eat breakfast at all

4. Please describe what you usually eat for breakfast on week days

5. Do you usually have a snack (any food or drink between meal times) between breakfast and lunch on week days?

- ◯ No
- ◯ Yes

6. What time do you usually eat snacks between breakfast and lunch on week days? (you may chose more than one answer)

- ☐ Before 6am
- ☐ 6-7am
- ☐ 7-8am
- ☐ 8-9am
- ☐ 9-10am
- ☐ 10-11am
- ☐ 11-12pm
- ☐ Don't have a snack

7. Please describe what you usually eat/drink for a snack on week days

8. Do you usually eat lunch on week days?

- ◯ No
- ◯ Yes

EXPLORE Eating Habits

9. What time do you usually eat lunch on week days?

- ◯ Before 12pm
- ◯ 12-2pm
- ◯ After 2pm
- ◯ Don't eat lunch at all

10. Please describe what you usually eat for lunch on week days

11. Do you usually have a snack (any food or drink between meal times) between lunch and dinner on week days?

- ◯ No
- ◯ Yes

12. What time do you usually eat a snack between lunch and dinner on week days? (you may chose more than one answer)

- ☐ 12-1pm
- ☐ 1-2pm
- ☐ 2-3pm
- ☐ 3-4pm
- ☐ 4-5pm
- ☐ 5-6pm
- ☐ Don't have a snack

13. Please describe what you usually eat/drink for this snack between lunch and dinner on week days

14. Do you usually eat dinner on week days?

- ◯ No
- ◯ Yes

EXPLORE Eating Habits

15. What time do you usually eat dinner on week days?

- ◯ Before 6pm
- ◯ 6-8pm
- ◯ 8-10pm
- ◯ Don't eat dinner at all

16. Please describe what you usually eat for dinner on week days

17. Do you usually have a snack after dinner on week days?

- ◯ No
- ◯ Yes

18. What time do you usually eat this snack on week days? (you may chose more than one answer)

- ☐ 6-7pm
- ☐ 7-8pm
- ☐ 8-9pm
- ☐ 9-10pm
- ☐ After 10pm
- ☐ Don't have a snack

19. Please describe what you usually eat/drink for a snack on week days

20. What time do you usually go to bed on week days?

21. Do these times change on weekends?

- ◯ No
- ◯ Yes

5. This part refers to food/eating habits on weekend days (Saturday and Sunday...

EXPLORE Eating Habits

1. What time do you usually wake up on weekends?

2. Do you usually eat breakfast on weekends?

- ◯ No
- ◯ Yes

3. What time do you usually eat breakfast on weekends?

- ◯ Before 6am
- ◯ 6-8am
- ◯ 8-10am
- ◯ Don't eat breakfast at all

4. Please describe what you usually eat for breakfast on weekends

5. Do you usually have a snack (any food or drink between meal times) between breakfast and lunch on weekends?

- ◯ No
- ◯ Yes

6. What time do you usually eat a snack between breakfast and lunch on the weekend? (you may chose more than one answer)

- ☐ 6-7am
- ☐ 7-8am
- ☐ 8-9am
- ☐ 9-10am
- ☐ 10-11am
- ☐ 11-12pm
- ☐ Don't have a snack

7. Please describe what you usually eat/drink for a snack between breakfast and lunch on weekends

EXPLORE Eating Habits

8. Do you usually eat lunch on weekends?

- ◯ No
- ◯ Yes

9. What time do you usually eat lunch on weekends?

- ◯ Before 12pm
- ◯ 12-2pm
- ◯ After 2pm
- ◯ Don't eat lunch at all

10. Please describe what you usually eat for lunch on weekends

11. Do you usually have a snack (any food or drink between meal times) between lunch and dinner on weekends?

- ◯ No
- ◯ Yes

12. What time do you eat a snack between lunch and dinner on weekends? (you may chose more than one anwser)

- ☐ 1-2pm
- ☐ 2-3pm
- ☐ 3-4pm
- ☐ 4-5pm
- ☐ 5-6pm
- ☐ 6-7pm
- ☐ Don't have a snack

13. Please describe what you usually eat/drink for a snack between lunch and dinner on weekends

14. Do you usually eat dinner on weekends?

- ◯ No
- ◯ Yes

EXPLORE Eating Habits

15. What time do you usually eat dinner on weekends?

- ◯ Before 6pm
- ◯ 6-8pm
- ◯ 8-10pm
- ◯ Don't eat dinner at all

16. Please describe what you usually eat for dinner on weekends

17. Do you usually have a snack after dinner on weekends?

- ◯ No
- ◯ Yes

18. What time do you usually eat this snack on weekends? (you may chose more than one answer)

- ☐ 6-7pm
- ☐ 7-8pm
- ☐ 8-9pm
- ☐ 9-10pm
- ☐ After 10pm
- ☐ Don't have a snack

19. Please describe what you usually eat/drink for a snack on weekends

20. What time do you usually go to bed on weekends?

6.

1. Do you eat differently when attending social occasions?

- ◯ No
- ◯ Yes

EXPLORE Eating Habits

2. Please describe these social occasions below. Include a description of the type of social occasion (eg. going to a party, going out to dinner), how often you would attend this occasion and the type of food and drink you would typically consume.

Social occasion description:

Occasion 1

Occasion 1 description and frequency

Occasion 1 food and beverage choices

3. Special occasion description

Occasion 2

Occasion 2 description and frequency

Occasion 2 food and beverage choices

4. Special occasion description

Occasion 3

Occasion 3 description

Occasion 3 food and beverage choices

5. Special occasion description

Occasion 4

Occasion 4 description

Occasion 4 food and beverage choices

6. Special occasion description

Occasion 5

Occasion 5 description

Occasion 5 food and beverage choices

7. Special occasion description

Occasion 6

Occasion 6 description

Occasion 6 food and beveage choices

EXPLORE Eating Habits

8. Please give an answer for how often you usually practice the following behaviours. Please tick one box per line

	Never	Rarely	Sometimes	Often	Always
Reading food labels when deciding what to eat?	◯	◯	◯	◯	◯
Eat sweets (e.g. chocolate, lollies, cakes, biscuits)	◯	◯	◯	◯	◯
Eat meals without meat (a vegetarian meal)?	◯	◯	◯	◯	◯
Eat fried foods (e.g. fried chicken, fried fish)?	◯	◯	◯	◯	◯
Remove the skin from chicken?	◯	◯	◯	◯	◯
Trim (cut away) the fat from meat?	◯	◯	◯	◯	◯
Eat take-away foods?	◯	◯	◯	◯	◯
Eat until you are stuffed?	◯	◯	◯	◯	◯

9. For which of the following foods do you choose low fat alternatives regularly? (Please tick either YES, NO or Not Applicable)

	No	Yes	Not Applicable
Milk (low fat or fat free)	◯	◯	◯
Crisps (low fat)	◯	◯	◯
Crackers (low fat)	◯	◯	◯
Margarine (lite or low fat)	◯	◯	◯
Ice cream (low fat or sorbet)	◯	◯	◯
Salad dressings or mayonnaise (lite or low fat)	◯	◯	◯
Cheese (low fat)	◯	◯	◯
Meat (Premium minced beef)	◯	◯	◯
Fast food choices (salads, grilled)	◯	◯	◯

Appendix B: 4-day Weighed Food Record

Subject Number:

MASSEY UNIVERSITY
COLLEGE OF HEALTH
TE KURA HAUORA TANGATA

Women's EXPLORE Study

Weighed 4 Day Food Record

Thank you very much for taking part in the EXPLORE Study. We are extremely grateful for your time, effort and commitment!

If you have any questions, please contact EXPLORE staff on:
414 0800 (extn 41189) email: explore@massey.ac.nz or
Zara Houston 021 029 31620 AJ Hepburn 027 404 5351

All information in this diary will be treated with the strictest confidence. No one outside the study will have access to this.

We will arrange the return of your food diary and accelerometer (and may be in contact with you regarding the food diary).

Subject Number:

What to do?

- Record all that you eat and drink on the following dates.

_____

_____

_____

_____

- If possible record food at the time of eating or just after – try to avoid doing it from memory at the end of the day.
- Include all meals, snacks, and drinks, even tap water.
- Include anything you have added to foods such as sauces, gravies, spreads, dressings, etc.
- Write down any information that might indicate **size or weight** of the food to identify the portion size eaten.
- Use a new line for each food and drink. You can use more than one line for a food or drink. See the examples given.
- Use as many pages of the booklet as you need.

Describing Food and Drink

- Provide as much detail as possible about the type of food eaten. For example **brand names and varieties / types** of food.

General description	Food record description
Breakfast example – cereal, milk, sugar	1 cup Sanitarium Natural Muesli 1 cup Pam's whole milk 1 tsp Chelsea white sugar
Coffee	1 tsp Gregg's instant coffee 1 x 200ml cup of water 2 Tbsp Meadow fresh light green milk
Pasta	1 cup San Remo whole grain pasta spirals (boiled)
Pie	Big Ben Classic Mince and Cheese Pie (170g)

Subject Number:

- Give details of all the **cooking methods** used. For example, fried, grilled, baked, poached, boiled…

General description	Food record description
2 eggs	2 size 7 eggs fried in 2tsp canola oil 2 size 6 eggs (soft boiled)
Fish	100g salmon (no skin) poached in 1 cup of water for 10 minutes

- When using foods that are cooked (eg. pasta, rice, meat, vegetables, etc), please record the **cooked portion** of food.

General description	Food record description
Rice	1 cup cooked Jasmine rice (cooked on stove top)
Meat	90g lean T-bone steak (fat and bone removed)
Vegetables	½ cup cooked mixed vegetables (Wattie's peas, corn, carrots)

- Please specify the **actual amount of food eaten** (eg. for leftovers, foods where there is waste)

General description	Food record description
Apple	1 x 120g Granny Smith Apple (peeled, core not eaten – core equated to ¼ of the apple)
Fried chicken drumstick	100g chicken drumstick (100g includes skin and bone); fried in 3 Tbsp Fern leaf semi-soft butter

- **Record recipes** of home prepared dishes where possible and the proportion of the dish you ate. There are blank pages for you to add recipes or additional information.

Subject Number:

Recording the amounts of food you eat

It is important to also record the quantity of each food and drink consumed. This can be done in several ways.

- By using household measures – for example, cups, teaspoons and tablespoons. Eg. 1 cup frozen peas, 1 heaped teaspoon of sugar.
- By weight marked on the packages – eg. a 425g tin of baked beans, a 32g cereal bar, 600ml Coke
- Weighing the food – this is an ideal way to get an accurate idea of the quantity of food eaten, in particular for foods such as meat, fruits, vegetables and cheese.
- For bread – describe the size of the slices of bread (eg. sandwich, medium, toast) – also include brand and variety.
- Using comparisons – eg. Meat equal to the size of a pack of cards, a scoop of ice cream equal to the size of a hen's egg.
- Use the food record instructions provided to help describe portion sizes.

General description	Food record description
Cheese	1 heaped tablespoon of grated cheese 1 slice cheese (8.5 x 2.5 x 2mm) 1 cube cheese, match box size Grated cheese, size 10B

- If you go out for meals, describe the food eaten in as much detail as possible.
- ***Please eat as normally as possible - don't adjust what you would normally eat just because you are keeping a diet record and be honest! Your food record will be identified with a number rather than your name.***

Subject Number:

Example day

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed (units, measures, weight)
Example 7:55am	Sanitarium weetbix	2 weetbix
" "	Anchor Blue Top milk	150ml
" "	Chelsea white sugar	2 heaped teaspoons
" "	Orange juice (Citrus Tree with added calcium – nutrition label attached)	1 glass (275 ml)
10.00am	Raw Apple (gala)	Ate all of apple except the core, whole apple was 125g (core was ¼ of whole apple)
12.00pm	Home made pizza (recipe attached)	1 slice (similar size to 1 slice of sandwich bread, 2 Tbsp tomato paste, 4 olives, 2 rashers bacon (fat removed), 1 Tbsp chopped spring onion, 3 Tbsp mozzarella cheese)
1.00pm	Water	500ml plain tap water
3.00pm	Biscuits	6 x chocolate covered Girl Guide biscuits (standard size)
6.00pm	Lasagne	½ cup cooked mince, 1 cup cooked Budget lasagne shaped pasta , ½ cup Wattie's creamy mushroom and herb pasta sauce, ½ cup mixed vegetables (Pam's carrots, peas and corn), 4 Tbsp grated Edam cheese
6.30pm	Banana cake with chocolate icing (homemade, recipe attached)	1/8 of a cake (22cm diameter, 8 cm high), 2 Tbsp chocolate icing
" "	Tip Top Cookies and Cream ice cream	1 cup (250g)
7.30pm	Coffee	1 tsp Gregg's instant coffee 1 x 300ml cup of water 2 Tbsp Meadow fresh blue top milk 2 tsp sugar

Subject Number:

Date_____ **DAY 1**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **DAY 1 continued**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Recipes (Day 1)

Subject Number:

Recipes (Day 2)

Subject Number:

Date_____ **DAY 2**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **DAY 2 continued**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **DAY 3**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **DAY 3 continued**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Recipes (Day 3)

Subject Number:

Recipes (Day 4)

Subject Number:

Date_____ **DAY 4**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **DAY 4 continued**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **(spare pages)**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Subject Number:

Date_____ **(spare pages)**

Time food was eaten	Complete description of food (food and beverage name, brand, variety, preparation method)	Amount consumed

Appendix C: Coding the eating habits questionnaire

This appendix describes how the eating habits questionnaire can be coded. Certain questions use the information and templates provided in Appendices D to H.

Eating habits questionnaire

The eating habits questionnaire can be coded as follows:

Appetite and weight

Question number	Question	How responses were coded	Notes
1	Please enter your study identification number	Code as participant's identification number	Used to anonymously identify participants
2	How would you describe your appetite?	1 = Good 2 = Fair 3 = Poor	
3	Are you happy with your current weight?	1 = Yes 2 = No	
4	If no, what would you like your weight to be?	1 = + 1 kg 2 = + 2 kg 3 = + 2 to 5 kg 4 = + 5 to 10 kg or more 5 = - 1 kg 6 = - 2 kg 7 = - 2 to 5 kg 8 = - 5 to 10 kg or more	This is only answered if participant responded "No" in question 2 For simplicity of analysis, group the responses together as follows: 1 = + 1 to 5 kg 2 = + 5 to 10 kg or more 3 = - 1 to 5 kg 4 = - 5 to 10 kg or more
5	Please give a reason for your choice	1 = Health 2 = Image and body satisfaction 3 = External influence 4 = Pregnancy related 5 = Sport and exercise 6 = Muscle and tone	This is only answered if participant responded "No" in question 2 As participants provided a descriptive response, group these according to the categories provided
6	Has your weight changed in the past year?	1 = No 2 = Gained 3 = Lost	

Question number	Question	How responses were coded	Notes
7	If yes, by how much has your weight changed?	1 = + 1 kg 2 = + 2 kg 3 = + 2 to 5 kg 4 = + 5 to 10 kg or more 5 = - 1 kg 6 = - 2 kg 7 = - 2 to 5 kg 8 = - 5 to 10 kg or more 9 = unsure	Code similarly to question 4 This is only answered if participant responded “Yes” in question 6 1 = + 1 to 5 kg 2 = + 5 to 10 kg or more 3 = - 1 to 5 kg 4 = - 5 to 10 kg or more 5 = Unsure
8	Please tell us why you lost or gained weight	1 = Lifestyle 2 = Diet 3 = Exercise 4 = Diet and exercise 5 = Self control 6 = Uncertain and don’t say	Group answers according to the categories provided
9	Is your weight an issue for you	1 = Yes 2 = No	
10	If yes, how are you trying to control your weight?	1 = Dieting 2 = Exercise 3 = Healthy eating regime 4 = Combination of diets, exercise and healthy eating 5 = Don’t know how to do it 6 = Other	

General eating habits

Question number	Question	How responses were coded	Notes
11	Please tell us a bit about your food habits	1 = Different every day 2 = Different only sometimes during a week 3 = Different only during weekend days 4 = Very monotonous	
12	Your diet is mainly based on	1 = High protein content foods 2 = High fat content foods 3 = High carbohydrate content foods 4 = Different foods every day	
13	Your snacks are mainly based on	For each of the 4 snack options code as: 1 = Eaten 2 = Not eaten	The 4 snack options are: 1. Fruit, fruit juice, fruit and milk shakes, yoghurt 2. Biscuits, crackers, bread, stick bread 3. Hot chips, pop corn, peanuts, chips, soft drinks 4. Sweets, chocolate, ice cream, cakes
14	Do you usually drink alcohol at meals?	1 = Always 2 = Often 3 = Sometimes 4 = Never	For simplicity of analysis, group the responses together as follows: 1 = Always and often 2 = Sometimes 3 = Never
15	Which beverages do you usually drink between meals?	1 = Water 2 = Soft drinks 3 = Alcoholic beverages 4 = Fruit, fruit juice, fruit and milk shakes	

Time distribution and food and food combinations eaten on weekdays

Question number	Question	How responses were coded	Notes
16	What time do you usually wake up on weekdays?	1 = Before 6am 2 = 6.00-7.59am 3 = 8.00-9.59am 4 = 10am or later	Group descriptive answers according to the categories provided
17	Do you usually eat breakfast on weekdays	1 = Yes 2 = No	
18	What time do you usually eat breakfast on weekdays?	1 = Before 6am 2 = 6-8am 3 = 8-10am 4 = Don't eat breakfast at all	
19	Please describe what you usually eat for breakfast on weekdays		See Appendix D on how to code this descriptive question
20	Do you usually have a snack (any food or drink between meal times) between breakfast and lunch on weekdays?	1 = Yes 2 = No	
21	What time do you usually eat snacks between breakfast and lunch on weekdays? (you may choose more than one answer)	Before 6 am 6-7am 7-8 am 8-9 am 9-10 am 10-11 am 11-12 pm Don't have a snack	For simplicity merge the times into the following: Before 8am 8-10 am 10-12 pm Don't have a snack For each time code as: 1 = Eaten 2 = Not eaten Note: If participants left this question blank and responded "No" to question 20, assume they answered "Don't have a snack" for this question

Question number	Question	How responses were coded	Notes
22	Please describe what you eat/drink for a snack on weekdays		See Appendix D on how to code this descriptive question
23	Do you usually eat lunch on weekdays?	1 = Yes 2 = No	
24	What time do you usually eat lunch on weekdays?	1 = Before 12pm 2 = 12-2 pm 3 = After 2 pm 4 = Don't eat lunch at all	
25	Please describe what you usually eat for lunch on weekdays		See Appendix D on how to code this descriptive question
26	Do you usually eat a snack (any food or drink between meal times) between lunch and dinner on weekdays?	1 = Yes 2 = No	
27	What time do you usually eat a snack between lunch and dinner on weekdays? (You may choose more than one answer)	12-1 pm 1-2 pm 2-3 pm 3-4 pm 4-5 pm 5-6 pm Don't have a snack	For simplicity merge the times into the following: 12-2 pm 2-4 pm 4-6 pm Don't have a snack For each time code as: 1 = Eaten 2 = Not eaten Note: If participants left this question blank and responded "No" to question 26, assume they answered "Don't have a snack" for this question
28	Please describe what you eat/drink for this snack between lunch and dinner on weekdays		See Appendix D on how to code this descriptive question

Question number	Question	How responses were coded	Notes
29	Do you usually eat dinner on weekdays?	1 = Yes 2 = No	
30	What time do you usually eat dinner on weekdays?	1 = Before 6 pm 2 = 6-8 pm 3 = 8-10 pm 4 = Don't eat dinner at all	
31	Please describe what you usually eat for dinner on weekdays		See Appendix D on how to code this descriptive question
32	Do you usually have a snack after dinner on weekdays?	1 = Yes 2 = No	
33	What time do you usually eat this snack on weekdays? (You may choose more than one answer)	6-7 pm 7-8 pm 8-9 pm 9-10 pm After 10 pm Don't have a snack	For simplicity merge the times into the following: 6-8 pm 8-10 pm After 10 pm Don't have a snack For each time code as: 1 = Eaten 2 = Not eaten Note: If participants left this question blank and responded "No" to question 32, assume they answered "Don't have a snack" for this question
34	Please describe what you usually eat/drink for a snack on weekdays		See Appendix D on how to code this descriptive question
35	What time do you usually go to bed on weekdays?	1 = 8-9.59 pm 2 = 10-11.59 pm 3 = 12 am or later	Group answers according to the categories provided
36	Do these times change on weekends?	1 = Yes 2 = No	

Time distribution and food and food combinations eaten on weekends

Question number	Question	How responses were coded	Notes
37	What time do you usually wake up on weekends?	1 = Before 6am 2 = 6.00-7.59am 3 = 8.00-9.59am 4 = 10am or later	Group descriptive answers according to the categories provided
38	Do you usually eat breakfast on weekends?	1 = Yes 2 = No	
39	What time do you usually eat breakfast on weekends?	1 = Before 6am 2 = 6-8am 3 = 8-10am 4 = Don't eat breakfast at all	
40	Please describe what you usually eat for breakfast on weekends		See Appendix D on how to code this descriptive question
41	Do you usually have a snack (any food or drink between meal times) between breakfast and lunch on weekends?	1 = Yes 2 = No	
42	What time do you usually eat snacks between breakfast and lunch on weekends? (you may choose more than one answer)	Before 6 am 6-7am 7-8 am 8-9 am 9-10 am 10-11 am 11-12 pm Don't have a snack	For simplicity merge the times into the following: Before 8am 8-10 am 10-12 pm Don't have a snack For each time code as: 1 = Eaten 2 = Not eaten Note: If participants left this question blank and responded "No" to question 41, assume they answered "Don't have a snack" for this question

Question number	Question	How responses were coded	Notes
43	Please describe what you eat/drink for a snack on weekends		See Appendix D on how to code this descriptive question
44	Do you usually eat lunch on weekends?	1 = Yes 2 = No	
45	What time do you usually eat lunch on weekends?	1 = Before 12pm 2 = 12-2 pm 3 = After 2 pm 4 = Don't eat lunch at all	
46	Please describe what you usually eat for lunch on weekends		See Appendix D on how to code this descriptive question
47	Do you usually eat a snack (any food or drink between meal times) between lunch and dinner on weekends?	1 = Yes 2 = No	
48	What time do you usually eat a snack between lunch and dinner on weekends? (You may choose more than one answer)	1-2 pm 2-3 pm 3-4 pm 4-5 pm 5-6 pm 6-7 pm Don't have a snack	For simplicity merge the times into the following: 12-2 pm 2-4 pm 4-7 pm Don't have a snack For each time code as: 1 = Eaten 2 = Not eaten Note: If participants left this question blank and responded "No" to question 47, assume they answered "Don't have a snack" for this question
49	Please describe what you eat/drink for this snack between lunch and dinner on weekends		See Appendix D on how to code this descriptive question

Question number	Question	How responses were coded	Notes
50	Do you usually eat dinner on weekends?	1 = Yes 2 = No	
51	What time do you usually eat dinner on weekends?	1 = Before 6 pm 2 = 6-8 pm 3 = 8-10 pm 4 = Don't eat dinner at all	
52	Please describe what you usually eat for dinner on weekends		See Appendix D on how to code this descriptive question
53	Do you usually have a snack after dinner on weekends?	1 = Yes 2 = No	
54	What time do you usually eat this snack on weekends? (You may choose more than one answer)	6-7 pm 7-8 pm 8-9 pm 9-10 pm After 10 pm Don't have a snack	For simplicity merge the times into the following: 6-8 pm 8-10 pm After 10 pm Don't have a snack For each time code as: 1 = Eaten 2 = Not eaten Note: If participants left this question blank and responded "No" to question 53, assume they answered "Don't have a snack" for this question
55	Please describe what you usually eat/drink for a snack on weekends		See Appendix D on how to code this descriptive question
56	What time do you usually go to bed on weekends?	1 = 8-9.59 pm 2 = 10-11.59 pm 3 = 12 am or later	Group answers according to the categories provided

Social occasions

Question number	Question	How responses were coded	Notes
57	Do you eat differently when attending social occasions	1 = Yes 2 = No	
58	Please describe these social occasions below. Include a description of the type of social occasion (e.g. going to a party, going out to dinner), how often you would attend this occasion and the type of food and drink you would typically consume	Social occasions were coded as: 1 = Dinner or lunch with friends or family 2 = Brunch or lunch 3 = Morning tea, meet friends at a café 4 = Party 5 = Church 6 = Drinks with friends or work 7 = Holiday, camping 8 = Takeaways 9 = Other (movies, book club with friends, date night, dessert night, sports event) Coding of frequency of social occasions: 1 = Weekly or more often 2 = Fortnightly and monthly 3 = Less than monthly Coding of beverages: 1 = Alcohol 2 = Soft drinks and juice 3 = Water 4 = Tea, coffee, hot chocolate 5 = Alcohol or soft drinks 6 = Soft drinks or water 7 = Alcohol or water 8 = Water or coffee Common foods consumed for each occasion were described, rather than coded	A box was provided where participants could describe the social occasion and the frequency they would attend this. Another box was provided for participants to describe their food and beverage choices Participants could describe seven different social occasions

Eating behaviours

Question number	Question	How responses were coded	Notes
59	Please give an answer for how often you usually practice the following behaviours. Please tick one box per line Behaviours: 1. Reading food labels when deciding what to eat? 2. Eat sweets (e.g. chocolate, lollies, cake, biscuits)? 3. Eat meals without meat (a vegetarian meal)? 4. Eat fried foods (e.g. fried chicken, fried fish)? 5.Remove the skin from chicken? 6. Trim (cut away) the fat from meat? 7. Eat takeaway foods? 8. Eat until you are stuffed?	1 = Never 2 = Rarely 3 = Sometimes 4 = Often 5 = Always	All 8 behaviours had the same 5 response options For simplicity of analysis, group the responses together as follows: 1 = Never and rarely 2 = Sometimes 3 = Often and always

Low fat alternatives

Question number	Question	How responses were coded	Notes
60	For which of the following foods do you choose low fat alternatives regularly (Please tick either yes, no or not applicable) Low fat alternatives: 1. Milk (low fat or fat free) 2. Crisps (low fat) 3. Crackers (low fat) 4. Margarine (lite or low fat) 5. Ice cream (low fat or sorbet) 6. Salad dressings or mayonnaise (lite or low fat) 7. Cheese (low fat) 8. Meat (premium minced beef) 9. Fast food choices (salads, grilled)	1 = Yes 2 = No 3 = Not applicable	All 9 low fat alternatives had the same three response options

Appendix D: Coding the descriptive questions on food intake in the eating habits questionnaire and food record

This appendix contains instructions on how the descriptive questions about food intake for meals and snacks were coded. Instructions are provided on how the EHQ should be coded when used in the future and how the WFR was coded for validation purposes.

The following instructions are intended to help future researchers wanting to analyse the data gathered through SurveyMonkey. The excel document provided in Appendix E can be used to code the aspect of the eating habits questionnaire (EHQ) or 4-day weighed food record (WFR) that asks participants to describe what they usually eat for meals and snacks on weekdays and weekends.

How to set up the excel document

In an excel document set up multiple tables (per Appendix E). Use a new tab for each of the following categories:

- Weekdays
    - Breakfast
    - Snack between breakfast and lunch
    - Lunch
    - Snack between lunch and dinner
    - Dinner
    - Snack after dinner
- Additional tabs for weekends
    - Breakfast
    - Snack between breakfast and lunch
    - Lunch
    - Snack between lunch and dinner
    - Dinner
    - Snack after dinner

Appendix F provides a list of all the food categories and food items used.

How to code the EHQ and WFR using the excel document

Please read through all the instructions prior to beginning coding, as some columns (ID number, EHQ description, EHQ time) are easier to copy between tabs before new rows are inserted into the excel document.

Eating habits questionnaire (EHQ)

1. *ID number:* Copy each participant's ID number into the column titled 'ID'. Participants' ID numbers should initially be in consecutive cells going down. Ensure every new row that is inserted contains the ID number for that participant.

2. *EHQ description:* Next to each participant's ID number, in the column labelled 'EHQ description', copy their descriptive answer from the EHQ for the respective meal or snack period.

3. *Questionnaire:* The column labelled 'Questionnaire' relates to how many food items or combinations a participant describes for the meal or snack period in the EHQ.

4. *EHQ time*: In the row labelled EHQ 1 record the time each participant selected for the time they consume each meal or snack. If participants indicate they don't eat that meal or snack, no further coding may be required (*Note: this is easier to code prior to inserting new rows for coding the foods and food combinations into the excel document)*.

5. *Food columns*:

    - The food category headings are:

        - Protein
        - Carbohydrate
        - Vegetables
        - Takeaways
        - Other

- Fruit
- Drinks

- Food items are listed under each category (details in Appendix F).

- Set up the excel document so that all the foods listed are in a separate column. This should be done for each meal and snack period.

6. *Coding the EHQ*:

- For each participant read the description in the 'EHQ description column' to determine what foods are eaten and in what combinations.

- For example in the template the description for participant 250005 reads 'meat and vegetables with potato, rice or pasta'. Per Appendix F code these as meat, non-starchy vegetables (NSV), starchy vegetables (SV) and grain. From the description we can also see these foods may be eaten in different combinations: 1) 'meat + NSV + SV', and 2) 'meat + NSV + grain'.

- Combination one would be coded in the row EHQ 1. To code each food place a '1' under the correct column to indicate that food was eaten. As this combination is 'meat + NSV + SV', a '1' would be placed under the meat, NSV and SV columns.

- To code the second combination, insert a new row called EHQ 2 and place a '1' under the meat, NSV and grain columns.

- For each additional food or meal combination add a new row as required called EHQ 3, EHQ 4 etc.

7. *EHQ food combinations*: Once all the individual foods have been coded combine these foods to create food combinations. This allows foods that are commonly consumed together to be determined. In the excel document these will be coded under the column called "food combinations". Add a new column for each additional combination. The combinations that should be created for meals and snacks are shown in the table below. Examples of

more specific foods included under each combination on weekdays and weekends are provided in Appendix G.

- For example, for participant 250005 a column would be created called ‘meat + SV + NSV’ and another called ‘meat + grain + NSV’. Code these similarly to the individual foods i.e. place a ‘1’ in the correct column and the same row as the foods used to create that combination.

Food combinations to code as meals and snacks

Meal or snack period	Food combinations
Meal	
Breakfast	• Dairy + grain • Dairy + grain + fruit • Bready foods • Dairy + grain + canned fruit • Dairy + grain + basic sandwich • Protein foods
Lunch	• Bready foods • Leftover combinations • Protein + NSV • Sushi combinations • Protein + grain + NSV • Soup combinations • Protein + grain • Grain + NSV • Takeaway combinations • Protein + SV + NSV
Dinner	• Meat + grain + NSV • Meat + SV + NSV • Meat + NSV • Bready foods • Takeaway combinations • Vegetarian meals • Meat + grain • Soup combinations • Meat + SV + grain + NSV • Leftover combinations
Snack	
Between breakfast and lunch	• Dairy + grain
Between lunch and dinner	• Dairy + grain
After dinner	• Dairy + grain

8. *EHQ summary*: For each participant add this row to summarise their responses (per Appendix E). Place a '1' in each respective column that food was eaten by this participant, irrespective of how many times it was coded.

Weighed food record (WFR)

9. *Questionnaire:* The column labelled "Questionnaire" relates to how many days are provided in the WFR. For each day of the FR insert a new row and call these 'WFR 1', 'WFR 2', 'WFR 3' or 'WFR 4'. Code the respective weekdays and weekends in different tabs. (*Note: there may be more than one row for each WFR day, if there is more than one eating occasion during that period, particularly for snacks)*.

10. *WFR day*: Record the day of the week each of the four food records were recorded on. Weekday and weekend days will be in different tabs.

11. *WFR time*: Record the time the meal or snack was eaten for each day of the FR so comparisons can be made with the EHQ. Insert a new row for every eating occasion during each meal or snack period.

    - If no meal or snack is eaten during a time period (e.g. snack between breakfast and lunch) note that no meal or snack was eaten (see the WFR 4 row in template). No further coding is required as no foods were eaten.

12. *Coding the WFR*:

The WFR can be coded similarly to the EHQ (see step 6 for individual foods and step 7 for food combinations), however there are some slight differences:

- Use the WFRs filled in by participants to obtain information on the foods and food combinations consumed. From the dates participants filled the WFR in on code the days as either weekdays or weekends.

- For each day of the WFR insert a new row. In the questionnaire column label these 'WFR 1, WFR 2, WFR 3 or WFR 4'. Ensure each day is coded in the correct tab for either weekdays or weekends. When more

than one food or food combination is consumed during a meal or snack period, insert a new row under that same WFR day.

- Further assumptions used for coding the WFR are provided in Appendix H.

13. *WFR summary*: This row is coded similarly to the EHQ (see step 8), however summarise the WFR responses instead of the EHQ.

How to prepare the Excel document before exporting into SPSS for analysis

Currently the excel document contains all the information on participants' eating habits, however it needs to be manipulated further before it can be exported into SPSS for statistical analysis. It is crucial that for every participant the rows 'EHQ summary' and 'WFR summary' are spelt exactly the same, and data is coded accurately, as this is how the information will be sorted. The instructions provided should be repeated for each meal and snack period on weekdays and weekends. Each new tab created should be labelled suitably.

14. Select all cells in the column labelled 'Questionnaire'.

15. Using the 'filter' function, sort the cells by cell value. Choose the option so all cells are selected that equal 'EHQ Summary'.

16. For all participants highlight the cells for all foods and food combinations (i.e. both blank cells and those containing a '1'). To code all the blank cells with a '2' (i.e. not eaten) go: Edit → Go to → Special → Blanks → Ok; Enter the value '2, hold down control and press enter. All of the selected blank cells will now contain the value '2'.

17. For all participants copy the cells you have just selected (i.e. cells with a '1' and '2' for all foods and food combinations) into a new tab (*note: the filter function should still be turned on)*. Also copy participants ID numbers next to their responses so their answers can be identified. Ensure each column is

labelled to distinguish between the food item, meal or snack period, weekdays or weekends and the EHQ or WFR.

18. Repeat steps 14 to 17 for the cells ‘WFR Summary.

19. Repeat steps 14 to 18 for all meal and snack periods on weekdays and weekends.

20. The results are now ready to be exported into SPSS for statistical analysis.

Appendix E: Template used for coding the descriptive questions on food intake and the times meals are eaten in the eating habits questionnaire compared to the food record

Template used to code and validate the eating habits questionnaire and food record

						Food combinations	Protein		Carbohydrate			Vegetables	Takeaways	Other	Fruit	Drinks
ID number	**EHQ Description**	**Questionnaire**	**EHQ Time**	**WFR Day**	**WFR Time**		**Meat**	**Other protein options…[1]**	**SV**	**Grain**	**Other CHO options…[1]**	**NSV**	**Takeaway options…[1]**	**Other options…[1]**	**Fruit options…[1]**	**Drink options…[1]**
250005	Meat and vegetables with potato, rice or pasta	EHQ 1	6-8 pm				1		1			1				
		EHQ 2					1			1		1				
		WFR 2		Mon	7.20		1			1		1				
		WFR 3		Tues	7.50		1					1				
		WFR 4		Wed	No meal/ snack											
		EHQ Summary					1		1	1		1				
		WFR Summary					1		1	1		1				
Continue for each new participant																

CHO: Carbohydrate; EHQ: Eating habits questionnaire; WFR: Weighed food record; Mon: Monday; SV: Starchy vegetables; Tues: Tuesday; Wed: Wednesday

[1] Note: For "Other protein options…", "Other CHO options…", "Takeaway options…", "Other options…", "Fruit options…" and "Drink options…" continue with the foods listed under each of the categories in Appendix F respectively.

Note: This table refers to the aspects of the EHQ, which asks what is usually eaten for meals and snacks on weekdays and weekends respectively. Use a new table for each weekday and weekend meal and snack period.

Appendix F: Food categories used for the coding and validation of the eating habits questionnaire and food record

Protein

1. Meat - beef, lamb, chicken, pork, ham, bacon, fish, sausages, pate, when write “protein”
2. Eggs - all cooking methods (for scrambled eggs etc. don’t code extra milk if added to the eggs)
3. Legumes - tofu, chickpeas, beans, wasabi peas, hummus, baked beans
4. Nuts and seeds - have to have consumed a significant portion such as for snacks (e.g. exclude a sprinkling over cereal at breakfast)
5. Dairy products - cows milk, soy milk, nut milks etc., yoghurt, cheese (ice cream is separate)
6. Smoothie - smoothie, fruit smoothie that includes milk (do not add extra fruit to the fruit column), smoothie with protein powder, protein shake, up and go

Carbohydrate

7. Starchy vegetables (SV) - potato, kumara, taro, yam
8. Grains - rice, pasta, noodles, couscous, quinoa, pastry, oats/muesli/porridge, corn thins, crackers (includes plain crackers and when spreads (e.g. vegemite) are added), corn fritter, spaghetti, oat cakes, dumpling, when write “carbohydrate or starch”
9. Breads - toast with butter/margarine (when write “bread” for lunch), bagels
10. Basic sandwich - toast with butter or margarine and a spread (e.g. jam, peanut butter, vegemite), sandwich
11. Fancy sandwich - as a base contains meat, non-starchy vegetables and a sauce, also wraps, pita bread, panini, subway, burritos; add extra ingredients such as dairy for cheese when eaten

Vegetables

12. Non-starchy vegetables (NSV) - fresh (e.g. garden salad, tomato, avocado, salad, carrots) and frozen (e.g. peas, beans)

Fruit

13. Fresh fruit - fresh fruit, berries
14. Canned fruit - canned, dried and stewed fruit

Takeaways

15. Unidentified takeaways - only coded for the EHQ when the type of takeaway could not be determined

16. Pizza - homemade and takeaway
17. Pie
18. Hot chips - hash brown, wedges
19. Meal type takeaways - Thai, Chinese, Indian, Asian, kebab, go out to a restaurant, meals out
20. Café food - don't specify further the type of food eaten
21. Sushi
22. Burger and chips
23. Fish and chips
24. Chicken and chips e.g. KFC
25. Fried chicken
26. Burger - homemade and takeaways i.e. no chips

Other

27. Bakery items - muffin, cake, scone, crumpet, waffles, pancakes, pikelets, croissant, cupcake, doughnut, scroll, custard twist, something from the bakery
28. Baking - slice, baking, biscuit, macaroon, lamington
29. Lollies - lollies, liquorice, candyfloss
30. Chocolate - includes chocolate with nuts
31. Muesli bar - weight watchers bar, nut bar, one square meal bite
32. Chips - potato chips, corn chips, twisties, includes dip when eaten with chips
33. Savoury snack items - popcorn, savoury bakery items, savouries, pretzel, spring roll, sausage roll
34. Protein bar
35. Carbohydrate Gel e.g. Gu Gel
36. Ice-cream - ice cream, frozen yoghurt
37. Baked dessert - apple pie
38. Dessert - something sweet, cheesecake, jelly, pear pastry with jam, éclairs, don't specify the type of dessert
39. Soup - don't add the flavour soup to it e.g. chicken soup
40. Leftovers - when they write this don't go further into the combinations they suggest
41. Don't specify/very vague - this was only coded for the EHQ when participants what they ate was unable to be determined

Drinks

42. Tea, coffee - tea, herbal tea, instant coffee, coffee sachets
43. Café drink - mochachino, milky drinks, latte, plunger coffee with milk, hot spicy hot chocolate
44. Fruit juice - fruit juice, smoothie (fruit and vegetable based, without milk)

45. Fruit drink - fruit drinks, cordial, “juice”
46. Milk based drinks - milo, hot chocolate, nesquick, flavoured milk, iced coffee
47. Sugar sweetened beverages - soft drink, energy drink, sports drink
48. Diet drinks - diet soft drink, diet energy drink
49. Alcoholic beverages - beer, wine, spirits

Other Notes:

- Water, coconut water, soda water → haven’t included in coding comparison for food record
- Salad
    - Code as NSV if no further detail is provided
    - If more detail is provided on what is included in the salad code as the foods described e.g. chicken salad → meat + salad

Appendix G: Food categories included under each food combination for breakfast, lunch and dinner

Food categories included under each food combination for breakfast

Combination	Combinations that are included	
	Weekday	**Weekend**
Dairy + grain	• Dairy + grain	• Dairy + grain
Dairy + grain + fruit	• Dairy + grain + fruit	• Dairy + grain + fruit
Bread-based foods	• Egg + bread • Bread + NSV • Meat + dairy + basic sandwich • Meat + bread + NSV • Egg + basic sandwich • Dairy + bread • Dairy + basic sandwich • Legume + bread + NSV • Bread + fruit • Basic sandwich + fruit • Meat + bread	• Meat + bread • Meat + egg + bread • Meat + egg + dairy + bread • Meat + dairy + bread • Fancy sandwich + egg • Egg + bread • Egg + bread + NSV • Egg + bread + basic sandwich • Egg + dairy + bread • Egg + legume + bread • Egg + basic sandwich • Egg + fancy sandwich • Dairy + bread • Bread + NSV • Bread + fruit • Basic sandwich + fruit
Dairy + grain + canned fruit	• Dairy + grain + canned fruit	• Dairy + grain + canned fruit
Dairy + grain + basic sandwich	• Dairy + grain + basic sandwich	• Dairy + grain + basic sandwich
Protein foods	• Meat + egg • Nuts/seeds + dairy • Egg + legume	• Meat + egg • Egg + legume
Other combinations	• Grain + fruit • Dairy + grain + fruit + canned fruit • Protein + NSV • Dairy + fruit • Dairy + canned fruit • Dairy + grain + basic sandwich + fruit • Dairy + grain + fancy sandwich • Smoothie + basic sandwich • Smoothie + grain + basic sandwich + NSV • Meat + dairy + hot chips + bakery item • Egg + bread + NSV + hot chips • Legume + dairy + basic sandwich + NSV • Meat + egg + grain • Meat + egg + NSV • Egg + fruit	• Dairy + grain + basic sandwich + fruit • Dairy + fruit • Meat + egg + dairy + hot chips + NSV • Meat + egg + nuts/seeds + grain + NSV • Leftovers + grain • Meat + egg + NSV • Egg + NSV • Egg + dairy + NSV • Egg + grain + bread (egg and spaghetti on toast) • Meat + egg + SV + bread + NSV • Egg + SV + bread + NSV • Dairy + smoothie + fruit • Egg + fruit • Legume + NSV

Food categories included under each food combination for lunch

Combination	Combinations that are included	
	Weekdays	**Weekends**
Bread-based foods	• Fancy sandwich • Meat + bread • Meat + basic sandwich • Meat + dairy + bread • Meat + egg + legume + bread • Egg + bread • Egg + bread + NSV • Egg + dairy + bread + NSV • Dairy + bread + NSV • Dairy + bread • Legume + bread • Legume + bread + NSV • Legume + dairy + bread + NSV • Bread + NSV • Fancy sandwich + egg • Fancy sandwich + dairy • Fancy sandwich + legume + dairy • Fancy sandwich + egg + dairy	• Meat + dairy + bread • Meat + egg + bread • Meat + legume + dairy + bread • Meat + bread • Egg + bread + NSV • Egg + bread • Dairy + bread • Dairy + bread + NSV • Legume + dairy + bread + NSV • Legume + bread + NSV • Fancy sandwich • Fancy sandwich + dairy • Fancy sandwich + legume • Bread + NSV • Basic sandwich + fancy sandwich • Basic sandwich + dairy
Protein + grain + NSV	• Meat + egg + grain + NSV • Meat + grain + NSV • Meat + dairy + grain + NSV • Dairy + grain + NSV • Egg + grain + NSV	• Meat + grain + NSV • Meat + egg + grain + NSV • Egg + grain + NSV • Dairy + grain + NSV
Protein + SV + NSV	• Meat + SV + NSV • Meat + egg + SV + NSV • Meat + legume + SV + NSV • Legume + SV + NSV	• Meat + SV + NSV
Protein + NSV	• Meat + NSV • Meat + dairy + NSV • Meat + egg + NSV • Meat + egg + dairy + NSV • Meat + legume + NSV • Legume + dairy + NSV • Egg + legume + NSV • Dairy + NSV • Egg + NSV	• Meat + NSV • Egg + NSV • Meat + egg + dairy + NSV
Protein + grain	• Meat + grain • Meat + dairy + grain • Egg + grain • Dairy + grain	• Meat + grain • Dairy + grain • Egg + grain • Meat + egg + legume + dairy + grain
Grain + NSV	• Grain + NSV	• Grain + NSV
Sushi combinations	• Sushi • Sushi + meat • Sushi + SV + NSV • Sushi + soup • Sushi + soup + NSV • Sushi + soup + bread + dairy + meat	• Sushi • Sushi + NSV • Sushi + meat + NSV

Combination	Combinations that are included	
	Weekdays	**Weekends**
Takeaway combinations	• Meal type + bread + meat • Pie + bakery item • Egg + dairy + bread + NSV + hot chips • Burger and chips • Fried chicken • Pizza • Pie • Hot chips • NSV + hot chips	• Unidentified • Meat + NSV + hot chips • Burger • Burger and chips • Meal type • Pie • Hot chips • Pizza + pie • Pizza • Fancy sandwich + hot chips • Chicken and chips • Meat + bread + pie • Pie + bakery item
Leftover combinations	• Leftovers • Leftovers + NSV • Leftovers + dairy • Leftovers + bread + NSV • Leftovers + baking • Leftovers + soup + bread	• Leftovers • Leftovers + NSV
Soup combinations	• Soup • Soup + bread • Soup + meat • Soup + dairy • Soup + dairy + bread • Soup + dairy + NSV • Soup + meat + grain + NSV • Soup + sushi • Soup + sushi + NSV • Soup + sushi + bread + dairy + meat • Soup + leftovers + bread	• Soup • Soup + bread • Soup + dairy • Soup + dairy + bread

Other combinations	• Dairy + grain + bakery item
	• Dairy + bakery item
	• Bread + bakery item
	• Basic sandwich + bakery item
	• Fancy sandwich + meat + dairy + bakery item
	• Meat + legume + potato chips (nachoes)
	• Meat + dairy + grain + bread
	• Meat + grain + bread
	• Meat + egg
	• Legume + dairy + potato chips
	• SV + NSV
	• Savoury snack + baking (sausage roll and slice)
	• Pie + baking + savoury snack
	• Protein + SV + NSV*)*
	  ○ Meat + SV + NSV
	  ○ Meat + egg + SV + NSV
	  ○ Meat + legume + SV + NSV
	  ○ Legume + SV + NSV
	  ○ Dairy + SV + NSV
		• Dairy + bakery item
		• Dairy + bread + grain + NSV
		• Legume + dairy + potato chips
		• Dairy + bread + pie + savoury snack item
		• Dairy + grain + basic sandwich + NSV
		• Basic sandwich + hot chips
		• Fancy sandwich + hot chips
		• Grain + bread + basic sandwich (spaghetti on toast and basic sandwich)
		• Meat + grain
		• Egg + grain
		• Dairy + grain
		• Meat + egg + legume + dairy + grain
		• SV + NSV
		• Protein foods
		• Legume + dairy + NSV
		• Grain + NSV
		• Meat + SV + NSV

Food categories included under each food combination for dinner

Combination	Combinations that are included	
	Weekdays	**Weekends**
Vegetarian meals	• Legume + grain + NSV • Legume + SV + grain + NSV • Legume + SV • Legume + NSV • Legume + grain • Dairy + grain + NSV • Dairy + grain • Dairy + NSV • Egg + grain + NSV • Egg + SV + NSV • Egg + NSV • Grain + NSV • SV + NSV • SV + grain	• Grain + NSV • Legume + grain + NSV • Legume+ NSV • Egg + grain + NSV • Egg + legume • Dairy + grain • Dairy + grain + NSV • SV + grain + NSV • SV + NSV
Meat + grain + NSV	• Meat + grain + NSV	• Meat + grain + NSV
Meat + SV + NSV	• Meat + SV + NSV	• Meat + SV + NSV
Meat + grain	• Meat + grain	• Meat + grain
Meat + grain + SV + NSV	• Meat + grain + SV + NSV	• Meat + grain + SV + NSV
Meat + NSV	• Meat + NSV	• Meat + NSV
Bread-based foods	• Meat + bread + NSV • Meat + legume + bread + NSV • Meat + egg + dairy + bread + NSV • Legume + bread + NSV • Legume + bread • Egg + bread • Egg + legume + bread • Dairy + bread + NSV • Grain + bread (spaghetti on toast) • Fancy sandwich • Fancy sandwich + legume • Fancy sandwich + legume + dairy • Bread + NSV	• Meat + dairy + bread + NSV • Meat + legume + bread + NSV • Meat + dairy + bread • Meat + dairy + grain + bread • Meat + dairy + grain + bread + NSV • Meat + bread + NSV • Dairy + grain + bread • Egg + bread • Bread + NSV • Legume + bread • Legume + bread + NSV • Dairy + basic sandwich • Fancy sandwich • Fancy sandwich + legume • Fancy sandwich + legume + SV

Combination	Combinations that are included	
	Weekdays	**Weekends**
Takeaway combinations	• Meal type • Meal type + NSV • Burger • Burger and chips • Pizza • Sushi • Pizza + meat + grain • Pizza + fancy sandwich + legume + dairy • Unidentified • Meat + pie • Meat + hot chips • Meat + SV + hot chips • Meat + grain + NSV + hot chips • Meat + grain + NSV + sushi • Meat + dairy + pizza + pie + potato chips • Meat + NSV + hot chips • Legume + dairy + fancy sandwich + hot chips • Legume + NSV + pie • SV + grain + NSV + hot chips • Hot chips	• Pizza • Meal type • Hot chips • Sushi + meal type • Fish and chips • Fish and chips + NSV • Burger • Burger and chips • Chicken and chips • Meat + SV + hot chips • Meat + NSV + hot chips • Meat + SV + NSV + hot chips
Leftover combinations	• Leftovers • Leftovers + bread • Leftovers + grain • Leftovers + baking • Leftovers + NSV + hot chips • Leftovers + grain + bread + legume	• Leftovers • Leftovers + soup
Soup combinations	• Soup • Soup + bread	• Soup • Soup + bread • Soup + leftovers

Other combinations	• Protein + SV + NSV
	  ○ Meat + legume + SV + NSV
	• Protein + NSV
	  ○ Meat + egg + NSV
	• Protein
	  ○ Meat + egg + dairy
	• Protein + SV
	  ○ Meat + egg + SV
	  ○ Meat + SV
	• Protein + grain + NSV
	  ○ Meat + egg + grain + NSV
	  ○ Meat + legume + grain + NSV
	  ○ Meat + legume + dairy + grain + NSV
		• Meat + potato chips
		• Meat + legume + potato chips
		• Meat + SV + grain + NSV
		• Protein + NSV
		  ○ Meat + legume + NSV
		  ○ Meat + egg + NSV
		• Protein
		  ○ Meat + legume
		• Protein + SV
		  ○ Meat + SV
		  ○ Meat + dairy + SV
		• Protein + grain + NSV
		  ○ Meat + legume + grain + NSV
		  ○ Meat + egg + grain + NSV
		• Meat + dairy + grain + NSV

Appendix H: Assumptions used when coding the eating habits questionnaire and food record for validation

This appendix describes the major assumptions used when coding the EHQ and WFR for analysis and validation purposes for use in the document in Appendix D.

Eating habits questionnaire coding assumptions:

Food	Assumption
Porridge, cereal	Dairy + grain
Toast	Basic sandwich
Toast and eggs	Egg + bread
Eggs benedict	Bread + meat + egg
Toasted sandwich (when no description is provided what is in it)	Bread + meat + dairy
Café food, café meal	Under café food section for takeaways
Eaten out	Meal type takeaway
Corn fritter	Grain + NSV
Pasta	Grain (assume eaten with a sauce but this isn't coded as pasta is the main component of the meal)
Chopsuey	Meat + egg + grain + NSV
Quiche	Egg + grain + NSV
Stirfry, hot rice dish, rice dish, noodle dish, pasta dish, seafood dish	Meat + grain + NSV
Vege curry, vegetarian meals	Legume + grain + NSV
Casserole, curry	Meat + grain
Cottage pie	Meat + SV
BBQ	Meat + grain + NSV
Roast	Meat + SV + NSV
Vegetable stirfry, rice/pasta based (often vegetarian)	Grain + NSV
Macaroni cheese	Grain + dairy
Frittata	Egg + NSV
Nachos	Chips + meat
Protein, vegetable, carbohydrate	Meat + NSV + grain and Meat + NSV + SV
Carbohydrate	Assume both SV and grain i.e. two carbohydrate options

Food	**Assumption**
Burrito	Fancy sandwich + legume
Crackers and pate	Grain + meat
Crackers and hummus	Grain + legume
Hot drink	Tea/coffee
Egg on toast or French toast	Bread + egg
Crackers with vegemite/peanut butter	Grain
Cooked breakfast	Meat + bread + NSV
Other Assumptions	Examples
Foods had to be a significant portion to be coded	Nuts and seeds sprinkled on top of cereal – excluded Little bit of cheese in a salad – excluded
When foods are described generally and then specific examples given, go with the general option	Leftovers – code as leftovers rather than the examples given Dinners – go with the more general option
Participant's selected "No" they don't usually eat a meal or snack and left the next question blank that asked what time they eat this	Assume they would have answered the question they left blank as "Don't eat that meal or snack"

Food record coding assumptions:

The following table provides assumptions used for coding the foods eaten throughout the day for meals and snacks, and other practices in the WFR.

Food or practice seen in WFR	Coding assumption
Obvious breakfast with foods eaten beforehand	Code foods eaten for breakfast as breakfast and the foods eaten beforehand as a snack between breakfast and lunch
Participants only have coffee or tea in the morning	Snack between breakfast and lunch
Snacking pattern throughout morning with no breakfast eaten	Snack between breakfast and lunch
Late lunch (e.g. 4pm) and then dinner later on	Code as: late lunch as lunch, dinner as dinner and all snacks before hand as a snack between breakfast and lunch
Participants have brunch, especially on weekends when lunch isn't eaten later on	Before 11am: breakfast After 11am: lunch
Participants don't have lunch and just snack around lunchtime	Snack before 12pm: snack between breakfast and lunch Snack after 12pm: snack between lunch and dinner
Participants don't have dinner, but have snacks around dinnertime	Snack before 6pm: snack between lunch and dinner Snack after 6pm: snack after dinner
When possible try to keep one meal for breakfast, lunch and dinner. If there are two eating occasions that look like a meal, code both as a meal	
Alcohol consumed around dinnertime (e.g. an hour before dinner)	Code as part of dinner, but code alcohol on a separate line in the excel document so the times can be distinguished between
Bread was not the major carbohydrate for dinner and was eaten on the side	Bread was excluded from food combinations
Meal and snack times were coded in hourly periods for comparison with EHQ	8-9 am coded when foods consumed between 8-8.59 am

Assumptions used to classify foods as low and high fat from the WFR were as follows:

Low fat alternative from the EHQ	Low fat foods in the WFR	High fat foods in the WFR	Notes
Milk (low fat or fat free)	Vitasoy Oat milk, trim milk, skim milk, So Good almond milk, lite coconut milk	Vitasoy Soy Milk Original, dark blue top milk, Australia's Own Organic Soy milk	
Crisps (low fat)	Bagel crisps, Health Plus vege crisps, corn chips	Pringles, Grain Waves, Delisio, Ceres Organic Crispy Chips	
Crackers (low fat)	Rice crackers, corn thins, Huntly & Palmers Rosemary and Garlic crackers, Arnotts vita wheat crackers, Vita-Weat	Arnotts Cheds, Meal mates, Arnotts sesame wheat crackers	
Margarine (lite or low fat)	Olivio lite	Olivio, olivani	Butter, dairy blend and plant sterol margarine (e.g. flora proactive) not included
Ice cream (low fat or sorbet)	Low fat ice cream options, sorbet	Ice cream	
Salad dressings or mayonnaise (lite or low fat)	Lite options, chilli dressing, caramelised onion dressing	Aioli, sesame dressing, vinaigrette (with oil), Best Foods Mayo (unless specified lite version), Heinz salad cream, Newman's Caesar dressing	
Cheese (low fat)	Low fat when <30g/100g Feta, Edam, camembert, cottage, ricotta, parmesan, blue, noble tasty, halloumi, goats cheese, mozzarella, Philadelphia, swiss	High fat when >30g/100g Tasty, mild, cheddar, colby	
Meat (premium minced beef)	98% fat free ham, steaks, premium beef mince, pork ribs	Salami, bacon	
Fast food choices (salads, grilled)	Skin removed from chicken, vegies included, grilled meat, salad, sushi, sandwiches	Hot chips, fried chicken	

Appendix I: Food record FoodWorks assumptions

This appendix describes the major assumptions used during data entry of food records into Food Works.

Assumptions used when entering food records into FoodWorks

Food	Assumption
A day is from 12am to 11.59pm	
Aioli	Mayonnaise commercial
Bread	Light e.g. Pams Heavy e.g. Ploughman's Vogel's, enter Vogels Soy and linseed, enter soy and linseed option For all breads select U.N.I option (upper north island)
Capsicum	Yellow → Green Orange → Red
Chewy gum lollies	Fruit gums
Chickpea tin	62% Chickpeas e.g. A 390g tin has 244g chickpeas
Coffee from a café when volumes not provided	*Small* - 200ml, 1 shot to give 30ml espresso, 1 tb hot chocolate powder if a mochachino *Medium* - 300ml, 2 shot to give 60ml espresso, 2 tb hot chocolate powder if a mochachino *Large* - 400ml, 3 shot to give 90ml espresso, 3 tb hot chocolate powder if a mochachino The rest of the volume is 4 parts milk to 1 part water
Corn thins	Enter as original corn thins recipe from website
Gravy	Gravy powder to water in a ratio of 1 to 10 (e.g. 25g gravy powder to 250ml water)
Haloumi cheese	Edam cheese
Heaped teaspoon/tablespoon	1.25 tsp or 1.25 tb
Tinned tuna/salmon	Take off 20g for a small tin and 40g for a big tin to account for oil/water/sauce
Margarines	Polyunsaturated option: Sunrise, Flora, Meadowlea Monounsaturated option: Olivio, Olivani Dairy blends, enter as dairy blend: Anchor spreadable
McDonalds drink volumes	*Small* - 229ml *Medium* - 328ml *Large* - 501ml

Food	Assumption
McDonalds chip sizes	*Small* - 72g *Medium* - 104g *Large* - 128g
Milk	Select Auckland, November option
Silver top milk	4% of total milk used enter as cream, then enter the rest as milk, whole
Oat milk	Rice milk
Almond milk	Soy milk
New foods that have been added	Carbohydrate gel based on glucose liquid, BP Coconut water based on soft drink, soda water Protein powder based on skim milk powder Protein bar and protein bar low carbohydrate based on skim milk powder, honey and chocolate bar, milk
Oil	Composite if not specified
Peanut butter	Salt and sugar added unless otherwise specified
Raw meat	70% of the weight provided is the weight of the cooked meat
Raw vegetables	80% of the weight provided is the weight of the cooked vegetables
Steamed vegetables	Enter as microwaved, then boiled if this is not an option
Salt/Pepper	A pinch is 1.25g Use table salt unless otherwise specified
Sushi	45g of: Rice, cooked, sushi, part of California roll Fillings weigh 5g Total weight when not specified is 50g
Teaspoon	5g
Dessertspoon	10g
Tablespoon	15g

Appendix J: Recommended changes to the eating habits questionnaire

Recommended changes to the eating habits questionnaire, including tools that can be used from different aspects of the eating habits questionnaire

Tool	Original question*	Suggested changes
A tool that investigates views on Weight Status (WEST).	3. Are you happy with your current weight 4. If no, what would you like your weight to be? 5. Please give a reason for your choice 6. Has your weight changed in the past year? 7. If yes, by how much has your weight changed? 8. Please tell us why you lost or gained weight 9. Is your weight an issue for you 10. If yes, how are you trying to control your weight?	
A tool that investigates general eating habits including appetite perception and dietary composition.	2. How would you describe your appetite?	
	11. Please tell us a bit about your food habits	
	12. Your diet is mainly based on	
	13. Your snacks are mainly based on • Fruit, fruit juice, fruit and milk shakes, yoghurt • Biscuits, crackers, bread, stick bread • Hot chips, pop corn, peanuts, chips, soft drinks • Sweets, chocolate, ice cream, cakes	Additional snack foods should be added: • Nuts (rather than just peanuts) • Muesli bars and protein bars • Vegetables • Meat • Sushi
	14. Do you usually drink alcohol at meals? • Never • Sometimes • Often • Always	The response 'rarely' should be added Definitions in terms of frequency should be provided for each response: • Never: Never • Rarely: 2-3 times a month • Sometimes: Once a week • Often: 2-3 times a week • Always: Daily
	15. Which beverages do you usually drink between meals?	• An additional response called 'tea and coffee' should be added • An additional question should be added that asks about beverages consumed with meals (i.e. breakfast, lunch and dinner

Tool	Original question*	Suggested changes
B-EAT: a Breakfast Eating Assessment Tool	17. Do you usually eat breakfast on weekdays	
	18. What time do you usually eat breakfast on weekdays?	
	19. Please describe what you usually eat for breakfast on weekdays	Change to: Please describe what you usually **eat and drink** for breakfast on weekdays
	38. Do you usually eat breakfast on weekends?	
	39. What time do you usually eat breakfast on weekends?	
	40. Please describe what you usually eat for breakfast on weekends	Change to: Please describe what you usually **eat and drink** for breakfast on weekends
L-EAT: a Lunch Eating Assessment Tool	23. Do you usually eat lunch on weekdays?	
	24. What time do you usually eat lunch on weekdays?	
	25. Please describe what you usually eat for lunch on weekdays	Change to: Please describe what you usually **eat and drink** for lunch on weekdays
	44. Do you usually eat lunch on weekends?	
	45. What time do you usually eat lunch on weekends?	
	46. Please describe what you usually eat for lunch on weekends	Change to: Please describe what you usually **eat and drink** for lunch on weekends
D-EAT: a Dinner Eating Assessment Tool	29. Do you usually eat dinner on weekdays?	
	30. What time do you usually eat dinner on weekdays?	
	31. Please describe what you usually eat for dinner on weekdays	Change to: Please describe what you usually **eat and drink** for dinner on weekdays
	50. Do you usually eat dinner on weekends?	
	51. What time do you usually eat dinner on weekends?	
	52. Please describe what you usually eat for dinner on weekends	Change to: Please describe what you usually **eat and drink** for dinner on weekends
S-EAT: a Snack Eating Assessment Tool	20. Do you usually have a snack (any food or drink between meal times) between breakfast and lunch on weekdays?	
	21. What time do you usually eat snacks between breakfast and lunch on weekdays? (you may choose more than one answer)	
	22. Please describe what you eat/drink for a snack on weekdays	
	26. Do you usually eat a snack (any food or drink between meal times) between lunch and dinner on weekdays?	

Tool	Original question*	Suggested changes
	27. What time do you usually eat a snack between lunch and dinner on weekdays? (You may choose more than one answer)	
	28. Please describe what you eat/drink for this snack between lunch and dinner on weekdays	
	32. Do you usually have a snack after dinner on weekdays?	
	33. What time do you usually eat this snack on weekdays? (You may choose more than one answer)	
	34. Please describe what you usually eat/drink for a snack on weekdays	
	41. Do you usually have a snack (any food or drink between meal times) between breakfast and lunch on weekends?	
	42. What time do you usually eat snacks between breakfast and lunch on weekends? (You may choose more than one answer)	
	43. Please describe what you eat/drink for a snack on weekends	
	47. Do you usually eat a snack (any food or drink between meal times) between lunch and dinner on weekends?	
	48. What time do you usually eat a snack between lunch and dinner on weekends? (You may choose more than one answer)	
	49. Please describe what you eat/drink for this snack between lunch and dinner on weekends	
	53. Do you usually have a snack after dinner on weekends?	
	54. What time do you usually eat this snack on weekends? (You may choose more than one answer)	
	55. Please describe what you usually eat/drink for a snack on weekends	
A tool that investigates eating habits at social occasions	57. Do you eat differently when attending social occasions	
	58. Please describe these social occasions below. Include a description of the type of social occasion (e.g. going to a party, going out to dinner), how often you would attend this occasion and the type of food and drink you would typically consume	

Tool	Original question*	Suggested changes
A tool that investigates Healthy and Unhealthy eating Behaviours (HUB)	59. Please give an answer for how often you usually practice the following behaviours. Please tick one box per line Responses available: • Never • Rarely • Sometimes • Often • Always	Provide definitions on how frequently each response is such as: • Never: Never • Rarely: 2-3 times per month • Sometimes: Once a week • Often: 2-3 times per week • Always: Daily
A Low Fat Alternatives Tool (L-FAT)	60. For which of the following foods do you choose low fat alternatives regularly (Please tick either yes, no or not applicable) Responses available: • Yes • No • Not applicable	Remove not applicable from the response options

* Question numbers are those used in Appendix C