Development and Reliability of a Short Food Frequency Questionnaire to Assess Intake of Non-Essential Energy-Dense Nutritionally-Deficient (NEEDNT) Food Items

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Abstract

Background: Obesity is a large and growing problem in the world today due to its association with non-communicable disease. Dietary energy density is an important contributor to obesity. People who are overweight are more likely than people of a healthy weight to be consuming an energy densediet.Energy dense food often has a poor nutritional content highlightingthe importance of nutrient as well as energy density. Energy dense nutrient poor food is not required in the diet to maintain good health. There is currentlyno quick, cost effective toolto measureindividual intakes of energy dense nutrient poor food. The NEEDNT (Non-Essential, Energy-Dense, Nutritionally-Deficient) Food Listwas developed as a clinical tool to aid in weight management. It is a comprehensive list containing energy dense nutrient poor foods that should be avoided, withlower energy dense alternatives provided where possible. A Food Frequency Questionnaire (FFQ) based on this list could be used in research and clinical settings to assessindividual intakes of energy dense nutrient poor foods.

Objective: The aim of this study was to develop and assess the reliabilityof a short FFQbased on the newly developed NEEDNT Food List.

Design: This was a cross sectional test re-test observational study. Participants completed the Non-Essential Energy-Dense Nutritionally-Deficient Food Frequency Questionnaire (NEEDNT-FFQ) on two separate occasions, 7-10 days apart. Participants were required to be obese (BMI above 30kg/m²) and 18-65years of age.

Results: 13 men and 41 women completed the study. Participants had a BMI range of 30.1-54kg/m², and age range of 21-65years. Eight out of 48 FFQ items were consumed in the highest frequency category of 3+ times per day, with sugar, butter and whole milk being the three highest. BMI was significantly positively associated with total score in NEEDNT-FFQ time one, even after adjustment for age and education.

Theintraclasscorrelation coefficient (ICC) for total score between NEEDNT-FFQ time one and twowas0.83, and the Spearman's signed-rank correlation coefficient (SCC) was 0.77.The 48 food items in the NEEDNT-FFQ, ICCsranged from -0.01 for 'fruit flavoured roll ups, sticks and straps', to 0.97 for 'regular luncheon sausage', and SCCs ranged from -0.02 for 'fruit flavoured roll ups, sticks and straps' to 0.94 for 'alcoholic drinks'. AllSCCs were statistically significant except 'fruit flavoured roll ups, sticks and straps'. 'Glucose' could not be correlated asall participants consumed this item at a frequency of never or less than once per month. Cronbach's alpha scores (internal consistency) were 0.82 and 0.85 for NEEDNT-FFQ time one and tworespectively. The number of items correctly classified ranged from 50.0-100.0% (median 75.0%); correctly and adjacently classified ranged from 81.5-100.0% (median 98.1%), and beyond adjacent classification ranged from 0-18.5% (median 1.9%).

Conclusion: The newly developed NEEDNT-FFQ is a reliable tool to assess energy dense nutrient poor food intake in obese New Zealand adults. Once validated, this tool will be valuablein both research and clinical settings.

Key words: food frequency questionnaire, screener, energy density, nutrient density, body mass index, reliability, reproducibility

Preface

The present study follows on from the development of the NEEDNT (non-essential, energy-dense, nutritionally-deficient) Food List by Dr. Jane Elmslie (Department of Psychological Medicine, University of Otago). The NEEDNT Food List and the NEEDNT Foods Moderation Guidelines (currently in draft form), were developed to aid weight management in clinical and research settings. Theobjective of the present study was to develop a short food frequency questionnairebased on the NEEDNT food list, to assessenergy dense nutrient poor food intake titled the Non-Essential, Energy-Dense, Nutritionally-Deficient Food Frequency Questionnaire (NEEDNT-FFQ).

As part of the thesis, the candidate:

- Developed the information sheet, consent form, twoversions of the study advertisement, self-screening form and the NEEDNT-FFQ.
- Completed Application 'A' for ethical approval.
- Advertised the study to recruita minimum of 30-50 participants. This involved pinning advertisements on noticeboards and placing on cafeteria tables in various locations,as well as using internet systems of the Canterbury District Health Board, University of Otago and Southern District Health Board. The candidate also organised a colleague, Lisa Daniels (Master of Dietetics candidate, University of Otago) in a distance location to pin up advertisements.
- Answered phone calls, text messages and emails for people interested in taking part in the study, collectedscreening form information,madeappointments with eligible participants,bookedappointment rooms, followed up participants, and sent text message reminders.
- Collated a consultation pack which included draft NEEDNT Foods Moderation Guidelines from Renee Graham (Master of Dietetics candidate, University of

Otago), information about how to access ongoing weight management support and advice following the appointment, and healthy eating information pamphlets.

- Conductedface-to-face appointments which involved:

  Appointment one -answering questions participants had in regards to the study,ensuring consent forms were signed, taking participants height and weight measurements, checkingNEEDNT-FFQs were completed adequately and booking in follow up appointments for a week later.

  Appointment two– checking NEEDNT-FFQs were completed adequately,and conductingoptional 45minute weight management consultationsoffered as an incentive.

- Posted study packs for distance participants, made phone calls to distance participants to explain everything that was expected of them, and sent text reminders to complete questionnaires one week later.
- Took responsibility for data security.
- Completed all data entry andstatistical analyses with guidance from Associate Professor Chris Frampton and Dr. Jill Haszard.
- Completed the thesis write up with guidance from Dr. Jane Elmslie.

The study was designed by Dr. Jane Elmslie, Associate Professor Chris Frampton and the thesis candidate. Dr. Jane Elmslie completed Maori Consultation and submitted the Ethical Approval application. Sharron Burford (Advanced Learning Tutor, Master of Dietetics, University of Otago) and Dr. Jane Elmslie provided contacts for advertising. The Department of Human Nutrition (Dietetics) and Department of Psychological Medicine, University of Otago provided funding, equipment and facilities required for the study.

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For recruitment there are too many people to mention so a big thank you to everyone involved in the recruitment of participants. There were a lot of kind people who went out of their way to help me and I am very appreciative of you all for that. I couldn't have done it without you.

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List of Abbreviations

BMI	Body mass index
BAC	Beyond adjacent classification
CAC	Correctly and adjacently classified
CC	Correctly classified
FFQ	Food Frequency Questionnaire
ICC	Intraclass correlation coefficient
kg/m²	Kilogram per metre squared
NEEDNT	Non-essential, energy dense, nutritionally-deficient
NEEDNT-FFQ	Non-essential energy -dense nutritionally-deficient food frequency questionnaire
NZ	New Zealand
SCC	Spearman rank-order correlation coefficient
SD	Standard Deviation
USA	UnitedStates of America
USDA	United States Department of Agriculture

1. Introduction

Obesity prevalence is increasing worldwide, and health problems associated with obesity are well established(1, 2). Many dietary factors influence the development of obesity, in particular the energy density of food consumed(1, 3-6).

Energy density is the amount of energy (kilojoules or kilocalories) per gram of food or beverage (3, 5). The greater the energy density the higher the energy content per gram (5). There is a positive relationship between energy density of the diet, and weight status (4, 7-9).This means the higher the body mass index (BMI), the higher the energy density of the diet.Reducing energy density of the diet has been found to reduce body weight(5, 6, 10-13), and if maintained can lead to weight maintenance as well(14).

Diet quality refers to the nutritional value of foods and drinks consumed (15-17).Higher energy density is related to a lower diet quality (15, 17,18). Foods and beverages with poor nutritional value together with high energy densityare referred to as energy dense nutrient poor foods. These foods are considered to be ‘non-core’ (19) or ‘extra’ (20)as they are not required in the diet to maintain good health(19). Foods high in fats (particularly solid fats), added sugars, and/or alcohol, are generally energy dense and nutrient poor (21).

Although energy dense nutrient poor food intakehas a link withweight status, there is currently no quick cost effective tool to measure intake of these foods. Dietary assessment methods can be time consuming and costly(22). A quick Food Frequency Questionnaire (FFQ) to assess energy dense nutrient poor food intakemight bean efficient andcost effective tool for doing this.

An FFQ isa list of food items or groups with frequency of intake category options (22). There are currently only twoFFQsavailable which specifically measure energy dense nutrient poor food intake. The FFQdeveloped by Francis and Stevenson (23)focuses on

measuring adults' intakes of foods high in added sugar and saturated fat (23), while the FFQ developed byNelson and Lytle (24)assessesfast-food and beverage intake in adolescents (24).Francis and Stevenson (23)focused on macronutrient composition typical of energy dense nutrient poor foods, but did not taken in to account thenutritional value(23). Nelson and Lytle (24)looked at particular energy dense nutrient poor food items (24). Fast-food and beverages are only two aspectsof energy dense nutrient poor foods(25). The NEEDNT (Non-Essential, Energy-Dense, Nutritionally-Deficient) Food List was developed as an education tool for health professionals to use in weight management counseling(25). It is a comprehensive list containing energy dense nutrient poor foods that should be avoided, and those that have a lower energy alternative. Converting this list into a FFQ for assessing individual intakes of energy dense nutrient poor foods would be beneficial for conducting further research in this area.

To develop a new questionnaire it is important to design the FFQ in a manner that aims at the target population (22). It is also important to assess the reliability and validity of the FFQ to ensure it measures what it is intended to measure in a reliable manner(22, 26). This is usually completed by measuring test re-test reliability and relative validity against a more valid dietary assessment method(22).

The aim of this study isto develop and examine the reliability of a self-administered food frequency questionnaire (FFQ) designed to assess energy dense nutrient poor food intake inobese New Zealand (NZ) adults.

2. Literature Review

2.1 Background

2.1.1 Prevalence, Causes and Health Effects of Obesity

Obesity is a large and growing problem in developed and developing countries (1, 2). In the latest New Zealand Adult Nutrition Survey 37.0% of the population were overweight, and 27.8% were obese based on World Health Organisation BMI categories (27). The obesity rates increased from the 1997 New Zealand National Nutrition Survey which found that 17.0% of males and 20.6% of females were obese (27). These increasing rates are probably the result of lifestyle factors such as diet and inactivity (28). The association between obesity and non-communicable disease is well established (1). The risk of type 2 diabetes, coronary heart disease, stroke, and some cancers, increases linearly throughout the healthy weight range and rises sharply at BMI ≥30 (1, 2, 29, 30).

2.1.2Dietary Factors Associated with the Development of Obesity

Macronutrient composition (28, 30), energy density (1, 3-6), glycaemic index (31, 32), glycaemic load (32), excessive consumption of 'junk food' (33, 34) and portion sizes (35), are among the important dietary factors that have been found to influence the development of obesity. Differences in these factors can affect the amount of energy consumed, which in turn affects weight status (28, 31,36-38).

2.1.3 Dietary Interventions for Treating Obesity

The effectiveness of numerous dietary intervention strategies designed to reduce energy intake has been evaluated in overweight/obese individuals (39, 40). The effects on weight loss outcomes and weight gain prevention of differences in dietary patterns, macronutrient composition and energy density have been studied in various settings (39, 41,42). Dietary supplements have also been trialed with little success; those found to reduce weight have produced negative side effects (43). The Mediterranean dietary pattern (39, 44), low

calorie, low fat and carbohydrate, high protein (39, 45-48), and less energy dense diets (9, 49) have successfully produced weight loss, but the ability for this to carry through to weight maintenance is less clear. Apart from diet, interventions combining diet with physical activity and behaviour change techniques have produced more successful weight loss outcomes (39, 41,50). All settings (face to face, telephone and internet based) can produce significant weight loss but interventions delivered face-to-face produce greater weight loss than those delivered via the internet (42).

2.2Energy Dense, Nutrient Poor Diets

2.2.1What is Energy Density and Why Should We Worry aboutIt

Energy dense, high fat and/or high sugar foods are readily available in the environment (1). Cohen et al. (34)found that United States of America (USA) individuals are consuming these foods in far greater amounts than is recommended by the United States Department of Agriculture (USDA) Dietary Guidelines (30, 34). Overconsumption of energy dense food items can contribute to excess energy intake and therefore excess body weight (1, 3-6). This is partly due to the ability for a large amount of energy to be consumed in a small portion of food(1, 5,6). This means it is easier to over-consume calories as the body does not have enough time to tell the brain to stop eating, which is likely to be contributing to the worldwide obesity problem (1, 5, 6). The hyper-palatability of these foods is also of great concern as evidence is accumulating to suggest that they may have addictive properties similar to tobacco and other drugs (1, 51-55). Another concerning factor is the greater cost associated with a less energy dense diet, making a higher energy dense diet more affordable (19, 56-60).

2.2.2Definitions of Energy Dense, Nutrient Poor Food

In the literature, a number of different terms are used to describe these ‘non-core’(19) or ‘extra’(20) foods. The USDA Dietary Guidelines for Americans refer to discretionary

calories; the number of calories left over after nutrient requirements have been met (30). The recently developed, NEEDNT (Non-essential, energy-dense, nutritionally-deficient) Food List, designed as a tool for weight management is based on the concept of discretionary calories (25). It is simpler than some existing systems, focusing on foods that are sources of saturated fat, added sugars and alcohol, whilst taking nutrient density in to account(25). However it has been criticised for the inclusion of some relatively unprocessed foods such as full fat dairy products and honey, and the exclusion of some energy dense nutrient rich foods such as hard cheese. These foods are included/excluded because the NEEDNT Food List addresses the nutrient density as well as energy density of food items which is often not taken in to account (61). The NEEDNT Food List does not target the sodium content of foods as salt has no calories so does not directly relate to weight management (25). This needs to be kept in mind when using the NEEDNT food list and other discretionary calorie tools due to the importance of dietary sodium moderation for health (30, 62).

2.2.3 Macronutrient Composition and Energy Density

Non-core foods are high in fat and/or sugar, and often low in protein (1). Fat has a high energy density (9kilocalories per gram) causing it to have a large influence on the energy density of a food (5, 63). Energy dense diets are associated particularly with a higher intake of saturated and trans fats (28, 64). However, energy intake has been found to have a relationship with energy density that is independent of fat intake, highlighting the multifactorial nature of energy density (65, 66). Although sugar is less energy dense than fat (4kilocalories per gram), it is nonetheless an important determinant of energy density, due to the high sugar content of many discretionary foods (5, 67). Individuals' intakes of sugar sweetened food and beverages have been found to be above recommendations and increasing, with a potential relationship found between sugar intake (particularly sugar

sweetened beverages) and body weight (67). Dietary protein may be important for satiety in weight loss and weight maintenance and is often low in energy dense nutrient poor foods (68, 69). In general, energy density has been found to have a stronger relationship with weight status than with macronutrient composition (49, 66).

2.2.4Effect on Diet Quality

Many tools have been developed to assess the quality of individual diets compared to recommended dietary intakes or particular dietary patterns such as the Mediterranean diet (16, 17). Using a variety of these measures it has been found that diets high in energy dense foods are associated with a poorer diet quality (15, 17, 18). Azadbakht et al(18)found that not only do people with energy dense diets have a lower diet quality, but have a higher prevalence of micronutrient deficiencies as well (18). This association is likely to be because energy dense foods contain minimal nutrients essential to health (21).

2.3 Association with Obesity

2.3.1 Association between Energy Density and Bodyweight

The diets of obese individuals are typically more energy dense than those of their lean counterparts (4, 7-9). Iqbal, Helge et al. (70)found a relationship between higher energy density and weight gain in women but not men (70). Two prospective cohort studies provide further evidence for a relationship between energy density and weight gain in females (64, 71). Another study found no relationship between energy density and weight change but a small but significant relationship between energy density and waist circumference in males and females (72). A systematic review conducted by 2010 Dietary Guidelines Advisory Committee concluded that there was sufficient evidence for a relationship between energy density and body weight (9). The relationship between energy density and body weight seems to be stronger with the exclusion of beverages in the calculation of dietary energy density (3, 9).

2.3.2Role of Energy Density in Dietary Interventions for Obesity

Achieving weight loss through reducing dietary energy density has shown promising results (5, 6,10-13). Individuals tend to eat the same volume of food regardless of energy density, so reducing energy density reduces their total energy intake and ultimately achieves weight loss (1, 5, 66). In the long term participants have not always managed to maintain a less energy dense diet, however when long term change indietary energy density has been achieved, long term change in weight status has been seen (14). Some researchers suggest that individuals consuming a low energy dense diet may increase the volume of their food intake to compensate for the decrease in their energy intake, sotherefore reducing energy density may be ineffective for weight control (73). Nonetheless both the World Cancer Research Fund and the USDA have concluded that there is sufficient evidence to promote less energy dense foods such as whole fruits and vegetables as substitutes for energy dense foods as this has been demonstrated to reduce energy intakes and body weight (29, 30). Palatability has been shown to be important for sustaining a lower energy dense diet. Liking for a spaghetti bolognaise meal lower in energy density decreased over 5 days of consumption, whereas liking for the regular energy dense version did not (74). This barrier will need to be overcome to ensure that changes in dietary energy density are maintained over the long term.

2.3.3 Summary

The health complications associated with increasing obesity rates are of concern. The energy density of the diet is important, due to its link with poor diet quality, excess energy intake, and weight status. The use of energy density in dietary interventions has produced promising results. When assessing energy density of individual diets it is important to use a reliable, accurate dietary assessment method. There are three main dietary assessment

methods currently available to measure consumption of energy dense foods in the diet and/or assess overall energy density of the diet.

2.4 Dietary Intake Assessment Tools

2.4.1 Diet Records

Diet records involve recording all food and beverages at the time of consumption, over a particular time period (22). Quantities can be estimated (using household measures) or weighed (using scales) (22). The number of days collected, and diet record method used depends on the objectives of the study (22). Weighed diet records are considered the most accurate dietary method for assessing usual dietary intake of an individual(22). They do however have a large time and cost associated with their use and are only appropriatein research with literate, motivated participants (22). Diet records varying from 3-7dayshave been used to assess energy density of the diet in studies where funding and time permits (12, 70).

2.4.2 Twenty-Four Hour Diet Recalls

Diet recalls involve trained personnel interviewing an individual to recall all food and beverages consumed in the last 24hours, or preceding day (22). The use of a single 24hour diet recall assesses an individual's actual intake over one day, and multiple recalls can be used to assess their usual intake (22). Diet recalls cause less respondent burden and cost less than diet records, but because they rely on memory they can be a less accurate measure of dietary intake (22). Using standardised methods around dietary recall collection, in particular the comprehensive training of interviewers, can increase precision and accuracy. (22). Diet recalls are also more appropriate to use in lower literacy populations compared to diet records (22). Twenty-fourhour diet recalls are often used for national surveys due to the large scale of data collectionmaking diet records too costly and time intensive (8, 20) . Single diet recalls were collected in the National Health And Nutrition

Examination Survey III and were used to assess energy density of the diet in the general USA population (8). Other large scale studies have used dietary recalls in relation to energy density. For example, two 24 hour diet recalls per participant were used to assess the relationship between dietary energy density and energy intake, the weight of food consumed, and body weight (4), and three 24 hour diet recalls were used to look at the relationship between energy density of the diet and body weight over 6 years (71).

2.4.3 Food Frequency Questionnaires

Non-quantitativeFFQs are a list of food items or groups with frequency of intake category options (22). FFQs usually have a specified time period, most commonly over the past year (75). With the inclusion of portion sizes, the FFQ becomes quantitative, enabling estimates of specific nutrient and energy intakes to be derived (22). Portion sizes can be predefined on the FFQ using writing and/or photographs, or otherwise defined by the individual completing the FFQ (75). FFQs are a quick and low cost method compared to diet records and multiple diet recalls for measuring usual food intake (22). Non-quantitative FFQs are easier than quantitative FFQs for the participant as they do not require interpretation of portion sizes, but simply ask how often an individual consumes the food or beverage. This can be particularly good for use in low literacy populations. Even easier and quicker still are dietary screener FFQs which are a shorter FFQ that generally measures just 1 or 2 nutrients or food types (76). When developing an FFQ, thefood items, frequency categories, questionnaire layout and administration method are carefully selected depending on what is to be measured in the diet and what study population is to be targeted (22). Some FFQs have also hidden the foods they intend to measure within other foods to try to gain more accurate answers(77).However. this strategy hasbeen found to have no benefit(77). Studies have used FFQs to measure overall energy density of individual diets (64, 72). Currently there area small number of FFQs available to assess macronutrient composition typical of

energy dense nutrient poor foods, as well as specific energy dense nutrient poor items. These include fat(78-80), saturated fat and free sugars (23), alcohol (81), fast-food and beverages (24), and sugar sweetened beverages (82) (see Appendix A, page 45 for more information on these studies). However, nothing is available to measure total energy dense nutrient poor food intake.The development of a quick, low cost dietary screener FFQ measuring energy dense nutrient poor food intake would be useful to assess intakes in both clinical and research settings. FFQs are generally less accurate than diet records and recalls, but with assessment of reliability and validity against a more valid dietary measure, the accuracy of the FFQ can be improved (22, 26).

2.4.4 Diet History

A diet history is commonly used in a clinical setting to assess a patient's usual dietary intake(83). Diet histories vary in what they entail but often include a 24 hour recall, diet record or FFQ (83). Not only is information collected on dietary intake, but also medical or health history, medication history and social history to ensure maximal information for care (83).

2.4.5 Misreporting in Dietary Assessment

People often under-report or under-eat when completing a diet record or diet recall, and under-report in food frequency questionnaires also (22, 84). Socially undesirable foods including energy dense nutrient poor foods are more likely to be under-reported than socially desirable foods such as fruit and vegetables (22). This trend is known as a social desirability bias (22, 75). The frequency of under-reporting has meant that methods such as the Goldberg cut-off method (85), comparisons with the doubly labelled water, and the use of energy adjusted data have become common in order to account for the under-reporting(22). Mendez et al (86)suggest that the most appropriate method to account for under-reporting in obese individuals is touse basal metabolic rate equations, or doubly

labeled water-predicted total energy expenditure equations(86). Different groups of individuals are more prone to under-reporting than others. These include individuals with a higher BMI, those worried about body image, females, older people, those who practice dietary restraint, and smokers (22). A biomarker can be useful as it avoids misreporting, but accuracy can vary due to differences in absorption and metabolism (75). Availability of biomarkers can vary, and for energy dense nutrient poor foods, the use of biomarkers is limited (87).

2.5 Food Frequency Questionnaire Assessment of Reliability

Test re-test reliability assessment is the extent to which an FFQ completed twice in the same condition produces similar results (22, 75).

2.5.1 Time between Administrations

The time period between the two FFQ administrations varies between studies (22, 75). The most appropriate time period has not yet been established (22). In a review by Cade et al(75)time intervals ranged from 2hours to 15years, but produced higher correlations when repeated at 1 month or less (75). This finding is in agreement with the Physical Activity literature where test re-test intervals can range from 1-2weeks (88) to 2 years (89). A balance needs to be found between minimising the natural change in individuals' diets over time, and avoiding information being retained from the first administration (22).

2.5.2 Statistical Analyses

There are many methods available for statistical analyses of test-retest reliability. These include paired tests on the mean or median intake, degree of misclassification, mean and standard deviation of the differences between the twoadministrations, limits of agreement, and correlation analyses (22). Cade et al(75)reported that correlation coefficients were used in 90% studies (with results commonly between 0.5-0.7), absolute intakes in 39% of studies, and Bland-Altman method in less than 10% of studies (75). Intraclass correlation

coefficients (23, 90, 91), Pearson's Product moment correlation coefficients (79, 81, 92) and Spearman rank-order correlation coefficient (24, 81, 82) analyses are commonly used in fat and/or sugar and/or salt and/or alcohol intake FFQ test re-test studies. Spearman's correlations are more appropriate for non-normally distributed data, and Pearson's correlations are more appropriate for normally distributed data (22, 93).Intraclass correlation coefficients are deemed most appropriate as they assess both within and between person variation(22). Some studies combine analyses to look atdifferent aspects of the data, such as using both correlation and misclassification analyses (23, 81,94).Internal consistency can also be assessed using Cronbach's alpha(23) and Cohen's kappa(81). Physical Activity studiesuse similar statistical analysesto look at reliability assessment, using Cohen's Kappa, percent agreement, and Intraclass and Spearman's correlations (88). It is important to analyse each food group or item on the FFQ separately as foods/itemsconsumed more frequently have been found to be more reliable than those consumed less frequently (22, 75). This often leads to refining of FFQs for example, in an FFQ measuring beverage consumption Hedrick et al (95)reduced the number of items from 19 to 15 (95). See Appendix A, page 45, for further information on the statistical analyses of relevant reliability studies.

2.6 Food Frequency Questionnaire Validation Assessment

Validation assessment is the extent to which an FFQ measures what it intends to measure (22, 75). This assessment is often completed by looking at the relative validity of a questionnaire where by the FFQ (referred to as 'test' method) is compared to a 'reference' method. The reference method has a greater degree of validity such as using a biomarker, diet record, multiple diet recalls or a validated FFQ (22, 75). The test method and reference method must match for whether they assess actual or usual food intake (22).

2.6.1 Dietary Validation Method

Gibson (2005) recommends completing four 7 day diet records spread evenly over 1 year for validation of an FFQ measuring intake over the past year. This method has also been used for assessment of physical activity using 7 day physical activity records spaced over 1 year (89). In practice however it is more common to use just one multiple day diet record (75). Francis and Stevenson(23)used single 4 day diet records to validate an FFQ measuring beverage intake in adults (23). Multiple 24 hour diet recalls are also used but may produce portion size recall errors (22). It is important to select the number of days for diet records and diet recalls to cover the same time frame as the FFQ (22). A study by Nelson and Lytle (24)validating an FFQ measuring fast-food and beverage consumption in adolescents using three 24 hour diet recalls found that it was impossible to validate some items due to differing assessment periods (24). However, three 24 hour diet recalls were used successfully to validate a questionnaire designed to measure diet quality (17). Validation with a previously validated FFQ can also be used (75). Francis and Stevenson (23)used the Commonwealth Scientific and Industrial Research Organisation Food Frequency Questionnaire as well as a 4 day diet record to validate their newly developed FFQ measuring intakes of saturated fat and free sugar (23). Combining dietary intake measures is often seen in the literature, most commonly with the use of biomarkers (87). Braakhuis, Hopkins et al (96) used a 7 day diet record as well as a blood sample to validate their FFQ assessing antioxidant intake in NZ athletes (96).Urine samples can also be used to validate FFQs for example to measure sodium excretion (77), or protein intake (97). For studies looking at non-quantitative intakes of food items, a biomarker cannot be used as there is no nutrient intake derived (87). A diet history or prediction equation should not be used to validate FFQs as they do not produce accurate measures (22).

2.6.2 Statistical Analyses

Age does not appear to influence the validity of a dietary assessment method for adults ranging 18-64years old(22). Men and women should be analysedseparately as responses have been found to differ (22). Socioeconomic status and ethnicity may affect the outcome of relative validity so these factorsneed to be accounted for in statistical analyses(22). There is currently a lack of agreement over the most appropriate statistical method for validation of FFQs(22). Therefore, it important to seek statistical advice for the particular study being undertaken (22). Statistical methods currently used are the extent of agreement expressed as a comparison of group means (or medians), differences between measurements within individuals, rankings, correlation analyses, regression analyses, and use of the Bland-Altman analyses (22).Correlation coefficients are most often used for statistical analyses in validation studies (75). However this statistical analyses alone is not recommended as it only measures the degree to which methods are related rather than the agreement between two methods (75). Completing both correlation analyses and the Bland-Altman method is considered a more appropriate analyses (75). Physical Activity studies looking at the validity of questionnaires have used Spearman's correlations (88, 89), and Pearson's correlations(89) for statistical analyses, showing similar trends to the nutrition literature (75).See Appendix A, page 45, for further information on the statistical analyses of relevant validation studies.

2.7 Quantitative Versus Non-Quantitative FFQ

Correlation coefficients may vary more in non-quantitative studies looking at specific food items as opposed to nutrient intakes derived in quantitative studies (22). This is due to day to day variation in food item intake which is smoothed out when converted to nutrients (22). A larger range of correlation coefficients would therefore be expected when looking at food items versus nutrient intakes. The reliability and validity of an FFQ is usually

similar whether there is a standard portion size specifiedor not (75). However, participants choosing their own portion sizes were found to produce higher correlation coefficients than the use of standard portion sizes in validation studies (75).

2.8 Study Design for Reliability and Validity Assessment

Since completing both reliability and validity assessment of an FFQ is recommended, the order in which these occur needs to be planned. FFQ test-retest results have found higher correlations when completed after the validation reference method (22). To ensure that the correlations mimic how the FFQ will be used in future settings (where it will be completed without any prior dietary assessment), the reliability assessment should be done before validation (22). The other option is to complete the 2 assessments alongsideeach other using different participants with the same characteristics to complete the reliability and validation aspects(96). See Appendix A, page 45 for more information on the design of relevant studies.

2.9 Summary

Energy dense nutrient poor foods are an important aspect of the diet in relation to weight management. Since higher intakes of energy dense nutrient poor foods are associated with obesity, a focus on reducing intake in the diet should play an important role in dietary interventions for weight reduction. Lowering dietary energy density should also increase diet quality by reducing fat intakes (particularly saturated fat) and refined sugars, and increasing intake of complex carbohydrates, fruit and vegetables which are higher in nutritional value. Developing a quick easy to useFFQto predict individual's intakes of energy dense nutrient poor foods would be beneficial in both clinical and research settings.

3. Objective Statement

The positive relationship between energy dense nutrient poor food intake and weight status means it is an important dietary aspect to measure with the rising prevalence of obesity. No quick cost effective measurement tool currently exists. The present study aimed to develop a quick reliable tool to assess energy dense nutrient poor food intake in obese New Zealand adults. This tool was to be based on the newly developed NEEDNT food list (25).

(1) To develop the Non-Essential Energy-Dense Nutritionally-Deficient Food Frequency Questionnaire (NEEDNT-FFQ).

(2) To examine the reliability of the NEEDNT-FFQ in obese New Zealand adults.

4. Subjects and Methods

4.1 Study Design

The study was a cross sectional test retest observational design. Participants were asked to complete the Non-Essential Energy Dense Nutritionally Deficient Food Frequency Questionnaire (NEEDNT-FFQ) on two separate occasions, 7 days apart.

4.2 Development of the NEEDNT-FFQ

The NEEDNT-FFQ was developed to assess intakes of energy dense nutrient poor foods. It is based on the NEEDNT Food List (25) and the draft NEEDNT Foods Moderation Guidelines (98).

The NEEDNT-FFQ (see AppendixB, page 55 for a version that has been modified to fit margin requirements) is a compilation of 48 items, comprised over four pages, taking 5-15minutes to complete. It is non-quantitative, designed to measure usual intake during the past year, and to be self-administered.

4.2.1 NEEDNT-FFQ Items

The 48 items used in the NEEDNT-FFQ weregrouped into types of foodsthat matched the draft NEEDNT FoodsModeration Guidelines (98); this differs from the alphabetical listing used in the original NEEDNT Food List(25). Each of the 48 FFQ items has examples associated with it. For instance, biscuit examples include cookies, café-style biscuits, chocolate coated biscuits, layered biscuits with cream and/or jam filling, plain fruit or chocolate chip biscuits. To ensure that items which might not typically be thought of as belonging to a particular food category were captured by the FFQ, food item examples were taken from the NEEDNT FoodsModeration Guidelines(98)and the Kai-culator Dietary assessment software v0.87 (99). Kai-culator Dietary assessment software v0.87 (99) was used to create 48 food groups to match the food items on the NEEDNT-FFQ. Foods were then matched to the items on the NEEDNT-FFQ.

4.2.2 Frequency Categories

The frequency category options were adapted from a New Zealand study conducted by Wong et al (94) and an FFQ designed to measure beverage consumption in US adults (82). The higher intake frequencies were taken from the FFQ measuring beverage consumption and lower intake frequencies from Wong et al (94). Frequency categories were given a value one to seven for analyses, with one being the lowest intake category, and seven being the highest intake category.

4.3 Sample Size Calculation

A formal power calculation was not undertaken to determine the sample size required for the present study. After comparison with similar studies(23, 96) and discussion with a biostatistician it was determined that 30-50 participants would be appropriate for the study.

4.4 Ethical Approval

The study was approved by the University of Otago Human Ethics Committee, reference number 12/343 (see AppendixC, page 60). All participants provided written informed consent.

4.4.1 Informed Consent

Participants were given an information sheet (see AppendixD, page 87) to read and were encouraged to ask any questions they had about the study. When they were happy with what was being asked of them a consent form (see AppendixE, page 89) was signed prior to measuring their height and weight and completing the NEEDNT-FFQs. The researcher's contact details were provided on the information sheet which was given to participants to keep so they could contact the researcher at any time. The information and consent forms explained that they could withdraw from the study at any stage without any disadvantage.

4.4.2 Data Handling Approach

Each study participant had a numerical ID number allocated upon entry to the study which

was used in all written and electronic forms of data. A list of participants' names and code numbers was stored electronically for the duration of the data collection and write-up phase of the study; this was accessible by password only. The password was known only to the study researcher. Once the study was complete this list was destroyed. During the data collection, analyses and write up phase of the study, all data were stored in a locked filing cabinet in the National Addiction Centre, Department of Psychological Medicine, University of Otago Christchurch. The study researcher, Brigit Eder, held the key. Upon project completion, all data was transferred to Jane Elmslie in the same location, where it will be held securely for 10 years.

4.5 Participants

The participants were members of the public recruited by advertisement in the South Island of New Zealand.

4.5.1 Demographic Information

Information was collected on age, ethnicity, gender, usual income (brackets used were NZ dollar 0-20,000; 21-30,000; 31-40,000; 41-50,000; 51-70,000; 71-100,000; 100,000+), height, weight, and highest level of education. Income brackets were adapted from New Zealand Census 2006 Questionnaire (100) and a study using income brackets as part of a New Zealand workforce survey looking at food and nutrient intakes (101). All information was self-reported except for height and weight. Heights were measured to the nearest 0.5cm, using a mobile Secastadiometer andweight was measured to the nearest 0.1kg using mobile TanitaWedderburn HD-351calibrated scales. BMIwas calculatedto 0.1kg/m², by dividing weight (kg) by height (m²). Heavy clothing and shoes were removed for height and weight measures. Participants who were unable to attend a face-to-face interview with the researcher had their height and weight measured with a practice nurse at their preferred location.

4.5.2 Inclusion and Exclusion Criteria

Participants were men and women 18-65 years of age. They were fluent in oral, written and numerical English language with a BMI of 30kg/m² or above based on World Health Organisation BMI categories.Potential participants were excluded if they were taking insulin, steroids (excluding inhalers), atypical antipsychotic or weight loss medications, or were currently pregnant, breastfeeding, or planning on becoming pregnant within the study period.

4.5.3 Recruitment

Recruitment took place between 4th February and 12th April 2013. Public advertisements (see Appendices F and G, pages 90and 92) were placed on noticeboards at Christchurch Public Hospital, Burwood Hospital, The Princess Margaret Hospital and Dunedin Hospital, and leaflets left on Cafeteria tables. The study was also advertised in the Canterbury District Health Board CEO's Newsletter (twice), on the Southern District Health Board and Canterbury District Health Board intranets and on notice boards of a number of Christchurch Health Centres (Cashmere Health, Christchurch South Medical Centre, Kaiapoi Medical Centre, Travis Medical Centre, New Brighton Healthcare, St Martins and the Kingdom Clinic). Advertisements were also placed on University of Canterbury noticeboards on campus and in the Health Centre, emailed to University of Canterbury Administration and Recreation Centre staff and placed on Christchurch Polytechnic Institute of Technology noticeboards on campus and in the Health Centre. The study was also advertised through the University of Otago Christchurch staff email list (twice), the South City Mall Christchurch noticeboard, Piko wholefoods Christchurch noticeboard, LyttelPikoLyttelton Christchurch noticeboard, Lyttelton Library Christchurch noticeboard, Central Library Peterborough Christchurch noticeboard, The Herb Centre Christchurch

noticeboard, Beat Street Café Christchurch noticeboard, and via word of mouth. Permission was obtained from appropriate personnel at each venue described.

4.5.4 Incentive

A 45minute one-on-one weight management consultation with Student Dietitian Brigit Eder (the researcher) was offered as reimbursement for participants' time. The consultation was offered at the second study visit.

4.6 Study Protocol

People interested in the study contacted the researcher via phone or email. They each completed a screening form (see AppendixH, page 94) to ensure they were eligible to take part in the study. Questions were optional at this stage particularly in regards to ethnicity, usual income and highest level of education as consent had not yet been signed and these answers were not required to assess for eligibility. Unanswered questions were completed following the consent form being signed at the first appointment. Individuals who contacted via email were sent a self-screening form to complete and return via email. Those contacting by phone were offered the self-screening form via email, or it was completed verbally over the phone. If individuals did not respond to the self-screening form email, they were sent one follow up email to ask if they were still interested in taking part. If they did not return contact before 5th April 2013 they were excluded from the study.

4.6.1 Study Condition One - Christchurch Participants

Christchurch participants attended a first appointmentface-to-face at which they read the information sheet and signed the consent form. Height and weight were measured and they completed the NEEDNT-FFQ time one. Questionnaires were checked for completeness immediately after participants had finished. They were asked to return one week later for appointmenttwo where they completed the NEEDNT-FFQ time two, before having an optional weight management consultation. Participants were sent a text reminder the day

before (for early morning appointments) or on the morning of their appointment stating the time and location of their appointment.

4.6.2 Study Condition Two - Distance Participants One

A subset of the Dunedin participants attended the first visit face-to-face. At the conclusion of this visit, they were given a pre-stamped and addressed envelope and asked to complete the NEEDNT-FFQ time two a week later and return via post. A text message was sent one week after the first visit to remind participants to complete the NEEDNT-FFQ time two. These participants were offered the optional consultation in person where possible or via Skype.

4.6.3 Study Condition Three - Distance Participants Two

Participants taking part in the study from locations outside Christchurch, New Zealand and unavailable to attend the first appointment face-to-face in specific time periods, were posted their study packs consisting of an Information Sheet, Consent Form, NEEDNT-FFQ time one, NEEDNT-FFQ time two and two pre-stamped and addressed envelopes. Participantswere asked to contact the researcher immediately on receiving their packs at which time they were phoned to ensure all the information and what was expected of them was understood. The consent form and NEEDNT-FFQ time one was sent back immediately on completion. Participants were sent a reminder text message one week later to ensure they completed the NEEDNT-FFQ time two. Separate envelopes were used to ensure that participants did not copy responses from their first to their second NEEDNT-FFQ. Height and weight measurements were completed during consultations which took place during time periods when the researcher was in their location. Consultations were also offered as a Skype meeting but no participants chose this option. Participants who did not want an optional weight management consultation had their height and weight measured by a registered nurse in their preferred location.

4.7 Statistical Analyses

All questionnaire data and demographic variables were entered into an excel spreadsheet (see AppendixI, page 96). The differences between NEEDNT-FFQ time one and two were calculated and compiled into a new excel spreadsheet (see AppendixJ, page 106).All data entry was checked by the Student Dietitian researcher then converted in to an SPSS document. The statistical analyses were performed using SPSS, version 21.0 *(SPSS Inc., Chicago, IL, USA)*.

4.7.1 Describing Demographic Characteristics and NEEDNT Food Intake

Absolute values and percentages were reported for ethnicity (categorised into NZ Maori, NZ European, and other), income (categorised based on the 7 usual income brackets described earlier in 4.5.1), highest level of education (categorised in to Secondary or Tertiary), and gender (female or male). Mean and Standard Deviation were reported for age and BMI. Absolute values and percentages were reported for the intake frequency of each food item for NEEDNT-FFQ time one, as well as the Mean and Standard Deviation for total scores in NEEDNT-FFQ time one and two.

4.7.2 Relationship between Demographic Characteristics and NEEDNT Food Intake

The Shapiro-Wilk test was used to test whether the 48 questionnaire items and total scores of the two FFQ administrations were normally distributed.The Wilcoxon Signed-Rank test was used to look at the statistical significance of the difference in total scores between the two administrations and the three study conditions, as well as genders. Linear regression analyses were undertaken to examine the relationship between total scores and age, BMI, gender, ethnicity, income, education and study condition. Multiple regression analyses was used to examine the effect of BMI on FFQ responses adjusted for age and education.

4.7.3 Reliability Analyses

Differences in responses between NEEDNT-FFQ time one and two were used to determine

the number of items matching, those that were one frequency classification different and so on up to six frequency categories different (maximum possible), for each of the 48 items. The absolute values are presented in a histogram. These data are also reported in a table as the percentage correctly classified (CC), percentage correctly and adjacently classified (CAC) i.e. correctly classified and misclassified by one frequency category, and beyond adjacent classification (BAC) i.e. misclassified by more than one frequency category. Intraclass correlation coefficients (ICCs) and two-tailed Spearman rank-order correlation coefficients (SCCs) were calculated to examine the level agreement between NEEDNT-FFQ time one and two for all food items and total scores. The NEEDNT-FFQ time one and two total scores were assessed for internal consistency using Cronbach's alpha. SCC was used to assess if a linear relationship was present between differences in total scores (total score reliability) and BMI.

5.Results

5.1 Study Sample

A total of 73 individuals volunteered to take part in the study. Of these, five individuals emailed to show their interest but did not respond again so were excluded from the study. No data had been collected from these individuals so differences between them and the study participants were not determined. All those who completed the initial screening form completed the study. Thirteen individuals who volunteered to take part did not meet the inclusion/exclusion criteria: six individuals with a BMI under 30kg/m², two on insulin, one breastfeeding, one on antipsychotic medications, and three who had lost more than 5% of their body weight in the last six months. This left 55 eligible individuals who completed the NEEDNT-FFQ at both time one and two. Of these individuals one NEEDNT-FFQ got lost in the post and could not be retrieved so had to be excluded from analyses, leaving 54 participants included in the final analyses. Follow up time periods ranged from 7-10days. Participants had an age range of 21-65years, BMI range of 30.1-54 kg/m² (see table 5.1).

Table 5.1 Demographic characteristics of the study sample

Characteristics (n=54)	Mean(SD)
Age (years)	46.0 (10.92)
BMI (kg/m²)	35.3 (4.82)
	n (%)
Gender	
Male	13 (24.1%)
Female	41 (75.9%)
Ethnicity	
New Zealand European	49 (90.7%)
New Zealand Maori	3 (5.6%)
Other	1 (1.9%)
Missing data	1 (1.9%)
Yearly Income ($)	
<20,000	10 (18.5%)
21-30,0000	2 (3.7%)
31-40,0000	4 (7.4%)
41-50,00	8 (14.8%)
51-70,00	11 (20.4%)
71-100000	5 (9.3%)
100,00+	8 (14.8%)
Missing data	6 (11.1%)
Education	
Secondary	16 (29.6%)
Tertiary	37 (68.5%)
Missing data	1 (1.9%)
Condition	
Person + person	39 (72.2%)
Person + post	6 (11.1%)
Post + post	9 (16.7%)

SD = Standard Deviation, n = number of participants, % = percentage of participants, BMI = body mass index, $ = NZ dollar, Person + person = 2 NEEDNT-FFQ administrations in person, Person + post = first administration in person and 2nd completed via post, post + post = both administrations completed via post.

5.2 NEEDNT Food Intake

The frequencies of consumption of specific NEEDNT-FFQ items are presented in table 5.2. Eight FFQ items were reported as consumed three plus times per day with sugar, butter and solid fats, and whole milk being the highest. Sixteen items were consumed twice per day, 18 once per day, 29 five to sixtimes per week, all but three, two to fourtimes per week, all but two, once per week. All 48 items were consumed never or less than once per month by some participants. Total achievable scores rangedfrom 48 to 336. Total scores achieved ranged from 51 to 148 in NEEDNT-FFQ time one. The total score mean (SD) for NEEDNT-FFQ time one was 83.37 (16.15) and for time two was 78.22 (16.09).

Table 5.2 Frequency and percentages ofNEEDNT food intake of the study sample

	Never or less than once per month	Once per week	2-4 times per week	5-6 times per week	Once per day	Twice per day	3+ times per day
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Biscuits	15 (27.8)	10 (18.5)	16 (29.6)	7 (13.0)	3 (5.6)	1 (1.9)	2 (3.7)
Cakes and slices	29 (53.7)	17 (31.5)	6 (11.1)	2 (3.7)	0	0	0
Desserts/puddings	28 (51.9)	18 (33.3)	7 (13.0)	1 (1.9)	0	0	0
Doughnuts and sweetbreads	48 (88.9)	5 (9.3)	1 (1.9)	0	0	0	0
Muffins and scones	24 (44.4)	18 (33.3)	8 (14.8)	4 (7.4)	0	0	0
Pastries sweet	46 (85.2)	8 (14.8)	0	0	0	0	0
Pies, savouries and pasties	26 (48.1)	19 (35.2)	8 (14.8)	1 (1.9)	0	0	0
Quiche	40 (74.1)	13 (24.1)	1 (1.9)	0	0	0	0
Alcoholic drinks	14 (25.9)	9 (16.7)	19 (35.2)	7 (13)	4 (7.4)	0	1 (1.9)
Cordial and fruit drinks	33 (61.1)	7 (13.0)	5 (9.3)	3 (5.6)	3 (5.6)	1 (1.9)	2 (3.7)
Drinking chocolate[1]	27 (50.0)	12 (22.2)	10 (18.5)	1 (1.9)	2 (3.7)	2 (3.7)	0
Energy and sports drinks	43 (79.6)	6 (11.1)	4 (7.4)	0	0	1 (1.9)	0
Fruit juices	29 (53.7)	11 (20.4)	6 (11.1)	2 (3.7)	4 (7.4)	2 (3.7)	0
Regular powdered drinks	48 (88.9)	3 (5.6)	2 (3.7)	1 (1.9)	0	0	0
Regular soft drinks	28 (51.9)	10 (18.5)	10 (18.5)	3 (5.6)	0	2 (3.7)	1 (1.9)
Toasted muesli[2]	28 (51.9)	5 (9.3)	4 (7.4)	10 (18.5)	7 (13.0)	0	0
Chocolate	20 (37.0)	16 (29.6)	10 (18.5)	3 (5.6)	3 (5.6)	0	2 (3.7)
Sweets/lollies	27 (50.0)	17 (31.5)	6 (11.1)	2 (3.7)	2 (3.7)	0	0

Condensed milk	47 (87.0)	3 (5.6)	3 (5.6)	0	0	1 (1.9)	0
Flavoured milk/milkshakes	46 (85.2)	5 (9.3)	2 (3.7)	0	1 (1.9)	0	0
Ice cream	23 (42.6)	21 (38.9)	9 (16.7)	1 (1.9)	0	0	0
Sour cream	33 (61.1)	17 (31.5)	4 (7.4)	0	0	0	0
Whole milk	38 (70.4)	5 (9.3)	3 (5.6)	1 (1.9)	2 (3.7)	2 (3.7)	3 (5.6)
Yoghurt type products[3]	18 (33.3)	14 (25.9)	10 (18.5)	6 (11.1)	4 (7.4)	2 (3.7)	0
Fried food	22 (40.7)	21 (38.9)	11 (20.4)	0	0	0	0
Hot chips and wedges	16 (29.6)	27 (50.0)	11 (20.4)	0	0	0	0
Takeaways	24 (44.4)	20 (37.0)	10 (18.5)	0	0	0	0
Butter and solid fats	12 (22.2)	12 (22.2)	13 (24.1)	6 (11.1)	6 (11.1)	1 (1.9)	4 (7.4)
Cream	32 (59.3)	16 (29.6)	5 (9.3)	1 (1.9)	0	0	0
Reduced cream	46 (85.2)	7 (13)	1 (1.9)	0	0	0	0
Coconut cream	42 (77.8)	8 (14.8)	3 (5.6)	1 (1.9)	0	0	0
Oil based dressings	19 (35.2)	14 (25.9)	15 (27.8)	5 (9.3)	1 (1.9)	0	0
Fruit tinned in syrup	39 (72.2)	12 (22.2)	3 (5.6)	0	0	0	0
Fruit flavoured rollups[4]	53 (98.1)	1 (1.9)	0	0	0	0	0
Regular sausages	23 (42.6)	26 (48.1)	3 (5.6)	1 (1.9)	0	1 (1.9)	0
Regular salami	39 (72.2)	9 (16.7)	6 (11.1)	0	0	0	0
Regular luncheon sausage	48 (88.9)	3 (5.6)	3 (5.6)	0	0	0	0
High fat bacon	26 (48.1)	24 (44.4)	3 (5.6)	1 (1.9)	0	0	0
Other high fat processed meat	42 (77.8)	10 (18.5)	2 (3.7)	0	0	0	0
Chips/crisps	20 (37)	22 (40.7)	9 (16.7)	2 (3.7)	1 (1.9)	0	0
High fat crackers	28 (51.9)	15 (27.8)	7 (13)	2 (3.7)	1 (1.9)	1 (1.9)	0
Muesli and snack bars	35 (64.8)	6 (11.1)	8 (14.8)	4 (7.4)	0	1 (1.9)	0
Nuts roasted in fat or oil	36 (66.7)	11 (20.4)	5 (9.3)	1 (1.9)	0	1 (1.9)	0
Popcorn with butter or oil	52 (96.3)	0	2 (3.7)	0	0	0	0
Glucose	54 (100)	0	0	0	0	0	0
Sweet spreads	15 (27.8)	14 (25.9)	12 (22.2)	3 (5.6)	7 (13)	3 (5.6)	0
Sugar	18 (33.3)	5 (9.3)	7 (13)	6 (11.1)	7 (13)	4 (7.4)	7 (13)
Syrups, sauces and toppings	44 (81.5)	8 (14.8)	1 (1.9)	0	1 (1.9)	0	0

[1] Drinking chocolate and beverage powders
[2] Toasted muesli and any other breakfast cereal with ≥ 15g sugar per 100g cereal
[3] Yoghurt type products with ≥ 10g sugar per 100g yoghurt
[4] Fruit flavoured rollups, sticks and straps

5.3 Relationship between BMIand NEEDNT Food Intake

BMI was significantly positively associated with total score in NEEDNT-FFQ time one (B=0.95; 95% CI: 0.05-1.84; p=0.04), but not in NEEDNT-FFQ time two (B=0.82; 95% CI: -0.09-1.72; p=0.08). Afteradjusting for age and education, BMI remained positively associated with total score in NEEDNT-FFQ time one (B=1.05; 95% CI: 0.11-2.00; p=0.03), and was also found to be significant in NEEDNT-FFQ time two (B=.96; 95% CI: 0.03-1.89; p=0.04). No other demographic variables were significantly related to total scores.

5.4 Reliability Analyses

All 48 NEEDNT-FFQ items and total scores were not normally distributed (Shapiro-Wilk test $p<0.05$). Using the Wilcoxon signed-rank test, no significant differences were found between gender or the three study conditions when comparing the difference in total score between NEEDNT-FFQ time one and two ($p<0.05$).

The median ICC between NEEDNT-FFQ time one and two is 0.73 and ranged from -0.01to 0.97 (see table 5.3). The lowest ICCs were fruit flavoured rollups, sticks and straps (-0.01), pastries sweet (0.30), desserts/puddings (0.38), and nuts roasted in fat or oil (0.45). The median SCC was 0.68 and ranged -0.02 to 0.94 (see table 5.3). There were no correlations calculated for glucose as all participants reported consuming the item at a frequency of never or less than once per month on both occasions. The number of items correctly classified ranged from 50.0-100.0% (median 75.0%); those correctly and adjacently classified ranged from 81.5-100.0% (median 98.1%), those beyond adjacent classification ranged from 0-18.5% (median 1.9%) (See table 5.3). Proportions of correct classifications and misclassifications are presented in Appendix K, page 110. Cronbach's alpha (internal consistency) for NEEDNT-FFQ time one was 0.82 and 0.85 for time two.BMI and total score reliability were not linearly related, SCC -0.17, p=0.22.

Table 5.3 Correlation and degree of misclassification analyses between NEEDNT-FFQ time one and two

			Degree of misclassification		
Food item	SCC	ICC (95% CI)	CC (%)	CAC (%)	BAC (%)
Biscuits	.86*	.86 (.77, .92)	64.8	90.7	9.3
Cakes and slices	.58*	.65 (.46, .78)	66.7	94.4	5.6
Desserts/puddings	.51*	.38 (.13, .59)	61.1	92.6	7.4
Doughnuts and sweetbreads	.59*	.73 (.58, .84)	92.6	100.0	0.0
Muffins and scones	.65*	.60 (.40, .75)	74.1	94.4	5.6
Pastries sweet	.50*	.30 (.03, .52)	88.9	98.1	1.9
Pies, savouries and pasties	.82*	.85 (.76, .91)	79.6	100.0	0.0
Quiche	.62*	.67 (.50, .80)	83.3	100.0	0.0
Alcoholic drinks	.94*	.95 (.91, .97)	85.2	98.1	1.9
Cordial and fruit drinks	.79*	.80 (.68, .88)	70.4	87.0	13.0
Drinking chocolate and beverage powders	.80*	.74 (.59, .84)	72.2	96.3	3.7
Energy and sports drinks	.85*	.94 (.89, .96)	90.7	100.0	0.0
Fruit juices	.72*	.79 (.67, .87)	70.4	87.0	13.0
Regular powdered drinks	.51*	.72 (.56, .82)	85.2	98.1	1.9
Regular soft drinks	.62*	.81 (.70, .89)	63.0	90.7	9.3
Toasted muesli[1]	.91*	.91 (.85, .95)	74.1	94.4	5.6
Chocolate	.83*	.84 (.73, .90)	72.2	96.3	3.7
Sweets/lollies	.73*	.84 (.74, .90)	72.2	96.3	3.7
Condensed milk	.62*	.88 (.81, .93)	88.9	98.1	1.9
Flavoured milk/milkshakes	.49*	.80 (.68, .88)	85.2	98.1	1.9
Ice cream	.79*	.76 (.62, .86)	77.8	98.1	1.9
Sour cream	.60*	.59 (.38, .74)	79.6	96.3	3.7
Whole milk	.89*	.95 (.92, .97)	77.8	98.1	1.9
Yoghurt type products[2]	.69*	.66 (.49, .79)	53.7	85.2	14.8
Fried food	.67*	.62 (.42, .76)	72.2	96.3	3.7
Hot chips and wedges	.70*	.69 (.52, .81)	75.9	98.1	1.9
Takeaways	.75*	.72 (.56, .82)	74.1	98.1	1.9
Butter and solid fats	.81*	.80 (.67, .88)	51.9	87.0	13.0
Cream	.57*	.62 (.43, .76)	66.7	98.1	1.9
Reduced cream	.58*	.69 (.52, .81)	88.9	100.0	0.0
Coconut cream	.76*	.79 (.66, .87)	85.2	100.0	0.0
Oil based dressings	.76*	.67 (.50, .80)	57.4	94.4	5.6
Fruit tinned in syrup	.63*	.66 (.48, .79)	83.3	98.1	1.9

Fruit flavoured rollups, sticks and straps	-0.02	-.01 (-.27, .26)	96.3	100.0	0.0
Regular sausages	.71*	.74 (.59, .84)	72.2	98.1	1.9
Regular salami	.75*	.84 (.73, .90)	85.2	100.0	0.0
Regular luncheon sausage	.93*	.97 (.94, .98)	98.1	100.0	0.0
High fat bacon	.67*	.69 (.52, .81)	74.1	100.0	0.0
Other high fat processed meat	.68*	.63(.44, .77)	83.3	100.0	0.0
Chips/crisps	.75*	.74 (.59, .84)	63.0	98.1	1.9
High fat crackers	.58*	.66 (.48, .79)	59.3	94.4	5.6
Muesli and snack bars	.85*	.85 (.76, .91)	77.8	96.3	3.7
Nuts roasted in fat or oil	.64*	.45 (.21, .64)	74.1	92.6	7.4
Popcorn with butter or oil	.61*	.60 (.40, .75)	90.7	100.0	0.0
Glucose	.	.	100.0	100.0	0.0
Sweet spreads	.61*	.62 (.42, .76)	50.0	81.5	18.5
Sugar	.80*	.81 (.69, .88)	55.6	81.5	18.5
Syrups, sauces and toppings	.66*	.76 (.61, .85)	64.8	90.7	9.3
Total score	.77*	.83 (.72, .90)			

. study sample all reported consumption of never or less than once per month on both administrations so correlation analyses could not be completed
*significant to p=0.01
SCC = Spearman rank-order correlation coefficient
ICC = Intraclass correlation coefficient
CI = Confidence interval
CC= Correctly classified
CAC= Correctly and adjacently classified
BAC= Beyond adjacent classification (Separated by more than one classification)
% = percentage
[1] Toasted muesli and any other breakfast cereal with ≥ 15g sugar per 100g cereal
[2] Yoghurt type products with ≥ 10g sugar per 100g yoghurt

6. Discussion

This is the first Food Frequency Questionnaire developed to directly measure total intake of energy dense nutrient poor food items. The results of the test-retest analyses and the internal consistency of the total scores indicate good reliability of the newly developed NEEDNT-FFQ (75, 93). The reliability of individual NEEDNT-FFQ items did vary however. A positive relationship was found between NEEDNT food intake and BMI, suggesting the higher an individual's BMI, the more often energy dense nutrient poor foods are consumed.

6.1 NEEDNT Food Intake

Intake of NEEDNT food items was only reported for NEEDNT-FFQ time one as these are the results that would occur in a real life setting. It is unclear why there is a significant positive relationship between BMI and total score from NEEDNT-FFQ time one but not time two (unadjusted). Participants were possibly more conscious of food choices at time two and may have reported more honestly in FFQ time one than FFQ time two. However the relationship between BMI and total score for NEEDNT-FFQ time two became significant after adjusting for income and age. The adjusted total score for NEEDNT-FFQ time one suggests that for every 1kg/m² increase in BMI, there is a one point (1.05) increase in their total score. Each point is associated with one higher frequency category selection, for example once per week changes up to two to four times per week. BMI was the only significant linear relationship found with total score so this was the only variable that was adjusted. Measuring saturated fat and sugar intake,Francis et al (23) found no relationship between FFQ total score and BMI; they suggest this is due to the limited range of BMI in their sample. This same study (23) found a significant negative correlation between age and FFQ score which was not found in the present study. This may be due to the lower mean and range of ages in the study by Francis et al (23).

6.2 NEEDNT-FFQ Reliability

The NEEDNT-FFQ has the same ICC value for total score, and a slightly higher internal consistency than a similar study measuring saturated fat and free sugar intake (23). In the present study, the reliability between NEEDNT-FFQ items varied which is not uncommon. A New Zealand study measuring antioxidant intakes found a similar variation in scores (96). The NEEDNT-FFQ is non-quantitative; these FFQs have a larger variation in correlation coefficients than quantitative FFQs (22). Glucosecould not be correlated as it was consumed so infrequently,so this item could potentially be removed from the questionnaire.The two least consumed items (excluding glucose) had the lowest ICCs which supports findings that items which are consumed less frequently tend to have lower correlation values (22, 75).ICCs were used as the main analyses as they take in to account within and between person variation (22). SCCs were also calculated due to non-normal distribution of data and for better comparisons with past studies where ICCs have not been used. Due to limitations associated with correlation analyses (93) degree of misclassification analyses were also completed(90, 94). Degree of misclassification analyses looks at absolute differences and similarities between administrations. Previous studieshave mostlycompleted their misclassification analyses in quartiles or tertiles of nutrient intakes. Frequencies were not converted into nutrient intakes in the present study, so each frequency category was assessed separately in the same way asAcheson and Doll(102). In the present study misclassification ranges showed good reliability for correctly classified, and correctly and adjacently classified, but for beyond adjacently classified the upper value of the range was higher than that reported by Acheson and Doll (102).The reliability analyses were completed on the whole study population as this most commonly occurs (23, 79, 81, 82, 90, 103), but gender (90, 92) and study conditions(89) are sometimes analysed separately. In the present study there were no significant

differences between study conditions or gender, so it was not necessary to break down the analyses in to these variables.

6.3 Strengths

To target the adult population the participants in the present study were 18-65 years of age. Due to the NEEDNT-FFQ being developed to aid in weight management research and for use in clinical settings with overweight individuals, the current study was targeted at the obese population hence participants were required to have a BMI above 30kg/m².The age range of the participants reflected therange of ages within this target age group, and there wasa range of BMIs above the 30 kg/m² requirement. Participants were also required to be fluent in oral, written and numerical English language to ensure they could understand what was being asked of them, in particular what was written on the FFQ. Individuals were excluded if they were taking insulin, steroids (excluding inhalers), atypical antipsychotic or weight loss medications, or were currently pregnant, breastfeeding, or planning on becoming pregnant within the study period as all of these factors can affect appetite which could in turn affect food intake and might confound results on the questionnaire(104). The NEEDNT-FFQ is intended to be a quick measure of NEEDNT food intake, not a measure of the whole diet so fewer items were included than on a typical FFQ (93). The NEEDNT Foods Moderation Guidelines(98) contained 48 items which were deemed appropriate for the FFQ's intended use (93). To obtain more accurate answers, some items in other FFQs have been concealed among less important items (77). As the answers do not usually differ when items are concealed (77) the NEEDNT food items were not hidden among non- NEEDNT foods. The food items were set out in groups of similar items to avoid confusion between items such as cordial and fruit drinks, fruit juices and powdered drinks. A review by Cade et al (93)recommends grouping similar items to clarify exactly which foodsare included in each item(93). Each of the 48 food items had examples

associated with it to clarify items further.This layout was purely for ease of completion; the subgroups were not used for statistical analysis. Kai-culator is the most comprehensive food composition data programme available in New Zealand.Using thisenabledinclusion of foods that could be overlooked in studies like the present study, such as the for NEEDNT-FFQ item ‘regular soft drinks’ which included carbonated fruit juice and frozen soft drinks. The NEEDNT-FFQ was designed to be self-administered. Ithas no portion sizes as theseare only useful if participants specify their own.(75).The FFQ was designed to measure intake over the past year as similar questionnaires have used this time frame (23, 80, 105, 106), as well is it being the most commonly used for FFQs in general (75). In similar questionnaires the number of frequency categories varies, ranging from three to nine(23, 81, 82,89). The most closely related FFQ is by Francis and Stevenson (23)which hasfive frequency categories for ease of administration (23). The two validated FFQs used to develop the NEEDNT-FFQ frequency categories both haveseven category options (82, 94). It was thought that twomore categories than was used by Francis and Stevenson (23)would provide more useful information with little extra respondent burden. The NEEDNT-FFQfrequency options were also chosen to provide more categories in the upper levels of intake enabling smaller changes to be identified in the higher frequency categories(8). This is particularly relevant for the target population as the NEEDNT-FFQ is aimed at overweight individuals who have a high intake of energy dense nutrient poor foods (8).

The NEEDNT-FFQ focuses on the nutritional value of food items as well as energy density. Many published studies focus on just the energy density in prevention and treatment of obesity(61). This approach often excludes sugar sweetened drinks as they do not have a high energy density due to their high water content (8). It also means foods that are energy dense nutrient rich foods are treated no differently to those with minimal nutritional value.

Other studies have looked at macronutrient composition (such as saturated fat and free sugars)typical of energy dense nutrient poor foods,but this does not properly take into account nutrient density (23)and does not make clear the distinction between energy dense nutritious foods such as hard cheeses and plant oils and energy dense nutrient poor foods such as fruit juice.

A test retest interval of one month or less is associated with greater reliability for FFQs (75).In the present study the 7 day test re-test time interval was chosen to minimise real-life changes in diet, while ensuring it was long enough for participants to not remember responses from the first administration (22). Similar intervals (ranging from 7-14days) have been used to assess test re-test reliability in nutrition (24, 96, 107), psychology (108) and physical activity (88).

To ensure that the optional weight management consultation did not alter answers to the FFQ, it occurred after the NEEDNT-FFQ time two was completed.

6.4 Limitations

The NEEDNT-FFQ measures frequency of intake only. This means it can only be used to measure how often NEEDNT food items are consumed not how much of these foods is consumed. The questionnaire has not been assessed for relative validity,so systematic errors or bias could mean the results are not valid (22). When developing a new FFQ, studies usually complete both validation and reliability assessments at the same time using the same participants.(75). Due to time constraints only the reliability of the NEEDNT-FFQ was assessed, with the intention of validating it in future using different participants from the same population. Previous studies have used differentparticipants from the same population to assess the reliability and validity of FFQs withoutany effect onthe results (24, 96,107). The non-quantitative nature of the FFQ means the data cannot be converted into energy or nutrient intake (75, 93). Furthermore, of the 48 food items, three have specified

sugar or fat criteria which individuals may not have the knowledge to interpret. For example participants who are unaware of the sugar content of yoghurt may answer the item‘Yoghurt type products with ≥ 10g sugar per 100g yoghurt’ incorrectly. The present study participants were able to check packets at home, but this may be time consuming if immediate results are wanted.It should also be noted that there is a mistake in the questionnaire design; the FFQ should have read never or less than once per week (94), not never or less than once per month. This may have caused greater misclassifications between the two frequency categories never or less than once per month and once per week, than other frequency categories. This highlights the importance of pretesting FFQs prior to reliability and validity assessment.

The participants have high BMIs and are predominantly female; both factors make people more prone to under reporting (22, 75,84). These factors may have causedparticipants to underreport their intakes making items appear to be consumed less often than they really were(22). However the positive relationship found between BMI and NEEDNT food intake, suggests that under reporting is likely to be limited.

Most participants were NZ European so there was not enough statistical power to adjust forethnicity in the multiple regression analyses. As there were no differences between the total scores of the different genders and study conditions, these were not included in regression analyses, and income and education are correlated so it was only necessary to use one of these variables. As it was measured using fewer categories than income,education was chosen resulting in more statistical power.

The mixture of post and in person study conditions could be a limitation. However no significant differenceswere found between the conditions,makingit likely that the study managed to uniformly give all participants the same information and opportunities to ask questions.

The follow up time period ranged from 7 to 10 days rather than the planned 7 days apart as some participants had to reschedule their second appointments due to unforeseen circumstances. These few extra days are unlikely to have affected the results as variations are commonly seen in other studies such as 7-14 days for the screener measuring fast food and beverage intake in adolescents (24).

A sample size calculation was deemed impractical for the present study. Based on similar studies(23, 96)and a biostatisitician's advice, the sample size was chosen to provide sufficient variability in responses to assess the reliability of the FFQ while at the same time representing a manageable number of participants from whom two data collections could be undertaken.

6.5 Implications

Once validated the NEEDNT-FFQ should be able to be usedto collect data on energy dense nutrient poor food intake in research and clinical settings without the cost and time burden of collecting 24hour diet recalls, diet records or diet histories. In a clinical setting the NEEDNT-FFQ will be able to be used alongside the NEEDNT food list and eventually the NEEDNT Foods Moderation Guidelines for maximum weight management help. At this stage the NEEDNT FoodsModeration Guidelines(98) used to inform the development of the NEEDNT-FFQ, are still in draft form and not currently in the public domain.

Census 2006 data of 15-64year olds was the most current and closely matching data available for comparison to the study population (100). As in previous studies (23, 82), males, ethnicities other than NZ European, those with incomes below $40,000, and those without tertiary qualificationswere under-represented in the present study(100). This may reduce the reliability of the NEEDNT-FFQ in these groups of the NZ adult population.

6.6 Conclusion

The NEEDNT-FFQ is a reliabletool for assessingfrequency of energy dense nutrient poor food intake in obese NZ adults; in particular, female, NZ Europeans with an income above NZ$40,000. Once validated it will be a low cost, quick method for assessing how often individuals consumeitems on the NEEDNT Food List.The FFQ can only assess frequency of consumption of NEEDNT foods not the amounts consumed; further research is required to make it suitable for this purpose.

8. References

1. World Health Organization. Obesity: Preventing and managing the global epidemic.Report of a WHO consultation Geneva: 2000.
2. Das UN. Obesity: genes, brain, gut, and environment. Nutrition. 2010;26(5):459-73.
3. Drewnowski A. Dietary energy density and body weight: is there a relationship? Nutr Rev. 2004;62(11):403-13.
4. Ledikwe JH. Dietary energy density is associated with energy intake and weight status in US adults. Am J Clin Nutr. 2006;83(6):1362-8.
5. Rolls BJ. The relationship between dietary energy density and energy intake. Physiol Behav. 2009;97(5):609-15.
6. Rolls BJ, Drewnowski A, Ledikwe JH. Changing the energy density of the diet as a strategy for weight management. J Am Diet Assoc. 2005;105(5 Suppl 1):S98-103.
7. Guerrero RTLPRD, Paulino YCMS, Novotny R, Murphy SPPRD. Diet and obesity among Chamorro and Filipino adults on Guam. Asia Pac J Clin Nutr. 2008;17(2):216-22.
8. Kant AK, Graubard BI. Energy density of diets reported by American adults: association with food group intake, nutrient intake, and body weight. Int J Obes. 2005;29(8):950-6.
9. Perez-Escamilla R, Obbagy JE, Altman JM, Essery EV, McGrane MM, Wong YP, et al. Dietary energy density and body weight in adults and children: a systematic review. J Acad Nutr Diet. 2012;112(5):671-84.
10. Ledikwe JH RB, Miciklas-Wright H, Mitchell DC, Ard JD, Champagne C, Karanja N, Lin P, Stevens VJ, Appel LJ. Reductions in dietary energy density are associated with weight lsos in overweight and obese participants in the PREMIER trial. Am J Clin Nutr. 2007;85:1212-21.
11. Blatt AD, Williams RA, Roe LS, Rolls BJ. Effects of energy content and energy density of pre-portioned entrees on energy intake. Obesity. 2012;20(10):2010-8.
12. Raynor HA, Looney SM, Steeves EA, Spence M, Gorin AA. The effects of an energy density prescription on diet quality and weight loss: a pilot randomized controlled trial. J Acad Nutr Diet. 2012;112(9):1397-402.
13. Masheb RM, Grilo CM, Rolls BJ. A randomized controlled trial for obesity and binge eating disorder: low-energy-density dietary counseling and cognitive-behavioral therapy. Behav Res Ther. 2011;49(12):821-9.
14. Greene LF. Weight maintenance 2 years after participation in a weight loss program promoting low-energy density foods. Obesity. 2006;14(10):1795-801.
15. Ledikwe JH, Blanck HM, Khan LK, Serdula MK, Seymour JD, Tohill BC, et al. Low-energy-density diets are associated with high diet quality in adults in the United States. J Am Diet Assoc. 2006;106(8):1172-80.
16. Guenther PM, Reedy J, Krebs-Smith SM. Development of the Healthy Eating Index-2005. J Am Diet Assoc. 2008;108(11):1896-901.
17. Verger EO, Mariotti F, Holmes BA, Paineau D, Huneau JF. Evaluation of a diet quality index based on the probability of adequate nutrient intake (PANDiet) using national French and US dietary surveys. PLoS One. 2012;7(8):e42155.
18. Azadbakht L, Haghighatdoost F, Esmaillzadeh A. Dietary Energy Density Is Inversely Associated with the Diet Quality Indices among Iranian Young Adults. J Nutr Sci Vitaminol. 2012;58(1):29-35.
19. Burns C, Sacks G, Gold L. Longitudinal study of Consumer Price Index (CPI) trends in core and non-core foods in Australia. Aust N Z J Public Health. 2008;32(5):450-3.

20. Rangan AM. Consumption of 'extra' foods by Australian adults: types, quantities and contribution to energy and nutrient intakes. Eur J Clin Nutr. 2009;63(7):865-71.
21. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. J Nutr. 2010;140(10):1832-8.
22. Gibson RS. Principles of Nutritional Assessment (2nd ed). New York: Oxford University Press; 2005.
23. Francis H, Stevenson R. Validity and test-retest reliability of a short dietary questionnaire to assess intake of saturated fat and free sugars: a preliminary study. J Hum Nutr Diet. 2012.
24. Nelson MC, Lytle LA. Development and evaluation of a brief screener to estimate fast-food and beverage consumption among adolescents. J Am Diet Assoc. 2009;109(4):730-4.
25. Elsmlie J. The NEEDNT Food List: non-essential, energy-dense, nutritionally-deficient foods. NZMA. 2012;125(1350):84-92.
26. Willett WC. Future directions in the development of food-frequency questionnaires. Am J Clin Nutr. 1994;59(1 Suppl):171S-4S.
27. University of Otago and Ministry of Health. A Focus on Nutrition: Key findings of the 2008/09 New Zealand Adult Nutrition Survey. Wellington: Ministry of Health. 2011.
28. Field A, Willet W, Lissner L, Colditz G. Dietary Fat and Weight Gain Among Women in the Nurses' Health Study. Obesity. 2007;15(4):967-76.
29. Kushi LH, Doyle C, McCullough M, Rock CL, Demark-Wahnefried W, Bandera EV, et al. American Cancer Society Guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. CA Cancer J Clin. 2012;62(1):30-67.
30. U.S. Department of Agriculture, U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010, 7th Edition, Washington, DC: U.S. Government Printing Office. December 2010.
31. Brand-Miller J, Buyken AE. The glycemic index issue. Curr Opin Lipidol. 2012;23(1):62-7.
32. Thomas D, Elliott E, Baur L. Low glycaemic index or low glycaemic load diets for overweight and obesity. Cochrane Database Syst Rev. 2009(1).
33. Cohen DA, Sturm R, Scott M, Farley TA, Bluthenthal R. Not enough fruit and vegetables or too many cookies, candies, salty snacks, and soft drinks? Public health reports. 2010;125(1):88-95.
34. Cohen DA, Sturm R, Lara M, Gilbert M, Gee S. Discretionary calorie intake a priority for obesity prevention: results of rapid participatory approaches in low-income US communities. J Public Health. 2010;32(3):379-86.
35. Burger KS, Cornier MA, Ingebrigtsen J, Johnson SL. Assessing food appeal and desire to eat: the effects of portion size & energy density. Int J Behav Nutr Phys Act. 2011;8:101.
36. Drewnowski A. Energy density, palatability, and satiety: implications for weight control. Nutr Rev. 1998;56(12):347-53.
37. Drewnowski A. Intense sweeteners and energy density of foods: implications for weight control. Eur J Clin Nutr. 1999;53(10):757-63.
38. Drewnowski A. The role of energy density. Lipids. 2003;38(2):109-15.
39. Brown T, Avenell A, Edmunds LD, Moore H, Whittaker V, Avery L, et al. Systematic review of long-term lifestyle interventions to prevent weight gain and morbidity in adults. Obes Rev. 2009;10(6):627-38.
40. Abete I, Astrup A, Martinez JA, Thorsdottir I, Zulet MA. Obesity and the metabolic syndrome: role of different dietary macronutrient distribution patterns and

specific nutritional components on weight loss and maintenance. Nutr Rev. 2010;68(4):214-31.
41. Galani C, Schneider H. Prevention and treatment of obesity with lifestyle interventions: review and meta-analysis. Int J Public Health. 2008;52(6):348-59.
42. Wadden TA, Butryn ML, Wilson C. Lifestyle modification for the management of obesity. Gastroenterology. 2007;132(6):2226-38.
43. Manore MM. Dietary supplements for improving body composition and reducing body weight: where is the evidence? Int J Sport Nutr Exerc Metab. 2012;22(2):139-54.
44. Buckland G, Bach A, Serra-Majem L. Obesity and the Mediterranean diet: a systematic review of observational and intervention studies. Obes Rev. 2008;9(6):582-93.
45. Hooper L, Abdelhamid A, Moore HJ, Douthwaite W, Skeaff CM, Summerbell CD. Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies. BMJ. 2012;345:e7666.
46. Santos FL, Esteves SS, da Costa Pereira A, Yancy WS, Jr., Nunes JPL. Systematic review and meta-analysis of clinical trials of the effects of low carbohydrate diets on cardiovascular risk factors. Obes Rev. 2012;13(11):1048-66.
47. Wycherley TP, Moran LJ, Clifton PM, Noakes M, Brinkworth GD. Effects of energy-restricted high-protein, low-fat compared with standard-protein, low-fat diets: a meta-analysis of randomized controlled trials. Am J Clin Nutr. 2012;96(6):1281-98.
48. Westerterp-Plantenga MS, Lemmens SG, Westerterp KR. Dietary protein - its role in satiety, energetics, weight loss and health. Br J Nutr. 2012;108 Suppl 2:S105-12.
49. de Castro JM. Macronutrient and dietary energy density influences on the intake of free-living humans. Appetite. 2006;46(1):1-5.
50. Greaves CJ, Sheppard KE, Abraham C, Hardeman W, Roden M, Evans PH, et al. Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. BMC Public Health. 2011;11:119.
51. Allen PJ, Batra P, Geiger BM, Wommack T, Gilhooly C, Pothos EN. Rationale and consequences of reclassifying obesity as an addictive disorder: Neurobiology, food environment and social policy perspectives. Physiol Behav. 2012;107(1):126-37.
52. Avena NM, Gold JA, Kroll C, Gold MS. Further developments in the neurobiology of food and addiction: update on the state of the science. Nutrition. 2012;28(4):341-3.
53. Colapinto CK, Lumb AB, Goldfield GS. Relative Reinforcing Value of Energy-dense Snack Foods in Overweight and Obese Adults. Can J Diet Pract Res. 2011;72(4):170-4.
54. Gearhardt AN, Grilo CM, DiLeone RJ, Brownell KD, Potenza MN. Can food be addictive? Public health and policy implications. Addiction. 2011;106(7):1208-12.
55. Guyenet SJ, Schwartz MW. Clinical review: Regulation of food intake, energy balance, and body fat mass: implications for the pathogenesis and treatment of obesity. J Clin Endocrinol Metab. 2012;97(3):745-55.
56. Connell CL, Zoellner JM, Yadrick MK, Chekuri SC, Crook LB, Bogle ML. Energy density, nutrient adequacy, and cost per serving can provide insight into food choices in the lower Mississippi Delta. J Nutr Educ Behav. 2012;44(2):148-53.
57. Drewnowski A. The Nutrient Rich Foods Index helps to identify healthy, affordable foods. Am J Clin Nutri. 2010;91(4):1095S-101S.
58. Drewnowski A, Monsivais P, Maillot M, Darmon N. Low-energy-density diets are associated with higher diet quality and higher diet costs in French adults. J Am Diet Assoc. 2007;107(6):1028-32.
59. Gomez M, Colagiuri R. Do socio-economic factors influence supermarket content and shoppers' purchases? Health Promot J Austr. 2009;20(3):241-6.

60. Renzaho AMN. Is a Healthy Diet Affordable and Accessible in the City of Yarra, Victoria-Australia? An Analysis of Cost Disparity and Nutritional Choices. Ecol Food Nutr. 2008;47(1):44-63.
61. Drewnowski A. Concept of a nutritious food: toward a nutrient density score. The American Journal of Clinical Nutrition. 2005;82(4):721-32.
62. He FJ, MacGregor GA. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. J Hum Hypertens. 2009;23(6):363-84.
63. Donahoo W, Wyatt HR, Kriehn J, Stuht J, Dong F, Hosokawa P, et al. Dietary fat increases energy intake across the range of typical consumption in the United States. Obesity. 2008;16(1):64-9.
64. Bes-Rastrollo M, van Dam RM, Martinez-Gonzalez MA, Li TY, Sampson LL, Hu FB. Prospective study of dietary energy density and weight gain in women. Am J Clin Nutr. 2008;88(3):769-77.
65. Bell EA, Rolls BJ. Energy density of foods affects energy intake across multiple levels of fat content in lean and obese women. Am J Clin Nutr. 2001;73(6):1010-8.
66. Bell EA, Castellanos VH, Pelkman CL, Thorwart ML, Rolls BJ. Energy density of foods affects energy intake in normal-weight women. Am J Clin Nutr. 1998;67(3):412-20.
67. Johnson RK, Appel LJ, Brands M, Howard BV, Lefevre M, Lustig RH, et al. Dietary sugars intake and cardiovascular health: a scientific statement from the American Heart Association. Circulation. 2009;120(11):1011-20.
68. Westerterp-Plantenga MS, Nieuwenhuizen A, Tome D, Soenen S, Westerterp KR. Dietary protein, weight loss, and weight maintenance. Annu Rev Nutr. 2009;29:21-41.
69. Jakubowicz D, Froy O, Wainstein J, Boaz M. Meal timing and composition influence ghrelin levels, appetite scores and weight loss maintenance in overweight and obese adults. Steroids. 2012;77(4):323-31.
70. Iqbal SISI, Helge JWJW, Heitmann BLBL. Do energy density and dietary fiber influence subsequent 5-year weight changes in adult men and women? Obesity. 2006;14(1):106.
71. Savage JS. Dietary energy density predicts women's weight change over 6 y. Am J Clin Nutr. 2008;88(3):677-84.
72. Du H, van der AD, Ginder V, Jebb SA, Forouhi NG, Wareham NJ, et al. Dietary energy density in relation to subsequent changes of weight and waist circumference in European men and women. PLoS One. 2009;4(4).
73. Shrapnel B. Is energy density a useful concept for understanding and preventing obesity? Nutrition & Dietetics. 2010;67(4):281-6.
74. O'Sullivan HL, Alexander E, Ferriday D, Brunstrom JM. Effects of repeated exposure on liking for a reduced-energy-dense food. Am J Clin Nutr. 2010;91(6):1584-9. Epub 2010/04/09.
75. Cade JE, Burley VJ, Warm DL, Thompson RL, Margetts BM. Food-frequency questionnaires: a review of their design, validation and utilisation. Nutrition Research Reviews. 2004;17(01):5-22.
76. NutritionQuest. Assessment & Analysis Services. http://www.nutritionquest.com/assessment/assessment-methods/; 2009.
77. Shepherd R, Farleigh CA, Land DG. Estimation of salt intake by questionnaire. Appetite. 1985;6(3):219-33.
78. Teal CR, Baham DL, Gor BJ, Jones LA. Is the MEDFICTS Rapid Dietary Fat Screener Valid for Premenopausal African-American Women? J Am Diet Assoc. 2007;107(5):773-81.

79. van Assema P, Brug J, Kok G, Brants H. The reliability and validity of a Dutch questionnaire on fat consumption as a means to rank subjects according to individual fat intake. Eur J Cancer Prev. 1992;1(5):375-80.
80. Thompson FE, Midthune D, Subar AF, Kipnis V, Kahle LL, Schatzkin A. Development and Evaluation of a Short Instrument to Estimate Usual Dietary Intake of Percentage Energy from Fat. J Am Diet Assoc. 2007;107(5):760-7.
81. Herran OF, Ardila MF. Validity and reproducibility of two semi-quantitative alcohol frequency questionnaires for the Colombian population. Public Health Nutr. 2006;9(6):763-70.
82. Hedrick VE, Comber DL, Estabrooks PA, Savla J, Davy BM. The beverage intake questionnaire: determining initial validity and reliability. J Am Diet Assoc. 2010;110(8):1227-32.
83. Mahan LK, Escott-Stump S, Raymond JL. Krause's Food and the Nutrition Care Process (13th ed.). USA: Elsevier; 2012.
84. Hill RJ, Davies PS. The validity of self-reported energy intake as determined using the doubly labelled water technique. Br J Nutr. 2001;85(4):415-30.
85. Goldberg GR, Black AE, Jebb SA, Cole TJ, Murgatroyd PR, Coward WA, et al. Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-recording. Eur J Clin Nutr. 1991;45(12):569-81.
86. Mendez MA, Popkin BM, Buckland G, Schroder H, Amiano P, Barricarte A, et al. Alternative methods of accounting for underreporting and overreporting when measuring dietary intake-obesity relations. Am J Epidemiol. 2011;173(4):448-58.
87. Yokota RTdC, Miyazaki ES, Ito MK. Applying the triads method in the validation of dietary intake using biomarkers. Cad Saude Publica. 2010;26(11):2027-37.
88. Giles K. Repeatability and accuracy of CHAMPS as a measure of physical activity in a community sample of older Australian adults. J Phys Act Health. 2009;6(2):221-9.
89. Wolf AM, Hunter DJ, Colditz GA, Manson JE, Stampfer MJ, Corsano KA, et al. Reproducibility and validity of a self-administered physical activity questionnaire. Int J Epidemiol. 1994;23(5):991-9.
90. Vandelanotte C, Matthys C, De Bourdeaudhuij I. Reliability and validity of a computerized questionnaire to measure fat intake in Belgium. Nutrition Research. 2004;24(8):621-31.
91. Eng JY, Moy FM. Validation of a food frequency questionnaire to assess dietary cholesterol, total fat and different types of fat intakes among Malay adults. Asia Pac J Clin Nutr. 2011;20(4):639-45.
92. Retzlaff BM, Dowdy AA, Walden CE, Bovbjerg VE, Knopp RH. The Northwest Lipid Research Clinic Fat Intake Scale: validation and utility. Am J Public Health. 1997;87(2):181-5.
93. Cade J, Thompson R, Burley V, Warm D. Development, validation and utilisation of food-frequency questionnaires - A review. Public Health Nutr. 2002;5(4):567-87.
94. Wong JE, Parnell W, Black KE, Skidmore PM. Reliability and relative validity of a food frequency questionnaire to assess food group intakes in New Zealand adolescents. Nutr J. 2012;11(1):65.
95. Hedrick VE, Savla J, Comber DL, Flack KD, Estabrooks PA, Nsiah-Kumi PA, et al. Development of a Brief Questionnaire to Assess Habitual Beverage Intake (BEVQ-15): Sugar-Sweetened Beverages and Total Beverage Energy Intake. J Acad Nutr Diet. 2012;112(6):840-9.

96. Braakhuis AJ, Hopkins WG, Lowe TE, Rush EC. Development and validation of a food-frequency questionnaire to assess short-term antioxidant intake in athletes. Int J Sport Nutr Exerc Metab. 2011;21(2):105-12.
97. Kipnis V, Midthune D, Freedman L, Bingham S, Day NE, Riboli E, et al. Bias in dietary-report instruments and its implications for nutritional epidemiology. Public Health Nutr. 2002;5(6A):915-23.
98. Graham RM. Personal Communication. 2013.
99. Kai-culator [0.85] [database on the Internet]. ©2013
100. Statistics New Zealand. 2006 Census Questionnaires. [30/04/2013]; Available from: http://www.stats.govt.nz/Census/about-2006-census/2006-census-questionnaires.aspx.
101. Metcalf P SR, Davis P. Dietary intakes by different markers of socioeconomic status: results of a New Zealand workforce survey. NZ Med J. 2006;119(1240).
102. Acheson E, Doll R. Dietary factors in carcinoma of the stomach: a study of 100 cases and 200 controls. Gut. 1964;5(2):126-31.
103. Kraschnewski JL, Gold AD, Gizlice Z, Johnston LF, Garcia BA, Samuel-Hodge CD, et al. Development and Evaluation of a Brief Questionnaire to Assess Dietary Fat Quality in Low-income Overweight Women in the Southern United States. J Nutr Educ Behav. 2013;In press.
104. Pijl H, AE M. Bodyweight change as an adverse effect of drug treatment. Mechanisms and management. Drug Saf. 1996;14(5):329-42.
105. Peters JR, Quiter ES, Brekke ML, Admire J, Brekke MJ, Mullis RM, et al. The Eating Pattern Assessment Tool: a simple instrument for assessing dietary fat and cholesterol intake. J Am Diet Assoc. 1994;94(9):1008-13.
106. Block G, Gillespie C, Rosenbaum EH, Jenson C. A rapid food screener to assess fat and fruit and vegetable intake. Am J Prev Med. 2000;18(4):284-8.
107. Gray-Donald K, O'Loughlin J, Richard L, Paradis G. Validation of a short telephone administered questionnaire to evaluate dietary interventions in low income communities in Montreal, Canada. J Epidemiol Community Health. 1997;51(3):326-31.
108. Guyonnet D, Chassany O, Picard C, Guillemin I, Meunier J, Seignobos E, et al. Perceived subject outcomes and impact on health-related quality of life associated with diet using the new Food Benefits Assessment (FBA) questionnaire: development and psychometric validation. Public Health Nutr. 2008;11(11):1163-72.

9. Appendices

Appendix A: Summary Table from Literature Review

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
Food frequency questionnaires or dietary screeners assessing fat intake				
The reliability and validity of a Dutch questionnaire on fat consumption as a means to rank subjects according to individual fat intake	van Assema, Brug, et al. (1992) (79) Netherlands	Questionnaire detail: 25-item, telephone-administered questionnaire, designed to rank individuals according to their dietary intake of fat over the last 6months. Asked how often they have foods opposed to selection categories – then put into 5 categories. Reliability/validation n = 639/ 52 Male: 306/ 23 Female: 333/ 29 Age: 18-93yrs/ 21-68yrs Reliability and Validation assessment participants: different	Reliability assessment: 1 yr test-retest Validation method: Estimated 7 day diet record but weighed measures used	Reliability Test retest - Pearson correlation coefficient of 0.71 Percentage classified in to extreme tertiles was 3.9 Validation Pearson Product-moment Correlation Coefficient 0.59 Gross misclassification defined as disagreement beyond the adjacent tertile, was 15.4% Unweightedcohen's Kappa between 2 methods was 0.42 with 2 fat intake categories, and 0.25 with 3 categories
Development and Evaluation of a Short Instrument to Estimate Usual Dietary Intake of Percentage Energy from Fat	Thompson,.Midthune , et al. (2007) (80) USA	Questionnaire detail: A 16-item screener assessing percentage energy from fat intake and a reliability assessed 120-item food frequency questionnaire. Both self-administered and measuring intake over the previous 12months. Reliability(none)/validation n = 404 Male: 205 Female: 196 Age: adults (35% aged 50-59years) Reliability and Validation assessment participants: no reliability analysis	Reliability assessment: Completed previously for 120-item FFQ, none completed for 16-item screener Validation method: Two non-consecutive phone administered 24-hour dietary recalls – median 21 days apart	Reliability N/A Validation The mean percentage energy from fat estimates for the different methods: Males: recalls 30.1%, screener 29.9%, FFQ 30.4% Females: recalls 31.3%, screener 28.4%*, FFQ 30.0%* *significantly different to recalls Estimated correlations between true intake and (1) Screener 0.64 (males), 0.58 (females) (2) FFQ 0.67 (males), 0.72 (females) Estimated attenuation coefficients for the (1) Screener 1.29 (males), 0.98 (females) (2) FFQ were 0.56 (males), 0.57 (females) Results significantly different between screener and FFQ Estimated slope in regression (1) Screener 0.31 (males), 0.34 (females) (2) FFQ 0.80 (males), 0.90 (females) Results significantly different between screener and FFQ

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
				Sensitivity >30% energy from fat (1) Screener 71.0 (males), 56.0 (females) (2) FFQ 75.0 (males), 68.2 (females) >35% Energy from Fat (1) Screener 52.1 (males), 34.6 (females) (2) FFQ 63.6 (males), 57.6 (females) Specificity >30% energy from fat (1) Screener 73.0 (males), 81.6 (females) (2) FFQ 71.8 (males), 82.1 (females) >35% Energy from Fat (1) Screener 87.7 (males), 92.6 (females) (2) FFQ 83.3 (males), 88.7 (females)
Development and Evaluation of a Brief Questionnaire to Assess Dietary Fat Quality in Low-income Overweight Women in the Southern United States	Kraschnewski, Gold et al. (in press) (103) USA	Questionnaire detail: Dietary Fat Quality Assessment (DFQA) Designed to measure total, saturated, polyunsaturated, and monounsaturated fat intake, as well as omega-3 fatty acid and cholesterol. Contained 20 questions which were compressed into 15 for analysis. Contained 3-4 frequency category options. Telephone administered. Sent portion size booklets. Reliability/validation n = 120 enrolled (demographics stats based on this number) n = 96 women completed Age: 51yrs (range 40–64yrs) BMI: 38kg/m^2 (range 27.5–45) Reliability and Validation assessment participants: same	Reliability assessment: 2-4weeks test-retest (25days average) Validation method: Fred Hutchisnson Cancer Research Center FFQ (FHCRC-FFQ)	Reliability Shrout and Fleiss intra-class correlations coefficients ranged from 0.48 to 0.59 for each of the fat components studied. Validation Spearman's correlation coefficents 0.54 to 0.66 DFQA correctly classified individuals into the same quartile of nutrient intake as the FHCRC-FFQ in 39% to 55% of cases, and the same or adjacent quartile 80% to 87% of the time Subgroup analyses DFQA performed equally well in younger and older women ($P < .001$). Higher correlation coefficients in white women than in African American women and for women with a BMI above the median compared with those with a BMI below it, all correlations computed within these subgroups were statistically significant ($P < .004$). The clinical scoring method Overall fat quality, the polyunsaturated to saturated fat ratio correlation coefficient, 0.4; $P < .001$

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
Reliability and validity of a computerized questionnaire to measure fat intake in Belgium.	Vandelanotte, Matthys et al. (2004) (90) Belgium	Questionnaire detail: 48-item self-administered computerized fat intake questionnaire asking how often foods are consumed over previous day, week or month with no selection categories. Gave average portion sizes and examples. Reliability/validation n = 86 Male: 45 Female: 41 Mean age: 35years Mean BMI: 23.8kg/m^2 (males) 22.6 kg/m^2 (females) Reliability and Validation assessment participants: same	Reliability assessment: 8 day test-retest Validation method: 7-day estimated diet record Order: Questionnaire, Diet Record, Questionnaire	Reliability Intraclass correlation coefficients: Questionnaire items ranged from 0.70 to 0.87 Total fat intake was 0.86 Percent energy from fat 0.81 Cohen's kappa was used to assess the degree of agreement in tertile classification between the two administrations. Cohens kappa - κ values were total fat intake 0.64 (0.59 males, 0.56 females) and percent energy from fat 0.50 (0.42 males, 0.59 females). Gross misclassification between the administrations was 1.2% for total fat intake (2.2% males, 0% females) as well as for percent energy from fat (0%males, 2.4% females). Validation Paired sample t tests foundno significant differences between means for total fat intake and for percent energy from fat Pearson product–moment correlation coefficients 0.67 for total fat intake and 0.60 for percent energy from fat. Subgroup analysis assessed differences in gender, age (</>40yrs), education, BMI, physical activity, cooking for household, shopping for household. Correlations ranged from 0.25-0.73. Higher correlations for total fat intake and for percent energy from fat intake were found for women, for participants <40 years of age, and who did regular household shopping as compared to their counterparts. Lower correlations were found for participants with a high level of physical activity and participants who did not engage in regular household shopping as compared to their counterparts. Spearman rank-order correlation coefficients were also computed but not reported, as they were very similar to the Pearson correlation. Skewed data were normalized using natural logarithmic transformations.

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
				Cohen's kappa was used to assess the degree of agreement in tertile classification between the two methods. Cohen's kappa - κ values were total fat intake 0.27 (0.20 males, 0.17 females) and percent energy from fat 0.29 (0.14 males, 0.45 females). Gross misclassification was 5.8% for total fat intake (11.1% males, 0% females) as well as for percent energy from fat (6.6% males, 4.9% females).
The Northwest Lipid Research Clinic Fat Intake Scale: validation and utility	Retzlaff, Dowdy et al. (1997) (92) USA	Questionnaire detail: Fat Intake Scale (FIS): 12-item instrument assesses intake of foods high in fat, saturated fat, and cholesterol over previous month. 3-4 response options. Participants had high cholesterol Reliability/validation n = 310 Male: 194 Female: 116 Age: males 42.2 (SD 10.5), females 42.5 (SD 9.7) years BMI: males 26.8 (SD 3.1), females 27.8 (SD 5.9) kg/m^2 Reliability and Validation assessment participants: same	Reliability assessment: 2-3 week and 6-8 week test-retest using FIS(1), FIS(2) and FIS(3). Validation method: 4 day diet record(1) Also assessed sensitivity to dietary change after an intervention Order: Visit 1: blood test + FIS(1) Visit 2: blood test + if FIS(1) score below 19 for first 9 questions then interview completed including 24hour recall to ensure participant was appropriate for the study Visit 3 (orientation): FIS(2) Visit 4 (baseline): 4 day diet record(1) + FIS(3) Note: FIS(2) + FIS(3) used to ensure participants weren't making changes to their diet Intervention completed Visit 5(18months after intervention began): blood test + FIS + 4 day diet record + individual dietary assessment and counselling	Reliability Paired t-test found FIS score 3 and 4 to be statistically significant from the previous FIS scores in males, and scores 2, 3, and 4 to be statistically significant from the previous score in females. Differences were small with no trends so were used for reliability assessment anyway. Test-retest Pearson correlation coefficients 2-3weeks apart: males 0.88, females 0.90 6-8 weeks apart: males 0.76 and females 0.78 Correlations of FIS scores with Keys and RISCC scores ranged from 0.43 to 0.53 Validation Pearson's Correlation coefficients for total fat ranged 0.42 to 0.54, saturated fat 0.44 to 0.51, cholesterol 0.42 to 0.60, carbohydrate 0.29 to -0.42. Sensitivity to dietary change Pearson Correlation Coefficients used but not relevant for the current research
Validation of a food frequency questionnaire to assess dietary cholesterol, total fat and different types of fat intakes among Malay adults	Eng, and Moy (2011) (91) Malaysia	Questionnaire detail: A 100 food item FFQ focused on dietary cholesterol, total fat, saturated fat, monounsaturated fat and polyunsaturated fat intake for the past one month. Used food pictures and measurement tools, and was interview administered. 4 response options were included.	Reliability assessment: Does not state but insinuates approx. 5days test-retest Validation method: 3 day diet record (2weekdays + 1 weekend) Order: diet record in between reliability administrations	Reliability Intra-class correlation (ICC) coefficients ranging from 0.92-0.98. Validation Independent t-test – mean differences all within 20%. Total energy, total fat, unsaturated fat, % energy from

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
		Reliability/validation n = 151 Male: 39 Female: 112 Mean age: 49.8±4.1years Mean BMI: 27.3±4.3 kg/m^2 Reliability and Validation assessment participants: same		unsaturated fat all showed statistically significant differences. Spearman correlation coefficients unadjusted 0.08-0.64, adjusted 0.04-0.37 Linear regression coefficients – unadjusted and energy adjusted g/d for total fat, SFA fat, MUFA, and PUFA, 0.19-0.47 all significant (above 0.5 is good), but when looking at the components as % energy, only fat is significant at 0.23-0.25. Cholesterol, mg/d is insignificant at 0.08 both adjusted and unadjusted. Energy, kcal/d is significant at 0.56. Classification into categories - same quartile 24.5 -37.8% adjacent quartile 35.1-48.3% grossly misclassified 1.99-12.6%
Food frequency questionnaires measuring other NEEDNT food aspects				
Validity and reproducibility of two semi-quantitative alcohol frequency questionnaire for the Colombian population	Herran and Ardila (2006) (81) Colombia	Questionnaire detail: 2 FFQs looking at previous months alcohol consumption. Alcohol intake frequency questionnaire-A (AFQ-A) 53items, 3 frequency options Alcohol intake frequency questionnaire-B (AFQ-B) 5items, 9 frequency options Serving sizes given. Reliability/validation n = 109 Male: 54 Female: 55 Mean age: 27.8yrs Mean BMI: 22.6 kg/m^2 Reliability and Validation assessment participants: same	Reliability assessment: 60day test-retest for both FFQS (ABAB or ABBA or BAAB) Validation method: Three consecutive 30day semi-quantitative alcohol intake records Order: Alcohol intake records then mean of 96days later began FFQs	Values log transformed where necessary Reliability Pearson's correlation coefficient AFQ-A 0.75-0.76, AFQ-B 0.13-0.57 Lin's concordance correlation coefficient AFQ-A 0.74-0.75, AFQ-B 0.12-0.55 Spearman's correlation coefficient AFQ-A 0.68-0.73, AFQ-B 0.50-0.55 Weighted Cohen's kappa for quartiles AFQ-A 0.49-0.56, AFQ-B 0.33-0.38 Limits of agreement AFQ-A 9.8-15.1, AFQ-B 2.1-6.1 Validation Lin's concordance correlation coefficient AFQ-A 0.38-0.46, AFQ-B 0.33-0.61 Spearman's correlation coefficient AFQ-A 0.41-0.50, AFQ-B 0.60-0.63 Limits of agreement AFQ-A -69.0-(-56.4), AFQ-B -11.0-33.7 Linear trend p-values AFQ-A 0.73-0.75, AFQ-B 0.71-0.95 Pearson correlation coefficient raw AFQ-A 0.46-0.60, adjusted AFQ-A 0.26-0.63, raw AFQ-B 0.28-0.63, adjusted AFQ-B 0.15-0.71.

Title of paper	Author, yr of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/ conclusions)
				Cohen's weighted kappa statistic for quartiles = 0.40 for both AFQ-A and AFQ-B
Validity and test–retest reliability of a short dietary questionnaire to assess intake of saturated fat and free sugars: a preliminary study	Francis and Stevenson (2012) (23) Australia	Questionnaire detail: Saturated fat and free sugar intake (DFS) 26 Qs, 5 response options measuring intake over previous 12months Reliability/validation n = 29/ 40 Male: 38%/40% Female: 62%/60% Age Mean(SD): 21.82(6.62)/21.28(5.78) Age range: 17-46yrs BMI Mean (SD) :23.53(3.69)/ 23.39 (3.42) kg/m^2 Reliability and Validation assessment participants: same	Reliability assessment: mean (SD) = 158 (10) , range =145-168 days test-retest and internal consistency Validation method: 172-item Commonwealth Scientific and Industrial Research Organisation Food Frequency Questionnaire (C-FFQ) and 4 day estimated diet record Order: C-FFQ + DFS then 4DR then DFS	Saturated fat and free sugar intake – converted in to % of diet for analysis Reliability Intraclass correlation coefficient 0.83 = good Cronbach's alpha coefficient 0.76 Validation Spearman rank-order correlation coefficients ranged from 0.35 to 0.71 when validating against FFQ and Diet Record.
The Beverage Intake Questionnaire: Determining Initial Validity and Reliability	Hedrick, Comber et al. (2010) (82) USA	Questionnaire detail: 19 item questionnaire designed to measure water, sugar-sweetened and total beverage in to over past month. 7 intake categories, 5 serving size options. Reliability/validation n = 105 Male: 45 Female: 60 Mean age: 39yrs SE: 2yrs Age range: 21-93yrs Mean BMI: 25.6 SE: 0.6kg/m^2 BMI rang e: 16.2-62.5kg/m^2 Reliability and Validation assessment participants: same	Reliability assessment: within 2 week test-retest (no specific results given) Validation method: Urine samples (12-5pm) twice with FFQ 4-day food intake records Order: visits were completed within a 2week period in one of two randomly assigned visit sequences. Sequence 1: (Visit 1) BEVQ1, (Visit 2) FIR, (Visit 3) BEVQ2; Sequence 2: (Visit 1) FIR, (Visit 2) BEVQ1, (Visit 3) BEVQ2.	Reliability Spearman's correlation coefficents ranged from 0.45 to 0.87 (all P values <0.001). Total beverage 0.635 (grams), 0.739 (kcal). Validation Spearman's correlation coefficents ranged -0.35 to 0.810. All but sweetened coffee and mixed alcoholic drinks were significantly correlated (P<0.001). Urinary specific gravity - Not significantly different across visits and negatively correlated with gms of total beverage intake (-0.202 and -0.238 P<0.05) and grams of water intake (-0.236, P<0.05 and -0.319, P<0.01).
Development of a Brief Questionnaire to Assess Habitual Beverage Intake (BEVQ-15): Sugar Sweetened Beverages and Total Beverage Energy Intake	Hedrick, Savla et al. (2012) (95) USA	Questionnaire detail: Aim was to reduce number of items in current beverage questionnaire. Reduced BEVQ from 19 to 15 items. Reduction of FFQ: n=1,596, age 43±12 years, body mass index 31.5±0.2	Reliability assessment: none Validation method: Three 24-hr dietary recalls BEVQ-19 Order: All within 1 week	Reliability None Validation Spearman's Correlations ranged from 0.129-0.759 (all significantly correlated except whole milk) BEVQ-19 paired sample t-tests found no significant difference between BEVQ-15 and BEVQ-19 for grams of intake in total beverages and sugar sweetened beverages,

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
		Validation of BEVQ-15 n = 70 Mean age: 37 Age SE: 2 Mean BMI: 24.5, SE: 0.4 kg/m^2 Reliability and Validation assessment participants: N/A		as well as energy of intake for total beverages, but found a significant difference with energy intake of sugar sweetened beverages (27+/- 12kcal).
Estimation of salt intake by questionnaire	Shepherd, Farleigh et al. (1985) (77) England	Questionnaire detail: Intake of table salt, cooking salt, high sodium foods hidden within questions based mainly on sugar intake. 5 frequency category options. No portion sizes given but portion size estimates used for analysis. Reliability/validation n = 155(33 reliability, 53 table salt validation, 47 cooking salt validation, 23 food content validation, 23 total intake validation) Male: 78 Female: 77 Reliability and Validation assessment participants: same	Reliability assessment: 2month test-retest Validation method: Table salt intake – salt pots over 7days Cooking intake – salt pots over 7 days Food content – weighed 7day record Total salt intake - 7-day urinary sodium excretion	Reliability Test-retest correlations (not specified which type) for the estimate of total intake was r = 0.75, and ranged from 0.71-0.88 (all sig. p<0.001). Validation Linear multiple and single regression analyses. Total intake, r = 0.66, adjusted 0.69 (-0.59 to 0.70) Table salt use, r = 0.70 Food content, r = 0.57 Cooking salt use, r = 0.17 (-0.21 to 0.26)
Physical activity questionnaire				
Reproducibility and validity of a self-administered physical activity questionnaire	Wolf, Hunter et al. (1994) (89) USA	Questionnaire detail: Weekly physical activity over past year measuring 8 activities Nurses Health Study II cohort representative sample (n = 147, mean BMI 23.8kg/m2) African-American sample (n = 84, mean BMI 26.9kg/m2). Mean age: 39. Reliability and Validation assessment participants: same	Reliability assessment: 2yr test-retest Validation method: Four past-week activity recalls and 7-day activity diaries were collected over 1 year Order: Questionnaire 1, 4 x activity records and recalls, Questionnaire 2	Pearson and Spearman coefficients analysed but Pearson reported as produced similar results Reliability Activity: Test-retest correlation for activity was 0.59 for the representative sample and 0.39 for the African-American sample. Inactivity: Test-retest coefficients for inactivity were 0.52 and 0.55, respectively. Validation Activity: Validity against recalls were representative sample 0.79 and African-American samples 0.83. Validity against diaries were representative sample 0.62

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
				and African-American sample 0.59. Inactivity: Correlations between inactivity reported in diaries and that reported on questionnaire were 0.41 and 0.44, respectively.
1-2 week test re test				
Development and Evaluation of a Brief Screener to Estimate Fast-Food and Beverage Consumption among Adolescents	Nelson and Lytle (2009) (24) USA	Questionnaire detail: Measuring sweetened beverage and fast-food intake in adolescents over past month. Frequency category options varied between 4-9. Reliability/validation n = 33/ 59 Male: 15/ 26 Female: 18/ 33 Age range: 11-18yrs Reliability and Validation assessment participants: different	Reliability assessment: Mainly 7 to 14 days test-retest (outliers 2-21days) Validation method: 3 telephone administered diet recalls 2 weekdays, 1 weekend on average within a 15 day time period	Category options 5 or more analysed with spearman's correlation coefficents Category options of less than 5 analysed with Kappa statistics Reliability Spearman's correlation coefficients ranged 0.63-0.84 Kappas ranged 0.10-0.80 Validation Kappas comparing tertiles ranged 0.03-0.38 Some screener were unable to be validated due to different assessment periods between screener and diet recalls.
Perceived subject outcomes and impact on health-related quality of life associated with diet using the new Food Benefits Assessment (FBA) questionnaire: development and psychometric validation	Guyonnet, Chassany et al. (2008) (108) France	Questionnaire detail: 43 items measuring disease prevention, well-being, aesthetics, physical appearance, snacking and pleasure Normal-weight n =130, 43 males, 87 females, Mean(SD) age: 40.7 (12.0), Mean (SD) BMI:22.1(2.0) kg/m^2 Overweight n= 67 (29 males, 38 females) Mean(SD)age: 47.1 (11.2)yrs Mean (SD) BMI:27.9(1.4) kg/m^2 Reliability and Validation assessment participants: same	Reliability: Test retest 7 days apart Validation : Concurrent validity –Short Form-36 scale	Reliability Internal consistency reliability cronbach's alpha 0.79 to 0.91 Intraclass correlation coefficients 0.54-0.85 Validation Concurrent validity – spearman's correlation coefficient -0.07 – 0.79
Validation of a short telephone administered questionnaire to evaluate dietary interventions in low income communities	Gray-Donald, O'Loughlin et al. (1997) (107) Canada	Questionnaire detail: 38 item short questionnaire measuring behaviour related to selecting low fat diets over past 3months. Telephone administered. 3 frequency options. Reliability/validation	Reliability assessment: 1 week test retest Validation method: Diet history interviews including a 24 hour diet recall and a complete recall of all foods consumed in the last month on a frequency	Reliability Spearman rank correlation coefficient 0.72-0.90, total score 0.84 Validation

Title of paper	Author, year of publication, country	Study design, participants, sample size	Study methods	Main results (outcome/conclusions)
in Montreal, Canada		n = 93/ 81 Male: 51/20 Female: 42/61 Mean(SD) age: 37.1 (12.1)/39.5(12.5) Reliability and Validation assessment participants: different	basis. Completed within 1month of questionnaire completion.	Spearman rank correlation coefficient Percentage energy from fat (0.12-0.48, total score 0.40) Total fat (g) (0.00-0.56, total score 0.45), Percentage energy from saturated fat (0.07-0.47, total score 0.37) Saturated fat (g) (0.02-0.57, total score 0.45)
Repeatability and accuracy of CHAMPS as a measure of physical activity in a community sample of older Australian adults	Giles (2009) (88) Australia	Questionnaire detail: Physical activity measure Reliability/validation Time 1 (n=73) 28m, 45f Time 2 (n=54) 20m, 34f Age: 65+ Reliability and Validation assessment participants: same	Reliability assessment: 1-2 week test-retest Validation method: Construct validity against 7day pedometer step counts and step log Order: 2xquestionnaire followed by step log	Reliability Spearman correlation coefficients 0.57-0.88 Intraclass correlation coefficients 0.78-0.93 Validation Spearman correlation coefficients Time 1: 0.21-0.57 Time 2: 0.38-0.60
Development and Validation of a Food-Frequency Questionnaire to Assess Short-Term Antioxidant Intake in Athletes	Braakhuis, Hopkins, et al. (2011) (96) NZ	Questionnaire detail: Quantitative Antioxidant intake in athletes Reliability/validation n = 20/ 113 Male: NA/ 56 Female: NA/ 57 Mean age: 22 +/- 3 yrs Age range: NA/17-36 Reliability and Validation assessment participants: different	Reliability assessment: 1 week test-retest Validation method: 7-d weighed diet record and antioxidant biomarker	Reliability Intraclass correlation coefficient 0.08-0.81, total intake 0.83 Validation Energy adjusted Pearson's Correlation Coefficients Diet record: 0.06-0.73, total intake 0.38 Plasma sample total intake 0.28
Reliability and relative validity of a food frequency questionnaire to assess food group intakes in New Zealand adolescents	Wong et al. (2012) (94) NZ	Questionnaire detail: NZAFFQ - Adolescents' food patterns. Non-quantitative 72-item FFQ was developed and pretested. Reliability/validation n = 52/ 41 Male:28/ 16 Female: 24/ 25 Mean age: 15.1yrs +/-0.8 Age range: 14-17.9yrs Reliability and Validation assessment participants: same	Reliability assessment: 2 week test-retest (mean 12days) Validation method: Four-day estimated food record Order: Questionnaire, diet record, questionnaire	Reliability: Intra-class correlations median 0.69, range 0.26-0.92 Spearman's correlations median 0.71, range 0.46-0.87 Cross-classification analyses in tertiles – correctly classified 46-88%, Grossly misclassified 0-25% Validation: Spearman's correlations median 0.40, range 0.04-0.70 Cross-classification analyses in tertiles correctly classified 27-78%, grossly misclassified 5-24%

Appendix B: NEEDNT-FFQ

Subject ID:..... Date:

NON-ESSENTIAL ENERGY-DENSE NUTRITIONALLY-DEFICIENT (NEEDNT) FOOD FREQUENCY QUESTIONNAIRE

Instructions:

Please mark in the box how often you have consumed these food items in the past year with a X or ✓. This questionnaire is assessing frequency of intake so how many times per day/week you consume these items rather than the amount per sitting.

Type of food	How often (mark one)						
	Never or less than once per month	Once per week	2-4 times per week	5-6 times per week	Once per day	Twice per day	3+ times per day
Baking and Desserts							
Biscuits (e.g. cookies, café-style biscuit, choc coated biscuits, layered biscuits with cream and/or jam filling, plain fruit or choc chip biscuits)							
Cakes and slices (e.g. rich gateaux/layered cake, cheesecake, slice or brownie, cake, light cake or sponge, cupcakes)							
Desserts/puddings (e.g. fruit crumble, pie or tart, self-saucing or syrup pudding, creamed rice, bread & butter pudding, ambrosia, trifle, pavlova, custard, mousse, jelly, sorbet, iceblock, eclairs, pancakes, piklets, waffles)							
Doughnuts and sweetbreads (e.g. doughnut filled with cream or jam, doughnut ring, chelsea bun, brioche, iced sweet bun, cream bun, fruit loaf)							
Muffins and scones (e.g. sweet or savoury)							
Pastries sweet (e.g. crossiants or Danish, premade or homemade pastry)							
Pies, savouries, and pasties (e.g. meat or vegetable pie, family sized dinner pie, sausage roll, pastie, party-sized savouries)							
Quiche (e.g. pastry-based quiche or bacon&egg pie)							
Beverages							
Alcoholic drinks (e.g. beer, wine, spirits, cream liqueur)							
Cordial and fruit drinks (e.g. cordial or fruit syrup prepared with water or premade)							
Drinking Chocolate and beverage powders (e.g. hot chocolate powder, Milo™ or similar beverages, flavoured coffee powders, flavoured milk mix/powder)							
Energy and sports drinks (e.g. bottle or canned energy drink, sports drink premade or prepared with water)							
Fruit Juices (e.g. pure fruit juice & fruit based smoothies except tomato juice and unsweetened blackcurrant juice)							

Subject ID:..... Date:

Type of food	How often (mark one)						
	Never or less than once per month	Once per week	2-4 times per week	5-6 times per week	Once per day	Twice per day	3+ times per day
Beverages continued							
Regular powdered drinks (e.g. Raro)							
Regular soft drinks (e.g. Regular soft drink, carbonated beverage or mixer, carbonated juice, frozen soft drinks) Diet soft drinks excluded.							
Breakfast cereals							
Toasted muesli and any other breakfast cereal with ≥ 15g sugar per 100g cereal(e.g. toasted muesli, sweetened cereals or novelty cereals) note: if unsure you can check packets at home							
Confectionary							
Chocolate (e.g. chocolate block or bar varieties, boxed or individual chocolates, bite sized bars)							
Sweets/lollies (e.g. jellies, boiled sweets, mints, chews, toffees, liquorice, fudge, nougat, coconut ice, bite sized choc fish)							
Dairy Products and Alternatives							
Condensed milk (e.g. regular, lite and flavoured varieties, condensed milk homemade dressings)							
Flavoured milk/milkshakes (e.g. flavoured milk varieties, milkshake, thickshake, café-style blended frappe with cream, breakfast cereal beverages)							
Ice cream (e.g. icecream on a stick or cone, regular or lite tub icecream, soft serve sundae or cone)							
Sour cream (e.g. regular or lite sour cream and crème fraiche)							
Whole Milk (e.g. dark blue or silver top milk, regular soy milk)							
Yoghurt type products with ≥ 10g sugar per 100g yoghurt (e.g. gourmet, greek, fromagefrais, dessert style yoghurts, dairy food, frozen yoghurt, drinking yoghurt, pottled yoghurt, yoghurt based dips) note: if unsure you can check packets at home							
Fast foods and takeaways							
Fried food (e.g. battered fish fillet, hotdog or sausage, coated chicken, spring rolls, sweet and sour pork, nuggets, hash browns, croquettes and similar items)							

Subject ID:..... Date:

Type of food	How often (mark one)						
	Never or less than once per month	Once per week	2-4 times per week	5-6 times per week	Once per day	Twice per day	3+ times per day
Fast food and takeaways continued							
Hot chips and wedges (e.g. hot chips or fries – shoestring, French, crinkle cut, thick or straight cut, wedges)							
Takeaways (e.g. burgers, creamy or buttery curry, ethnic meal or fried rice, pizza, sub or sandwich with high fat meats and sauces or equivalent wrap, roll or donor kebab, any other takeaway item)							
Fats, creams and butters							
Butter and solid fats (e.g. used as spread or in baking/cooking; white fat or rind from untrimmed meats; fat from un-skimmed gravies, stews or boil-ups; garlic bread, garlic naan, pita or other butter- soaked varieties; hollandaise or béarnaise sauce)							
Cream (e.g. liquid cream; whipped cream; cream based sauces in pasta, curries, simmer sauce etc; cream based soups, dips or spreads; cream based dressings)							
Reduced cream (e.g. in dips, dressings, sauces)							
Coconut cream (e.g. regular or lite in sauces, drinks etc.)							
Oil based dressings (e.g. Mayonnaise, aioli, tarter, Caesar, dijionaise)							
Fruit Products							
Fruit tinned in syrup (e.g. lite or heavy syrup, including when syrup is drained)							
Fruit flavoured rollups, sticks and straps							
Processed Meats							
Regular sausages (e.g. sausages, frankfurters or saveloys without reduced fat)							
Regular salami (e.g. pastrami, salami without reduced fat)							
Regular luncheon sausage (e.g. luncheon sausage/chicken roll without reduced fat)							
High fat bacon (e.g. streaky or middle bacon)							
Other high fat processed meat not mentioned above (e.g. pate, canned corned beef)							
Snack Foods							
Chips/crisps (e.g. corn chips, potato crisps or vegetable crisps)							

Subject ID:..... Date:

Type of food	How often (mark one)						
	Never or less than once per month	Once per week	2-4 times per week	5-6 times per week	Once per day	Twice per day	3+ times per day
Snack Foods Continued							
High fat crackers (≥ 10g fat per 100g – will usually appear shiny) note: if unsure can check packets at home							
Muesli and snack bars (e.g. meal replacement bars, chocolate/yoghurt coated muesli or snack bar, plain or fruit muesli bar, soft cereal bar, muffin bar)							
Nuts roasted in fat or oil (e.g. nuts roasted in butter, oil or honey etc. - will often appear greasy/shiny)							
Popcorn with butter or oil (e.g. cinema popcorn, caramel or candied, microwave or premade popcorn)							
Sugars, syrups and spreads							
Glucose (e.g. pure glucose liquid)							
Sweet spreads (e.g. Jam, honey, marmalade, lemon curd, choc/hazelnut spread)							
Sugar (e.g. white, raw, low-GI, brown, Demerara, coffee crystals added to anything including drinks, baking, cooking etc.)							
Syrups, sauces and toppings (e.g. golden, maple, corn, fruit and flavoured syrups; treacle; ice cream toppings and sweet sauces such as chocolate, caramel and fruit compote)							

Original List Source: Elmslie JL, Sellman JD, Schroder RN, Carter FA. N Z Med J. 2012 Feb 24;125(1350):84-92.

Appendix C: Ethical Approval

Office Use Only	



HUMAN ETHICS APPLICATION: CATEGORY a

PLEASE *read carefully the instructions "Filling out your Human Ethics Application" and important notes on the last page of this form. Provide a response to each question; failure to do so may delay the consideration of your application.*

1. University of Otago staff member responsible for project:

(surname) Elmslie (first name) Jane (title) Dr

2. **Department:** Psychological Medicine, University of Otago Christchurch.

3. Contact details of staff member responsible: jane.elmslie@otago.ac.nz, 027 646 0098

4. Title of project: The NEEDNT Food List Intake Assessment Research Study

5. Indicate type of project and names of other investigatorsand students:

Staff Research	☐	**Names**	
Student Research	✓	**Names**	Brigit Eder
Level of Study(e.g. PhD, Masters, Hons)			MDiet
External Research/ Collaboration	☐	**Names**	Not applicable
Institute/Company			Not applicable

6. Is this a repeated class teaching activity?

NO

If YES, and this application is to continue a previously approved repeated class teaching activity, please provide Reference Number:

7. Fast-Track procedure

Do you request fast-track consideration? *(See 'Filling Out Your Human Ethics Application')*

NO

If YES, please state specific reasons:-

8. When will recruitment and data collection commence?

Recruitment and data collection will commence on February 4th 2013

When will data collection be completed?

Data collection will be completed by May 31st

9. Funding of project.

Is the project to be funded by an external grant?

NO

If YES, please specify who is funding the project:

If commercial use will be made of the data, will potential participants be made aware of this before they agree to participate? If not, please explain:

Not applicable

10. Brief description <u>in lay terms</u> of the purpose of the project (approx. 75 words)**:**

The purpose of the study is to develop and test a 52 item food frequency questionnaire (FFQ) designed to assess intake of non-essential energy dense (NEEDNT) foods. The recently developed NEEDNT Food List (Elmslie et al 2012) will be used as a basis for the FFQ. The study will examine whether participants give similar answers to the questionnaire on 2 separate occasions (reproducibility) and whether comparable amounts and types of non-essential energy dense foods are measured using the food record (relative validity).

11. Aim of project, including the research questions the project is intended to answer:

The aim of the study is to develop and examine the reproducibility and relative validity of a 52 item self-administered food frequency questionnaire (FFQ) designed to assess intake of energy dense nutrient poor food in a group of 60 New Zealand adults with obesity.

The main research questions are:

Are NEEDNT Food intakes measured using the FFQ reproducible?

What is the level of agreement between intakes of NEEDNT Foods intakes measured using the FFQ and the food record?

12. Researcher or instructor experience and qualifications in this research area:

Dr Elmslie the project supervisor, developed the NEEDNT Food list to be used as a clinical tool in the management of obesity. She is currently supervising a project to develop moderation guidelines for this list. She has published a number of papers in the area of obesity; her PhD research involved dietary assessment in bipolar patients and she retains a strong research interest in the role of diet in obesity. She has previously supervised a student project to adapt an existing FFQ and she has collected dietary data using an FFQ in a previous study.

13. Participants

13(a) Population from which participants are drawn:

The participants will be members of the general public recruited by advertisement.

13(b) Specify inclusion and exclusion criteria:

Inclusion Criteria

1. Adult men and women aged 18-65 years of age who are fluent in oral, written and numerical English language.
2. Who currently have a BMI of 30 or above and have not lost ≥5% of their total body weight within the last six months;
3. Who are not taking insulin, steroids, atypical antipsychotic medications, or weight loss medications;
4. Who are not currently pregnant, breastfeeding, or planning to become pregnant within the study period.

13(c) Estimated number of participants:

The sample size and statistical analyses were discussed with Associate Professor Chris Frampton. To allow for dropouts, 60 participants will be recruited for the study. It is anticipated that 50 people will complete the study. This number of participants has been found to be sufficient in previous similar studies (Wong et al 2012).The level of agreement between the two dietary assessment methods will be evaluated using Bland-Altman analysis while intra-class correlations will be used to examine the test-retest reliability of the FFQ.

13(d) Age range of participants: 18-65years

13(e) Method of recruitment:

Participants will be recruited by public advertisement. Word of mouth may also be used.

13(f) Please specify any payment or reward to be offered:

Free 45 minute consult with Student Dietitian Brigit Eder post study. This consult will include discussion of food record and FFQ results for each individual. The newly developed NEEDNT Food Moderation Guidelines will be used in these consults where appropriate.

14. Methods and Procedures:

The test-retest reproducibility will be assessed at 2 time points and the relative validity of the FFQ will be assessed using a 4-day estimated food record as the reference method. Participants will complete the questionnaire on 2 occasions 4 weeks apart. In the interval between these 2 occasions they will complete a 4-day food record. The reproducibility of the FFQ will be assessed by comparing the frequency of reported non-essential energy dense food intake at the 2 time points, and the relative validity of the FFQ will be assessed by comparing non-essential energy dense food intakes using the food record with those reported in the FFQ. Associate Professor Chris Frampton has been consulted about statistical methods for the project. He suggests that 50 participants will provide sufficient power to answer the research questions posed. Dr Paula Skidmore, Department of Human Nutrition has also advised on the study design.

References

1. Elmslie JL, Sellman JD, Schroder RN, Carter FA. N Z Med J. 2012;125(1350):84-92

2. Wong JE, Parnell WR, Black KE, Skidmore PM. Nutrition Journal 2012;11:65. doi: 10.1186/1475-2891-11-65

15. Compliance with The Privacy Act 1993 and the Health Information Privacy Code 1994 imposes strict requirements concerning the collection, use and disclosure of personal information. These questions allow the Committee to assess compliance.

15(a) Are you collecting and storing personal information directly from the individual concerned that could identify the individual?

We will be collecting participants' names and contact details. Each participant will be assigned an ID number. This will be used on all information relating to the study. Participants' names and contact details will be stored separately from other study documentation.

15(b) Are you collecting information about individuals from another source? Please explain:

NO

15(c) Collecting Personal Information:

- Will you be collecting personal information?

  YES

- Will you be informing participants of the purpose for which you are collecting the information and the uses you propose to make of it?

  YES

- Will you be informing participants who will receive the information?

  YES

- Will you inform participants of the consequences, if any, of not supplying the information?

  YES

- Will you inform the participants of their rights of access to and correction of personal information?

  YES

Where the answer is YES, please make sure the information is available in the Information Sheet for Participants.

If you are NOT informing them of the points above, please explain why:

15(d) Please outline your data storage and security procedures.

During the data collection, analysis and write up phase of the study, all data (screening, anthropometric, demographic, food records, and FFQs) will be stored in a locked filing cabinet in the Dietetic Training programme Office, University of Otago Christchurch, The study researcher, Brigit Eder, will hold the key. Upon project completion, all data will be sent to Jane Elmslie at the National Addiction Centre, Department of Psychological Medicine, University of Otago Christchurch, where it will be held securely for 10 years. Each study participant will have a numerical ID number. This will be allocated upon entry to the study and used in all written and electronic forms of data. A separate list of participants' names and code numbers will be stored securely for the duration of the data collection and write-up phase of the study and accessible only to the study researcher (Brigit Eder). Once the study is completed and participants have been notified of their study results this list will be destroyed.

15(e) Who will have access to personal information, under what conditions, and subject to what safeguards?

The Principle Investigator; Dr Jane Elmslie, and Brigit Eder will have access to the data during the study. Additional researchers involved in potential future research related to this study may also have access, at the discretion of Dr Jane Elmslie.

Will participants have access to the information they have provided?

YES

15(f) Do you intend to publish any personal information they have provided?

NO

If YES, please specify in what form you intend to do this?

15(g) Do you propose to collect demographic information to describe your sample? For example: gender, age, ethnicity, education level, etc.

YES

15 (h) Have you, or do you propose to undertake Māori consultation? Please choose one of the options below, and delete the options that do not apply:

(Please see http://www.otago.ac.nz/research/maoriconsultation/index.html).

YES We have ALREADY undertaken consultation *[please attach a copy of your completed Research Consultation with Māori Form]*

16. Does the research or teaching project involve any form of deception?

NO

If yes, please explain all debriefing procedures:

17. Please disclose and discuss any potential problems: (For example: medical/legal problems, issues with disclosure, conflict of interest, etc)

We can think of no specific issues relating to this research.

18. Applicant's Signature: .....

[Principal Applicant: as specified in Question 1]

Date: .....

19. Departmental approval:*I have read this application and believe it to be scientifically and ethically sound. I approve the research design. The Research proposed in this application is compatible with the University of Otago policies and I give my consent for the application to be forwarded to the University of Otago Human Ethics Committee with my recommendation that it be approved.*

Signature of *Head of Department:.....

Name of Signatory (please print): …….

Date:.....

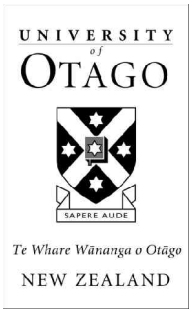
**(In cases where the Head of Department is also the principal researcher then an*

appropriate senior staff member in the department must sign)

Please attach copies of the Information Sheet, Consent Form, and Advertisement for Participants

[Please send the original and 16 copies of the application, double-sided and stapled, to Academic Committees, Room G23 or G24, Ground Floor, Clocktower Building, University of Otago]

[Reference Number *as allocated upon approval by the Ethics Committee*]
[*Date*]



The NEEDNT Food List Intake Assessment Research Study

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

To develop and examine the reproducibility and relative validity of a 52 item self-administered food frequency questionnaire (FFQ) designed to assess NEEDNT food intakes in New Zealand adults who are overweight or obese. This project is being undertaken as part of the requirements for the Masters in Dietetics programme.

What Type of Participants are being sought?

60 adult men and women aged 18-65 years of age recruited by public advertisement

Participants must also be:
-fluent in oral, written and numerical English language
-currently have a BMI of 30 or above and have not lost ≥5% of their total body weight within the last six months
-not taking insulin, steroids, atypical antipsychotic medications, or weight loss medications
-not currently pregnant, breastfeeding, or planning on becoming pregnant within the study period

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to complete a 52 item food frequency questionnaire at 2 time points, 4 weeks apart. Demographic information will also be collected on a separate form. Within the 4 weeks between questionnaires you will be asked to complete a 4 day estimated food record. This information will be used toassess reproducibility (test-retest) and validity of the food frequency questionnaire. The food frequency questionnaire will take approximately 15 minutes to complete. Following the first questionnaire instruction on how to complete the 4 day estimated diet record will be provided.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

The data collected will be securely stored in such a way that only those mentioned below will be able to gain access to it. Data obtained as a result of the research will be retained for 10 years in secure storage. Any personal information held on the participants may be destroyed at the completion of the research even though the data derived from the research will, in most cases, be kept for much longer or possibly indefinitely.

A 4-day estimated food record and a food frequency questionnaire (FFQ) will be collected at 2 separate time points. The 2 FFQ's will be used to assess the reproducibility of the questionnaire, and the diet record will be used as a reference method to assess relative validity of the FFQ. Your age, sex, height, weight, usual income, highest level of education and ethnicity will be collected as part of the research study. This information may be used to help us better understand differences in dietary intakes. The Principle Investigator; Dr Jane Elmslie, and Brigit Eder will have access to the data during the study. Additional researchers involved in potential future research related to this study may also have access, at the discretion of Dr Jane Elmslie.

The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

If you are unsure of some food items consumed when answering the FFQ you will have the opportunity to go home and check before answering these questions. Once data entry has been completed you will no longer be able to modify answers to questionnaires or food record information.

You will have access to your food record and FFQ assessment following the completion of the study. This information will be explained during a consult with final year Student Dietitian Brigit Eder if desired.

Can Participants Change their Mind and Withdraw from the Project?

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

What if Participants have any Questions?

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

Brigit Eder	and/or	Jane Elmslie
Dietetic Training Programme, University of Otago, Christchurch University Telephone Number 027 920 1313 Email Address:NeedntFoodList@otago.ac.nz		Department of Psychological Medicine, University of Otago, Christchurch University Telephone Number 364 0480 Email Address: jane.elmslie@otago.ac.nz

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

The NEEDNT Food List Intake Assessment Research Study.

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. Personal identifying information will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

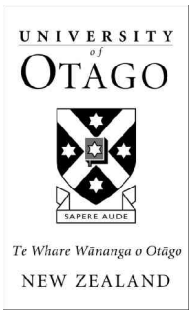
4. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

....

(Signature of participant) (Date)

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.





Dietetic Training Programme
University of Otago, Christchurch

The NEEDNT Food List Intake Assessment Research Study

PLEASE NOTE

We have included our intended advertisement as a separate document, included with this application. Owing to problems with formatting, the advertisement we wish to use, could not be copied into the University of Otago, Ethics form.

[Brief list of benefits to participants (if any) reasonably stated. Outsized fonts emphasising money should not be used]

[The time commitment that will be required]

[Contact Details: Name, address, phone number and email address of principal investigator]

[This project has been reviewed and approved by the University of Otago Human Ethics Committee. Reference: ##/###]

Dietetic Training Programme

University of Otago, Christchurch

'The NEEDNT Food List Intake Assessment Research Study'

Did you hear about the list of foods we **NEEDNT** eat?
…Or that **Blacklist** of **Foods to Avoid**?

Are you intrigued to know what it's <u>really</u> all about?

Otago University researchers have developed a questionnaire to assess people's intake of certain high calorie foods that tend to promote weight gain & poor health when eaten habitually.

We are seeking 60 people to complete this questionnaire taking approximately 15 min on 2 separate occasions. You will also be asked to record of what you eat for 4 days so we can assess whether the questionnaire measures NEEDNT food intake accurately.

What's in it for you?

- The chance to validate a questionnaire that may improve weight management for others like you
- A one-on-one consult with a final year Student Dietitian to explain your results and assist you with weight loss after the study period
- Learn about how much 'treat' food you can actually eat

So, if you are:

- <u>18-65 years</u> of age, with a <u>BMI of 30 or above</u>, and have<u>not lost a large amount of weight in the last 6 months</u>, we would love to hear from you. If you're not sure what your BMI is, Google search 'BMI calculator' or feel free to contact us

For more info or to register your interest
Please contact Brigit Eder on
027 920 1313**(texts welcome) or**<u>NeedntFoodList@otago.ac.nz</u>

The University of Otago Ethics Committee has approved this study: Reference ……

This study is being conducted by Masters in Dietetics Candidate Brigit Eder under the supervision of Dr Jane Elmslie, Department of Psychological Medicine, University of Otago, Christchurch, Phone 03 364 0480

UNIVERSITY OF OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

19 November 2012

Dr Jane Elmslie
Department of Psychological Medicine
University of Otago, Christchurch

Mā te rangahau hauora e tautoko te whakapiki ake te hauora Māori
All health research in Aotearoa New Zealand benefits the hauora (health and wellbeing) of tangata whenua

Tena koe Jane,

Thank you for taking the time to meet with me at the University of Otago, Christchurch on Monday 12 November 2012, to discuss your research study titled:

Development and Validation of an FFQ to measure non-essential, energy dense (NEEDNT) food intake in people with obesity

I note that the research is a Masters thesis, a 5 month observational study of people with obesity recruited from the general population.

As your research is a questionnaire, it is always challenging to make comment in terms of achievement for improving health status and in particular Maori health status. However, what we have both discussed is obesity and type 2 diabetes significant to Maori health problems.

It was apparent in your research summary, that there could be a number of Maori participants should you need the assistance.

Maori health workers, Maori health providers, Maori health professionals, should be relatively accessible and well placed to advise you as to a relevance of your research and the outcomes which can be achieved for Maori health and the population overall.

We also discussed the relevance of the research in regard to improving Maori health status and referred to the *1. HRC's Nga Pou Rangahau Hauora Kia Whakapiki Ake Te Hauora Maori 2004-2008, 2. The Health Research Strategy to Improve Maori Health and Well Being 2004-2008.* The other reference that is available is 3. *Hauora Maori Standards of Health IV: A Study of the Years 2000-2005* by Bridget Robson and Ricci Harris, Maori Health Research Unit, Wellington School of Medicine, University of Otago, Wellington. All provide Maori specific information on a range of health issues.

The recent publication *Tatau Kahukura: Maori Health Chart Book 2010*, Ministry of Health, 2010 (2nd edition), is an update relating to the socio economic determinants of health, health status and service utilisation of the Maori population. Further references are available from the HRC's *Guidelines for Researchers on Health Research Involving Maori* (page 22), www.hrc.govt.nz

Research Office, Department of the Dean
University of Otago, Christchurch
PO Box 4345, Christchurch Mail Centre, Christchurch 8140, New Zealand
Tel +64 3 364 0237 • Fax +64 3 364 1490 • Email research.uoc@otago.ac.nz
www.uoc.otago.ac.nz

It is also advisable that researchers review and refer to the District Health Board's Annual Plan, www.cdhb.govt.nz/communications/documents/pdf/annualplan/annual_plan_2011_2012.pdf and/or the current Health Targets published by the Ministry of Health for 2011/2012, www.health.govt.nz/new-zealand-health-system/health-targets

It was agreed that there is a need to acknowledge the issues pertaining to ethnicity and to consider how ethnicity data will be collected in your study. Also, given the poor ethnicity data collection in hospital databases, this information is collected in demographic information and supplied to the Ministry of Health, as part of the research. Through our discussion, the Census 2006 ethnicity question was considered to be the preferred tool in recording ethnicity.

It is a requirement of the ethics approval process, that a final report be submitted when the research is complete. A copy of the report should also be supplied to me at that time, as findings from this project may contribute to the development of future research hypotheses or projects. It is therefore important that appropriate Maori organisations, Maori health professionals and Maori researchers are aware of your findings. The Research Office of the University of Otago, Christchurch and in particular myself as the Research Manager - Maori would be willing to assist in the dissemination of your findings once your project has reached a successful conclusion.

My suggestions do not necessarily relate to ethical issues with your research, including methodology. Other committees may also provide feedback in these areas. Please contact me should you need any other information that may not have been included in this letter that was relevant to our conversation.

I wish you well in your research.

"Mo tatou a mo ka uri a muri ake nei" Ngai Tahu 2025
For us and our children after us

Ka nui tonu nga mihi

Elizabeth Cunningham
Research Manager - Maori

Academic Services
Manager, Academic Committees, Mr Gary Witte

12/343

3 December 2012

Dr J Elmslie
Department of Psychological Medicine (ChCh)
Terrace House, 4 Oxford Terrace
University of Otago, Christchurch

Dear Dr Elmslie,

I am writing to thank you for sending to me copies of your proposal entitled "**The NEEDNT Food List Intake Assessment Research Study**".

The next meeting of the Ethics Committee is scheduled for **Thursday, 13 December, 2012.**

I shall ensure that your application is considered at that meeting and I anticipate that I will be able to let you know the outcome early in the following week.

For your future reference, the Ethics Committee's reference code for this project is **12/343**.

Yours sincerely,

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

UNIVERSITY OF OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

Academic Services
Manager, Academic Committees, Mr Gary Witte

12/343

17 December 2012

Dr J Elmslie
Department of Psychological Medicine (ChCh)
Terrace House, 4 Oxford Terrace
University of Otago, Christchurch

Dear Dr Elmslie,

I am writing to let you know that, at its recent meeting, the Ethics Committee considered your proposal entitled "**The NEEDNT Food List Intake Assessment Research Study**".

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

For your future reference, the Ethics Committee's reference code for this project is:- **12/343**.

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

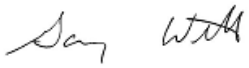
While approving the application, the Committee would be grateful if you would respond to the following:

The Committee would be grateful if you could define "NEEDNT" in the Information Sheet, to clarify the study for participants. We recommend the Information Sheet be reviewed with a view to simplifying it for lay people.

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

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

Yours sincerely,



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

c.c. Professor R Mulder Head Department of Psychological Medicine (ChCh)

National Addiction Centre

(Aotearoa New Zealand)

Friday, January 25th, 2013

Mr Gary Witte
Manager Academic Committees
Academic Services
University of Otago
PO Box 56
DUNEDIN

Dear Mr Witte,

RE: Ethical Approval **12/343**
Study title: **The NEEDNT Food List Intake Assessment Research Study**
Investigators: Dr Jane Elmslie, Ms Brigit Eder

Thank you very much for your letter dated 17 December 2012.We have clarified the meaning of NEEDNT Food in the information sheetas suggested by the ethics committee members.We have also simplified the language in the information sheet, and Brigit has sought feedback on it from family and friends to ensure that it will be easily understood by the general public (revision attached).

We have made one small but important change to the study protocol; we have reduced the time between completing the first and second FFQ from 4 weeks to 2 weeks. This decision was made to ensure that as many participants as possible would be retained in the study and would complete all the required assessments. The information sheet has been revised to reflect this change.

In addition we wish to advise of a small but important amendment to our answer to the following question in the original ethical proposal:

15(e) Who will have access to personal information, under what conditions, and subject to what safeguards?

In the original proposal we said that:

The Principle Investigator; Dr Jane Elmslie, and Brigit Eder will have access to the data during the study. Additional researchers involved in potential future research related to this study may also have access, at the discretion of Dr Jane Elmslie.

Brigit would now like to have the option of employing data entry personnel for the study if necessary. In line with this change our answer to the above question is: The Principle Investigators; Dr Jane Elmslie, and Brigit Eder, as well as data entry personnel will have access to the data during the study.

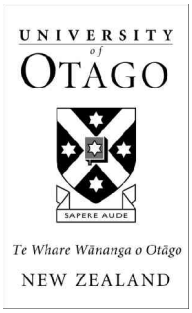
We have updated the information sheet to reflect this. We have also updated Brigit's contact details in the information sheet.

We have created a second version of the study advertisement with tear off phone numbers. Both versions will be used to advertise the study, an email version (without tear off phone numbers) and a noticeboard version (with tear off phone numbers). Brigit's contact details have been updated in both versions (see documents attached).

In addition we draw your attentionto a typographical error in the original proposal document, in which the FFQ was described as a 52 item questionnaire. It should have been described as a 48 item questionnaire. Thecorrect 48 item questionnaire was supplied with the original proposal and will be used in the study.

Yours sincerely
Dr Jane Elmslie

Reference Number 12/343
Date: 25th January 2013



The NEEDNT Food List Intake Assessment Research Study

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

To develop a food frequency questionnaire (FFQ) designed to assess non-essential energy dense (NEEDNT) food intakes in New Zealand adults who are overweight or obese. The questionnaire will then be examined for reliability and accuracy. This project is being undertaken as part of the requirements for the Masters in Dietetics programme.

What Type of Participants are being sought?

60 adult men and women aged 18-65 years of age recruited by public advertisement

Participants must also be:
-fluent in oral, written and numerical English language
-currently have a BMI of 30 or above and have not lost ≥5% of their total body weight within the last six months
-not taking insulin, steroids, atypical antipsychotic medications, or weight loss medications
-not currently pregnant, breastfeeding, or planning on becoming pregnant within the study period

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to complete a 48 item food frequency questionnaire at 2 time points, 2 weeks apart. Demographic information will also be collected on a separate form. Within the 2 weeks between questionnaires you will be asked to complete a 4 day estimated food record. This information will be used toassess the reliability and accuracy of the food frequency questionnaire. The food frequency questionnaire will take approximately 15 minutes to complete. Following the first questionnaire, information on how to complete the 4 day estimated diet record will be provided.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

The data collected will be securely stored in such a way that only those mentioned below will be able to gain access to it. Data obtained as a result of the research will be retained for 10 years in secure storage. Any personal information held on the participants may be destroyed at the completion of the research even though the data derived from the research will, in most cases, be kept for much longer or possibly indefinitely.

A 4-day estimated food record and a food frequency questionnaire (FFQ) will be collected at 2 separate time points. The 2 FFQ's will be used to assess the reliability of the questionnaire, and the diet record will be used to assess accuracy of the FFQ. Your age, sex, height, weight, usual income, highest level of education and ethnicity will be collected as part of the research study. This information may be used to help us better understand differences in dietary intakes. The study investigators; Dr Jane Elmslie, and Brigit Eder, as well as data entry personnel will have access to the data during the study. Additional researchers involved in potential future research related to this study may also have access, at the discretion of Dr Jane Elmslie.

The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

If you are unsure of some food items consumed when answering the FFQ you will have the opportunity to go away and check before answering these questions. Once data entry has been completed you will no longer be able to modify answers to questionnaires or food record information.

You will have access to your food record and FFQ assessment following the completion of the study. This information will be explained during a consultation with final year Student Dietitian Brigit Eder if desired.

Can Participants Change their Mind and Withdraw from the Project?

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

What if Participants have any Questions?

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

Brigit Eder	and/or	Jane Elmslie
Dietetic Training Programme, University of Otago, Christchurch University Telephone Number 0273122973 Email Address:needntfoodlist@gmail.com		Department of Psychological Medicine, University of Otago, Christchurch University Telephone Number 364 0480 Email Address: jane.elmslie@otago.ac.nz

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

The NEEDNT Food List Intake Assessment Research Study.

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

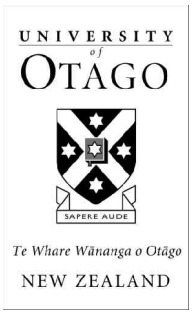
3. Personal identifying information will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

5. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

....
(Signature of participant) (Date)

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.



Dietetic Training Programme

University of Otago, Christchurch

'The NEEDNT Food List Intake Assessment Research Study'

Did you hear about the list of foods we **NEEDNT** eat?
…Or that **Blacklist** of **Foods to Avoid**?

Are you intrigued to know what it's <u>really</u> all about?

Otago University researchers have developed a questionnaire to assess people's intake of certain high calorie foods that tend to promote weight gain & poor health when eaten habitually.

We are seeking 60 people to complete this questionnaire taking approximately 15 min on 2 separate occasions. You will also be asked to record of what you eat for 4 days so we can assess whether the questionnaire measures NEEDNT food intake accurately.

What's in it for you?

- The chance to validate a questionnaire that may improve weight management for others like you
- A one-on-one consult with a final year Student Dietitian to explain your results and assist you with weight loss after the study period
- Learn about how much 'treat' food you can actually eat

So, if you are:

- <u>18-65 years</u> of age, with a <u>BMI of 30 or above</u>, and have<u>not lost a large amount of weight in the last 6 months</u>, we would love to hear from you. If you're not sure what your BMI is, Google search 'BMI calculator' or feel free to contact us

For more info or to register your interest
Please contact Brigit Eder on
027 312 2973**(texts welcome) or**needntfoodlist@gmail.com

The University of Otago Ethics Committee has approved this study: Reference 12/343

This study is being conducted by Masters in Dietetics Candidate Brigit Eder under the supervision of Dr Jane Elmslie, Department of Psychological Medicine, University of Otago, Christchurch, Phone 03 364 0480

Dietetic Training Programme

University of Otago, Christchurch

'The NEEDNT Food List Intake Assessment Research Study'

Did you hear about the list of foods we **NEEDNT** eat?
…Or that **Blacklist** of **Foods to Avoid**?
Are you intrigued to know what it's <u>really</u> all about?

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We are seeking 60 people to complete this questionnaire taking approximately 15 min on 2 separate occasions. You will also be asked to record of what you eat for 4 days so we can assess whether the questionnaire measures NEEDNT food intake accurately.

What's in it for you?

- The chance to validate a questionnaire that may improve weight management for others like you
- A one-on-one consult with a final year Student Dietitian to explain your results and assist you with weight loss after the study period
- Learn about how much 'treat' food you can actually eat

So, if you are:

- <u>18-65 years</u> of age, with a <u>BMI of 30 or above</u>, and have<u>not lost a large amount of weight in the last 6 months</u>, we would love to hear from you. If you're not sure what your BMI is, Google search 'BMI calculator' or feel free to contact us

For more info or to register your interest
Please contact Brigit Eder on
027 312 2973**(texts welcome) or**needntfoodlist@gmail.com

The University of Otago Ethics Committee has approved this study: Reference 12/343. This study is being conducted by Masters in Dietetics Candidate Brigit Eder under the supervision of Dr Jane Elmslie, Department of Psychological Medicine, University of Otago, Christchurch, Phone 03 364 0480

The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973

Academic Services
Manager, Academic Committees, Mr Gary Witte

28 January 2013

Dr J Elmslie
Department of Psychological Medicine (ChCh)
Terrace House, 4 Oxford Terrace
University of Otago, Christchurch

Dear Dr Elmslie,

I am again writing to you concerning your proposal entitled "**The NEEDNT Food List Intake Assessment Research Study**", Ethics Committee reference number **12/343**

Thank you for your letter of 24/01/13 which responds to the Committee, and requests an amendment to your study.

The Committee thanks you for your letter of response, and for providing copies of your amended and finalised Information Sheet and advertisement. The language of the Information Sheet has been simplified, and you have clarified the meaning of NEEDNT for participants. We confirm that these amendments are approved.

In addition you have requested two amendments, the first being a change to the study protocol to reduce the time between completing the first and second FFQ from four weeks to two weeks. The second is to alert study participants that data entry staff will have access to the data during the study. We confirm that these amendments are approved.

Your proposal continues to be fully approved by the Human Ethics Committee. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing. I hope all goes well for you with your upcoming research.

Yours sincerely,

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

c.c. Professor R Mulder Head Department of Psychological Medicine (ChCh)

Academic Services
Manager, Academic Committees, Mr Gary Witte

12/343

12 March 2013

Dr J Elmslie
Department of Psychological Medicine (ChCh)
Terrace House, 4 Oxford Terrace
University of Otago, Christchurch

Dear Dr Elmslie,

I am again writing to you concerning your proposal entitled "**The NEEDNT Food List Intake Assessment Research Study**", Ethics Committee reference number **12/343**.

Thank you for your email of 9/3/13 requesting an amendment to the protocol for the study, reducing the timeframe between the two questionnaires, and for recruiting in Dunedin as well as Christchurch to ensure there are enough participants. We confirm that these amendments are approved.

Your proposal continues to be fully approved by the Human Ethics Committee. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing. I hope all goes well for you with your upcoming research.

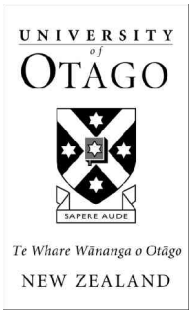
Yours sincerely,

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

c.c. Professor R Mulder Head Department of Psychological Medicine (ChCh)

Appendix D: Study Information Sheet

Reference Number 12/343
Date: 25th January 2013



The NEEDNT Food List Intake Assessment Research Study

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

To develop a food frequency questionnaire (FFQ) designed to assess non-essential energy dense (NEEDNT) food intakes in New Zealand adults who are overweight or obese. The questionnaire will then be examined for reliability. This project is being undertaken as part of the requirements for the Masters in Dietetics programme.

What Type of Participants are being sought?

60 adult men and women aged 18-65 years of age recruited by public advertisement

Participants must also be:
-fluent in oral, written and numerical English language
-currently have a BMI of 30 or above and have not lost ≥5% of their total body weight within the last six months
-not taking insulin, steroids, atypical antipsychotic medications, or weight loss medications
-not currently pregnant, breastfeeding, or planning on becoming pregnant within the study period

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to complete a 48 item food frequency questionnaire at 2 time points, 1 week apart. Demographic information will also be collected on a separate form. This information will be used toassess the reliability of the food frequency questionnaire. The food frequency questionnaire will take approximately 15minutes to complete. Following the 2nd questionnaire there will be an option to receive a 45min consult about weight management by Student Dietitian Brigit Eder.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

The data collected will be securely stored in such a way that only those mentioned below will be able to gain access to it. Data obtained as a result of the research will be retained for 10 years in secure storage. Any personal information held on the participants will be destroyed at the completion of the research even though the data derived from the research will, in most cases, be kept for much longer or possibly indefinitely.

A food frequency questionnaire (FFQ) will be completed at 2 separate time points. The 2 FFQ's will be used to assess the reliability of the questionnaire. Your age, sex, height, weight, usual income, highest level of education and ethnicity will be collected as part of the research study. This information may be used to help us better understand differences in dietary intakes. The Principle Investigators; Dr Jane Elmslie, and Brigit Eder, will have access to the data during the study. Additional researchers involved in potential future research related to this study may also have access, at the discretion of Dr Jane Elmslie.

The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

If you are unsure of some food items consumed when answering the FFQ you will have the opportunity to go away and check before answering these questions. Once you have left your final appointment you will no longer be able to modify answers to the questionnaires.

You will have access to your FFQ assessment following the completion of the study. This information will be explained during a consultation with final year Student Dietitian Brigit Eder if desired.

Can Participants Change their Mind and Withdraw from the Project?

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

What if Participants have any Questions?
If you have any questions about our project, either now or in the future, please feel free to contact either:-

Brigit Eder
Dietetic Training Programme,
University of Otago, Christchurch
University Telephone Number 0273122973
Email Address:needntfoodlist@gmail.com

and/or

Jane Elmslie
Department of Psychological Medicine,
University of Otago, Christchurch
University Telephone Number 364 0480
Email Address: jane.elmslie@otago.ac.nz

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Appendix E: Study Consent Form

The NEEDNT Food List Intake Assessment Research Study.
CONSENT FORM FOR
PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.
I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

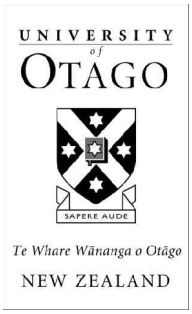
3. Personal identifying information will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

6. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

....
(Signature of participant) (Date)

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.



Appendix F: Advertisement

Dietetic Training Programme

University of Otago, Christchurch

'The NEEDNT Food List Intake Assessment Research Study'

Did you hear about the list of foods we **NEEDNT** eat?
…Or that **Blacklist** of **Foods to Avoid**?

Are you intrigued to know what it's really all about?

Otago University researchers have developed a questionnaire to assess people's intake of certain high calorie foods that tend to promote weight gain & poor health when eaten regularly.

We are seeking 60 people to complete this questionnaire taking approximately 15 min on 2 separate occasions.

What's in it for you?

- The chance to assess a new questionnaire that may improve weight management for others like you
- A one-on-one consult with a final year Student Dietitian to explain your results and assist you with weight loss after the study period
- Learn about how much 'treat' food you can actually eat

So, if you are:

- 18-65 years of age, with a BMI of 30 or above, and havenot lost a large amount of weight in the last 6 months, we would love to hear from you. If you're not sure what your BMI is, Google search 'BMI calculator' or feel free to contact us

For more info or to register your interest
Please contact Brigit Eder on
027 312 2973**(texts welcome) or**
needntfoodlist@gmail.com

The University of Otago Ethics Committee has approved this study: Reference 12/343

This study is being conducted by Masters in Dietetics Candidate Brigit Eder under the supervision of Dr Jane Elmslie, Department of Psychological Medicine, University of Otago, Christchurch, Phone 03 364 0480

Appendix G: Advertisement with Tear-off Tabs

Dietetic Training Programme

University of Otago, Christchurch

'The NEEDNT Food List Intake Assessment Research Study'

Did you hear about the list of foods we **NEEDNT** eat?
…Or that **Blacklist** of **Foods to Avoid**?
Are you intrigued to know what it's <u>really</u> all about?

Otago University researchers have developed a questionnaire to assess people's intake of certain high calorie foods that tend to promote weight gain & poor health when eaten regularly.

We are seeking 60 people to complete this questionnaire taking approximately 15 min on 2 separate occasions.

What's in it for you?

- The chance to assess a new questionnaire that may improve weight management for others like you
- A one-on-one consult with a final year Student Dietitian to explain your results and assist you with weight loss after the study period
- Learn about how much 'treat' food you can actually eat

So, if you are:

- <u>18-65 years</u> of age, with a <u>BMI of 30 or above</u>, and have<u>not lost a large amount of weight in the last 6 months</u>, we would love to hear from you. If you're not sure what your BMI is, Google search 'BMI calculator' or feel free to contact us

For more info or to register your interest
Please contact Brigit Eder on
027 312 2973**(texts welcome) or**needntfoodlist@gmail.com

The University of Otago Ethics Committee has approved this study: Reference 12/343. This study is being conducted by Masters in Dietetics Candidate Brigit Eder under the supervision of Dr Jane Elmslie, Department of Psychological Medicine, University of Otago, Christchurch, Phone 03 364 0480

The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973	The NEEDNT food list intake assessment research study needntfoodlist@gmail.com 0273122973

Appendix H: Self-Screening Form

PARTICIPANT SELF-SCREENING FORM:
The NEEDNT Food List Intake Assessment study

Date:

Participant number:

Phone numbers:

Preferred email:

Age:

Current height:
Current weight:

Ethnicity:

Usual income:

☐$<20,000 ☐$21-30,000 ☐$31-40,000 ☐$41-50,000 ☐$51-70,000 ☐$71-100,000 ☐$100,000+

Highest level of education:

Are you fluent in oral, written and numerical English language? Yes/No

Have you lost weight in the previous 6 months? Yes / No
If yes:
How much weight did you lose? (in kg or lb):

How much, if any, of this have you since regained? (in kg or lb):

Are you currently taking any of the following classes of medications:
Insulin, steroids, antipsychotic medications, or weight loss medications? Yes/No

Female participants:
Is there any possibility that you might be pregnant at the moment? Yes / No

Are you trying to become pregnant within the next 4-weeks or are you currently breastfeeding? Yes / No

Thank you for taking the time to fill this in!

I will be in contact with you as soon as I can to let you know if this study is suitable for you & talk about what to do next ☺

Appendix I: Raw Data

Participant ID	Biscuits1	Biscuits2	Cakes slices1	Cakes slices2	Desserts puddings 1	Desserts puddings 2	Doughnuts 1	Doughnuts 2	Muffins scones1	Muffins scones2	Pastries sweet1
1	1	1	1	1	1	1	1	1	1	1	1
2	3	3	1	1	3	1	1	1	2	2	2
3	1	1	2	1	2	1	1	1	1	1	1
4	3	2	1	1	1	1	1	1	1	1	1
5	4	3	2	2	2	4	1	1	1	1	1
6	7	7	4	2	2	3	2	1	2	2	2
7	4	2	1	1	1	1	1	1	2	1	1
8	1	1	1	1	1	1	1	1	2	2	2
9	5	3	1	2	2	2	1	1	4	1	2
10	2	1	3	3	3	2	1	1	4	3	2
11	1	1	2	2	2	2	1	1	2	1	1
12	1	1	1	1	1	1	1	1	1	1	1
13	3	3	1	1	2	2	3	3	1	1	1
14	3	2	3	3	3	2	1	1	2	2	1
15	3	1	1	1	2	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1	1	1
17	3	2	1	1	1	1	1	1	1	1	1
18	3	2	1	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	2	1
21	6	6	2	2	2	1	2	2	1	1	1
22	1	1	1	1	1	1	1	1	1	1	1
23	2	2	2	1	1	2	1	1	2	2	1
24	3	3	2	2	2	2	1	1	3	3	1
25	2	2	2	1	1	1	1	1	1	2	1
26	4	3	2	3	2	3	1	2	3	4	1
27	2	2	2	2	1	2	1	1	3	3	2
28	4	3	3	3	1	1	1	1	1	1	2
29	4	4	4	4	3	1	2	1	2	2	1
30	5	3	1	1	2	1	1	1	3	3	1
31	2	2	2	2	2	2	1	1	3	3	1
32	7	7	2	1	1	1	1	1	4	3	1
33	1	1	2	2	1	1	1	1	2	2	1
34	3	3	2	1	3	2	1	1	2	2	1
35	3	2	3	1	2	1	1	1	3	2	2
36	1	1	1	1	1	1	1	1	1	1	1
37	4	4	3	2	4	1	2	1	2	1	1
38	3	3	1	1	1	1	1	1	2	2	1
39	4	2	2	1	3	3	1	1	4	1	1
40	2	2	1	1	1	1	1	1	1	1	1
41	3	2	1	2	1	1	1	1	2	2	1
42	3	2	2	2	2	2	1	1	2	2	1
43	2	1	1	1	1	1	1	1	1	1	1
44	3	3	1	2	1	1	2	2	2	2	1
45	2	1	1	1	1	1	1	1	1	1	1
46	3	3	1	2	1	2	1	1	1	3	1
47	3	3	1	2	2	3	1	1	3	3	1
48	5	5	3	5	3	2	1	1	1	2	1
49	2	2	2	2	2	1	1	1	2	2	1
50	1	1	1	1	1	1	1	1	1	1	1
51	2	2	2	1	1	1	1	1	2	1	1
52	1	1	1	1	2	2	1	1	3	3	1
53	1	1	1	1	1	1	1	1	1	1	1
54	1	2	1	2	2	1	1	1	2	2	1

Pastries sweet2	Pies1	Pies2	Quiche1	Quiche2	Alcoholic 1	Alcoholic 2	Cordial1	Cordial2	Drinking choc1	Drinking choc2	Energy drinks1
1	1	1	1	1	3	3	1	1	1	1	1
1	2	2	2	2	7	7	7	7	3	4	2
1	3	3	1	1	2	3	2	2	6	5	6
1	1	1	1	1	3	2	3	2	2	1	1
1	2	1	1	1	3	3	1	1	1	1	1
2	2	2	1	1	2	2	2	3	3	3	2
1	1	1	2	1	4	4	6	3	5	4	1
1	2	2	2	1	5	5	1	1	1	1	1
2	3	4	1	2	5	5	1	1	1	1	1
2	2	2	2	2	5	5	1	1	2	2	1
1	1	1	1	1	1	1	1	1	3	3	1
1	1	2	2	2	3	2	1	1	2	3	1
1	1	1	1	1	1	1	3	3	1	1	1
1	2	2	1	1	1	1	1	1	1	1	1
1	1	1	1	1	3	3	1	1	1	1	1
1	2	2	1	1	3	3	2	1	2	1	1
1	3	2	1	1	3	3	1	1	1	1	2
1	2	2	1	1	1	1	1	1	2	2	1
1	3	3	1	1	3	2	4	1	1	1	3
1	1	1	1	1	1	1	1	1	1	1	1
1	2	2	2	2	3	3	1	1	3	4	1
1	1	1	1	1	3	3	5	5	1	1	1
1	2	2	1	1	1	2	1	1	5	5	1
1	2	1	1	1	2	2	1	1	3	3	1
1	1	1	1	1	2	2	3	1	1	1	1
4	3	3	2	3	3	3	1	2	4	2	1
2	1	1	3	3	2	2	3	2	3	3	1
1	1	1	1	1	1	1	5	3	1	1	1
1	1	1	1	1	2	2	1	1	3	2	1
1	1	1	1	1	1	1	2	2	3	3	1
1	1	1	1	1	3	3	7	5	2	2	3
1	1	1	1	1	3	3	1	1	3	2	1
2	2	2	2	1	4	3	3	3	2	2	3
1	2	1	1	1	3	3	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
1	2	3	1	1	3	3	1	1	2	2	3
1	2	1	2	2	2	2	4	2	3	3	1
1	3	3	2	2	4	4	5	5	1	1	2
1	1	1	1	2	2	2	1	1	1	1	1
1	1	1	1	1	1	1	2	2	2	2	1
1	1	1	1	1	3	3	1	1	1	1	1
1	1	1	1	1	3	3	1	2	1	1	2
1	4	4	1	1	1	1	1	1	1	1	1
1	1	1	1	1	4	4	1	2	1	1	1
1	1	1	1	1	4	4	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
1	3	3	1	1	1	1	1	1	2	2	1
1	2	2	1	2	3	3	4	2	1	2	2
1	3	3	2	2	4	4	1	1	1	1	1
1	2	1	2	1	4	6	1	1	2	1	1
1	1	1	1	1	3	3	2	3	6	1	1
1	2	1	1	1	2	3	1	1	1	1	1
1	1	1	1	1	5	5	1	1	1	2	1
1	2	1	2	1	1	1	2	1	2	1	1

Energy drinks2	Fruit juice1	Fruit juice2	Regular powdered 1	Regular powdered 2	Regular soft1	Regular soft2	Toasted muesli1	Toasted muesli2	Chocolate 1	Chocolate 2	Sweets lollies1
1	1	1	1	1	1	1	1	1	1	1	1
2	2	1	1	1	2	3	1	1	3	3	1
6	1	1	1	2	6	7	2	2	1	1	2
1	1	2	1	1	3	2	1	1	1	1	1
1	1	1	1	1	2	2	1	1	1	2	2
2	2	2	4	4	3	2	2	1	4	4	4
1	6	4	1	1	3	1	4	4	1	1	1
1	3	5	1	1	2	2	2	2	2	1	1
1	1	1	1	1	1	1	1	2	2	3	2
1	3	3	1	1	1	2	1	1	2	2	1
1	1	1	1	1	1	1	1	1	7	6	2
1	1	2	1	2	1	1	1	1	1	1	3
1	5	5	1	1	1	1	1	1	1	1	1
1	2	2	1	1	1	2	1	1	5	5	5
1	1	1	1	1	1	1	1	1	2	2	2
1	3	1	1	1	4	2	4	2	1	1	1
1	1	1	1	1	3	3	1	1	2	2	2
1	1	1	1	1	3	1	1	1	2	1	1
3	3	1	1	1	3	2	4	3	1	1	1
1	1	1	1	1	1	1	1	1	2	2	2
1	1	1	1	1	1	1	1	1	2	2	2
1	6	6	1	1	1	1	5	5	1	1	3
1	2	2	3	3	1	2	1	1	1	2	1
1	2	2	1	1	1	2	4	3	3	3	1
1	1	1	1	1	1	1	1	1	1	1	1
1	5	2	1	2	4	3	5	5	3	3	3
1	5	4	1	1	1	2	3	3	2	2	1
1	5	5	1	1	1	1	5	5	2	2	1
1	1	1	1	1	3	1	1	1	3	2	3
2	2	2	1	1	2	1	4	2	3	2	1
2	1	2	1	1	3	3	5	5	5	5	2
1	1	1	1	1	6	6	1	1	2	1	5
2	3	2	3	2	1	1	5	4	1	2	1
1	1	1	1	1	1	1	4	4	1	1	2
1	1	1	1	1	1	1	1	1	1	2	1
3	1	1	1	3	2	2	1	1	2	2	2
1	4	2	1	1	2	1	4	4	4	3	4
2	1	1	1	1	3	3	2	2	1	1	1
1	2	1	1	1	2	2	1	1	5	5	1
1	3	3	2	1	1	2	3	1	2	2	1
1	4	4	1	1	4	4	4	3	3	3	2
1	1	3	1	1	2	2	1	1	4	4	3
1	1	1	1	1	7	7	1	1	7	3	1
1	1	1	1	1	1	4	1	1	2	2	2
1	1	1	1	1	1	1	1	1	1	1	2
1	1	1	1	2	1	1	4	4	3	3	1
1	2	2	2	2	1	1	3	2	2	2	2
2	1	2	1	1	2	2	5	5	2	3	2
1	2	2	1	1	3	3	3	2	3	3	3
1	1	1	1	1	1	1	4	5	1	1	1
1	1	1	2	1	2	2	1	2	1	1	1
1	1	1	1	1	1	2	1	1	3	3	2
1	2	2	1	1	1	1	2	1	1	1	1
1	2	1	1	1	1	1	5	5	3	1	1

Sweets lollies2	Condensed milk1	Condensed milk2	Flavoured milk1	Flavoured milk2	Icecream 1	Icecream 2	Sour cream1	Sour cream2	Whole milk1	Whole milk2	Yoghurt1
1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	4	3	1	1	1	2	4
3	2	1	1	1	1	2	2	2	6	5	2
2	1	1	1	1	1	1	2	1	1	1	2
2	1	1	1	1	2	2	1	1	1	1	2
3	3	3	2	1	1	1	2	2	2	2	4
1	1	1	2	1	3	3	1	1	1	1	1
1	1	1	1	1	2	2	1	1	1	1	2
2	1	1	1	1	3	2	3	1	1	1	2
1	2	2	2	2	2	2	2	3	2	2	5
2	1	1	1	1	3	3	1	1	1	1	2
3	1	1	1	2	2	2	1	2	1	1	6
1	3	3	1	1	2	2	1	1	1	1	3
5	1	1	1	1	3	2	2	2	1	1	3
1	1	1	1	1	1	1	2	2	4	3	1
1	1	1	1	1	2	1	3	1	1	1	4
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	2	2	3	2	1
1	1	1	1	1	1	1	1	1	7	7	2
2	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	2	2	1	1	1	1	3
3	1	1	1	1	2	2	1	1	1	1	5
3	1	1	1	1	1	1	1	1	5	5	1
2	2	1	1	2	2	1	1	1	1	1	3
1	1	1	1	1	1	1	1	1	1	1	1
3	1	3	3	4	3	3	2	2	1	2	6
1	6	6	3	1	1	1	3	3	3	2	3
1	1	1	1	1	1	1	1	1	1	1	5
2	1	2	2	1	3	3	2	2	1	1	1
2	1	1	1	1	2	2	1	1	1	1	3
2	1	1	5	5	2	2	1	1	1	1	2
7	1	2	1	1	1	1	2	1	3	2	2
1	1	1	1	1	2	2	2	2	1	1	2
1	1	1	1	1	1	1	1	2	1	1	4
1	1	1	1	1	3	1	1	1	1	2	3
2	1	2	1	1	1	1	1	2	1	1	1
4	1	1	1	1	3	2	1	1	2	1	1
1	3	3	1	1	2	2	2	2	7	7	2
1	1	1	1	1	2	3	1	1	1	1	1
1	1	1	1	1	1	1	1	1	7	7	4
2	1	1	1	1	2	3	2	2	1	1	4
2	1	1	1	1	2	2	1	1	1	1	2
1	1	1	2	2	1	1	1	1	1	1	1
2	1	1	1	1	1	1	2	1	1	1	1
1	1	1	1	1	2	2	1	1	1	1	1
1	1	1	1	1	1	1	1	2	2	3	1
2	1	1	1	2	1	1	1	1	1	1	1
2	1	1	1	1	2	2	2	2	1	1	3
3	1	1	1	1	3	3	3	3	1	1	2
1	1	1	1	1	1	1	1	1	1	1	3
1	1	1	1	1	1	1	1	1	2	2	3
1	1	1	1	1	2	1	2	1	5	3	5
1	1	1	1	1	2	2	1	1	6	5	2
1	1	1	1	1	2	1	2	2	1	1	1

Yoghurt2	Fried food1	Fried food2	Hotchips 1	Hotchips 2	Takeaways1	Takeaways2	Butter1	Butter2	Cream1	Cream2	Reduced cream1
1	1	1	1	1	1	1	1	1	1	1	1
7	2	2	2	2	2	2	3	2	1	2	1
1	2	3	3	3	2	3	4	5	3	3	2
1	1	1	1	1	1	1	5	3	1	1	1
1	1	1	2	2	2	2	3	3	1	2	1
3	3	2	2	2	1	1	7	7	4	2	1
1	2	2	2	1	2	1	4	1	2	1	1
1	2	2	2	2	3	2	5	3	2	1	1
2	3	3	3	3	3	2	3	2	1	1	1
3	2	2	1	2	3	3	6	4	3	3	2
2	2	2	2	2	1	1	1	1	1	2	1
5	1	2	2	2	1	2	3	2	1	2	1
3	1	1	2	2	1	1	3	3	1	1	1
4	3	2	2	2	2	2	2	3	2	1	1
2	1	1	1	1	1	1	3	3	2	2	1
3	2	2	2	1	3	2	3	2	2	2	1
1	2	2	2	2	2	2	2	1	1	1	1
1	1	1	1	1	1	1	5	5	1	1	1
1	3	2	2	2	2	2	3	1	1	1	1
1	2	2	2	2	1	1	2	2	1	1	1
3	1	1	2	2	1	1	5	4	1	1	1
3	1	1	1	1	1	1	2	1	2	1	1
1	2	2	2	2	1	1	1	1	1	1	1
3	1	2	2	2	2	2	2	2	1	1	1
1	2	2	2	2	2	2	3	3	1	1	1
3	2	3	2	3	3	3	7	3	3	3	3
1	3	2	2	3	2	2	4	4	3	3	1
5	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	2	1	1	4	4	2	2	1
3	2	2	2	2	1	1	2	1	1	1	1
3	2	2	3	2	2	2	1	2	2	3	1
2	1	1	1	1	1	1	7	7	1	1	1
2	2	1	1	2	2	1	4	4	3	2	1
4	1	1	1	1	1	1	3	3	2	2	2
1	3	1	3	1	1	1	1	1	1	1	1
1	2	3	2	3	1	3	1	1	1	1	1
2	2	2	2	2	2	1	1	1	2	1	1
2	3	3	3	3	3	3	5	5	2	2	2
1	1	1	1	1	2	2	5	5	1	1	1
4	1	1	1	1	1	1	1	1	1	1	1
4	1	1	2	2	2	2	2	3	1	2	2
2	1	1	1	1	3	2	2	1	1	1	1
1	2	2	2	2	2	2	1	1	1	1	1
1	3	2	3	2	1	1	2	1	1	1	2
1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	2	2	3	2	3	1	1	1
2	3	2	3	2	2	1	4	3	2	1	1
4	2	2	3	3	3	3	3	1	2	1	1
2	3	3	3	3	3	3	3	3	2	3	2
1	1	1	2	2	1	1	1	1	1	1	1
2	2	2	2	2	2	2	3	2	1	1	1
1	2	2	3	3	2	1	2	1	2	1	1
1	1	1	1	1	1	1	7	6	1	1	1
2	3	1	3	2	3	2	2	2	2	1	1

Reduced cream2	Coconut cream1	Coconut cream2	Oil dressings 1	Oil dressings 2	Fruit tinned1	Fruit tinned2	Fruit rollups1	Fruit rollups2	Regular sausages 1	Regular sausages 2	Regular salami1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	2	1	1	2	2	1
1	1	1	4	3	1	1	1	1	2	2	3
1	2	1	2	1	1	1	1	1	1	1	1
1	1	1	3	2	2	2	1	1	2	2	1
1	1	1	3	3	3	1	1	1	2	2	1
1	1	1	1	1	1	1	1	1	1	1	1
1	2	1	2	2	1	1	1	1	2	2	3
1	1	1	4	2	1	1	1	1	4	3	2
2	3	3	1	2	1	1	1	1	2	2	2
1	1	1	1	1	1	1	1	1	2	2	1
2	2	2	3	2	1	2	1	1	1	2	1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	2	3	3	1	1	1	1	1
2	1	2	3	3	1	1	1	1	1	1	1
1	3	2	1	1	2	2	1	1	2	2	2
1	2	2	2	1	1	1	1	1	2	1	2
1	1	1	1	1	1	1	1	1	2	2	1
1	2	1	1	1	2	1	1	1	2	1	1
1	1	1	3	3	2	1	1	1	1	1	1
1	2	2	1	1	1	1	1	1	3	2	1
1	3	2	2	2	1	1	1	1	2	2	1
1	1	1	3	2	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	2	2	1
1	1	1	1	1	1	1	1	1	1	1	1
3	4	3	4	3	3	3	1	2	3	3	3
1	1	1	3	3	1	1	1	1	1	1	3
1	1	1	2	2	1	1	1	1	1	1	1
1	1	1	3	2	1	1	1	1	2	2	1
1	1	1	3	2	2	1	1	1	2	2	2
1	1	1	2	5	1	1	1	1	1	1	1
1	1	1	3	3	1	1	1	1	1	1	1
1	1	1	3	3	1	1	1	1	1	1	3
2	1	1	4	3	2	2	1	1	2	2	1
1	1	1	3	1	2	1	1	1	2	1	1
1	1	1	2	1	2	2	1	1	2	3	1
1	1	1	3	2	2	2	1	1	1	1	1
2	1	1	3	3	1	1	1	1	2	2	2
1	1	1	1	1	2	2	1	1	1	1	1
1	1	1	2	1	1	1	1	1	1	1	1
1	1	1	3	3	2	1	1	1	2	1	1
1	2	2	1	2	2	3	1	1	1	1	1
1	1	1	1	1	1	1	1	1	6	4	1
1	1	1	2	1	1	1	1	1	2	1	1
1	1	1	4	3	1	1	1	1	2	2	2
1	1	1	2	2	1	1	1	1	1	2	1
1	1	1	1	1	1	1	1	1	2	3	1
2	1	1	1	1	1	1	1	1	1	2	1
2	1	1	2	2	1	1	1	1	2	2	1
1	1	1	2	1	1	1	1	1	3	2	1
1	1	1	1	2	1	1	2	1	2	2	2
1	1	1	5	4	1	1	1	1	2	2	3
1	1	1	1	1	1	1	1	1	1	1	1
1	2	1	2	2	1	1	1	1	1	2	2

Regular salami2	luncheon sausage1	luncheon sausage2	Bacon1	Bacon2	Other processed 1	Other processed 2	Chips crisps1	Chips crisps2	Crackers1	Crackers2	Muesli bars1
1	1	1	2	2	1	1	1	1	1	1	1
2	1	2	2	2	3	2	1	2	1	1	1
3	1	1	3	2	2	1	2	3	2	3	1
1	1	1	2	1	1	1	1	1	2	1	1
1	1	1	2	2	1	1	2	2	1	2	1
1	1	1	1	1	2	1	2	3	5	4	4
1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	2	2	2	2	3	3	1	1	1
2	1	1	3	3	3	2	3	4	3	1	3
2	1	1	2	3	2	1	1	1	1	1	2
1	1	1	1	1	1	1	2	2	1	1	1
2	1	1	1	2	1	1	2	2	1	2	3
1	1	1	2	2	1	1	3	3	4	4	1
1	1	1	2	2	1	1	2	2	1	1	1
1	1	1	2	1	1	1	1	1	1	2	1
1	1	1	2	1	2	1	2	1	1	2	1
1	1	1	1	1	1	1	2	2	2	2	1
1	2	2	2	1	1	1	2	1	3	1	1
1	1	1	1	1	1	1	2	1	2	1	3
1	1	1	1	1	1	1	2	1	1	1	1
1	1	1	2	2	1	1	1	1	1	1	4
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	1	1	1	5	3	3	3	1
2	1	1	2	2	2	1	3	3	1	1	1
1	1	1	1	1	1	1	3	3	1	1	3
3	3	3	4	3	2	3	4	3	6	3	3
3	3	3	2	2	2	2	2	2	1	1	2
1	1	1	1	1	1	1	1	1	1	1	3
1	1	1	1	1	1	1	3	3	1	1	2
1	1	1	1	1	1	1	2	2	2	1	4
1	1	1	1	1	1	1	1	2	1	1	1
1	1	1	1	1	1	1	4	3	4	3	2
3	1	1	2	2	1	1	1	1	1	1	4
1	1	1	2	2	1	1	2	1	2	2	2
1	1	1	1	1	1	1	2	2	3	2	1
1	1	1	1	2	1	1	2	2	1	1	1
1	1	1	2	1	1	1	1	2	2	1	1
2	1	1	2	2	1	1	2	2	1	1	1
1	1	1	1	2	1	1	1	1	2	1	1
1	1	1	1	1	1	1	2	1	2	2	1
1	1	1	1	1	1	1	2	1	2	2	1
1	1	1	1	2	1	1	3	3	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	2	1	1	1	1	2	1	3
2	1	1	1	1	2	2	2	1	3	2	1
1	1	1	1	1	1	1	1	1	2	1	1
1	3	3	1	1	1	2	2	1	1	2	1
1	1	1	2	2	2	2	2	3	3	3	6
2	2	2	2	2	1	1	3	3	2	2	3
1	1	1	3	2	1	1	1	1	3	2	1
2	2	2	1	1	1	1	1	1	2	2	2
3	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	2	1	1	1	1	1	1	1
2	1	1	2	2	1	1	3	2	2	1	1

Muesli bars2	Nuts roasted1	Nuts roasted2	Popcorn1	Popcorn2	Glucose1	Glucose2	Sweet spreads1	Sweet spreads2	Sugar1	Sugar2	Syrups1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	3	1	1	1
1	1	1	1	1	1	1	3	2	5	6	5
1	2	2	1	1	1	1	1	1	2	2	1
1	1	1	1	1	1	1	2	2	6	6	1
4	1	1	1	1	1	1	2	3	7	7	3
1	2	1	1	1	1	1	4	3	4	1	1
1	3	2	1	1	1	1	2	2	7	7	1
3	3	2	1	1	1	1	1	1	1	1	1
2	1	1	1	2	1	1	5	5	1	3	2
1	1	1	1	1	1	1	2	1	1	2	1
3	3	2	1	2	1	1	1	2	1	1	2
1	4	4	1	1	1	1	5	5	3	3	1
1	2	1	1	1	1	1	1	1	3	3	1
1	1	2	1	1	1	1	1	2	4	2	1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	2	1	1	1	1
1	1	1	1	1	1	1	5	2	2	2	1
2	2	1	1	1	1	1	2	1	7	7	1
1	2	3	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	4	4	1	1	1
1	1	1	1	1	1	1	3	1	3	2	1
1	1	1	1	1	1	1	1	2	5	5	1
2	2	2	1	1	1	1	2	2	5	5	2
3	1	1	1	1	1	1	3	2	4	2	1
3	6	2	3	2	1	1	6	2	6	3	2
1	2	2	1	1	1	1	5	5	4	3	1
2	1	1	1	1	1	1	1	1	5	5	1
2	1	1	1	1	1	1	1	1	7	7	1
3	1	1	1	1	1	1	2	1	1	1	1
1	1	5	1	1	1	1	3	5	1	6	1
1	1	1	1	1	1	1	5	6	6	3	1
4	2	3	1	1	1	1	3	3	1	2	1
2	2	1	1	1	1	1	2	3	3	2	1
2	3	1	1	2	1	1	2	1	2	1	1
1	1	1	1	1	1	1	3	1	3	1	1
1	1	1	1	1	1	1	2	3	5	3	1
1	1	1	1	1	1	1	3	3	7	7	1
1	1	1	1	1	1	1	5	1	5	5	1
3	2	2	1	1	1	1	3	2	7	7	1
1	1	1	1	1	1	1	2	3	2	2	1
1	1	1	1	1	1	1	2	2	3	2	2
1	1	1	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	4	4	4	3	1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	3	1	1	1	1	3	3	5	4	1
1	1	1	3	2	1	1	3	1	4	1	2
4	3	3	1	1	1	1	2	2	1	1	2
2	1	1	1	1	1	1	3	3	7	6	1
1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	3	3	1	2	1
1	1	1	1	1	1	1	6	3	3	2	1
1	1	1	1	1	1	1	6	6	6	5	1
1	2	2	1	1	1	1	5	3	2	2	2

Syrups2	total score1	total score2	BMI	Age	Ethnicity	Income	Education	Gender	Condition
1	51	51	31.4	51	1	7	1	1	1
1	90	97	32.1	55	1		2	0	1
5	110	110	49.9	26	1	1	1	1	1
1	69	58	40.8	58	1	3	2	1	1
1	76	77	31.9	46	1	1	2	1	1
1	123	110	54	38	1		1	1	1
1	92	68	31.4	61	1	7	2	0	1
1	90	81	32.9	57	1	7	2	0	1
1	97	86	31.1	42	1	5	2	1	1
3	99	100	36.8	40	1		2	1	1
1	68	67	33.7	57	1	4	1	1	1
2	72	84	30.7	44	1		2	1	1
1	82	82	40.8	46	1	4	2	1	3
1	84	81	37.7	47	1		2	1	1
1	68	66	37.3	62	1	2	2	1	1
1	82	63	42.8	48	1	5	1	1	1
1	70	61	33.6	30	1	4	2	0	1
1	73	61	36.8	31	2	1	1	1	1
1	92	72	30.1	26	1	1	2	0	1
1	58	58	34.6	58	2	6	2	1	1
1	82	79	38.3	36	1	6	2	1	1
1	80	72	40.9	50	1	7	2	1	3
1	78	80	36.8	39	1	1	2	1	1
2	83	84	33.5	36	1	6	2	1	1
1	67	62	33.8	46	1	3	1	1	2
3	148	134	31.6	49	1	4	2	1	1
1	107	100	31.7	50	1	2	2	1	1
1	78	73	32.4	52	1	5	2	1	1
1	88	79	34.7	56	1	1	1	1	3
1	82	70	38.4	63	1	4	2	1	1
1	89	104	35.9	43	1	5	2	1	1
1	100	92	34	42	1	3	2	1	1
1	89	85	33.1	54	1	6	2	0	3
1	81	75	30.1	56	2	6	2	0	3
1	75	56	31.9	64	1	7	2	1	1
1	67	73	33.8	21	1	1	1	0	2
1	96	77	35.3	42	1	5	1	1	1
1	102	102	34.9	41	1	7	2	0	3
1	80	71	32.4	56	1	3	1	1	1
1	78	75	32.1	42	0			1	1
1	82	81	42.7	56	1	4	2	1	1
2	75	75	34.2	31	1	5	2	1	1
1	73	66	32.8	22	1	1	1	0	2
3	76	75	32	46	1	4	1	1	3
1	63	58	33	65	1	5	2	1	3
1	66	78	31.3	59	3	5	2	1	3
1	83	76	40	47	1	1	1	1	1
1	96	98	32.7	50	1	5	2	0	1
1	99	97	41.8	33	1	4	1	1	2
1	67	61	30.4	39	1	7	2	0	2
1	77	70	35.4	38	1	1	1	1	2
1	86	70	31.1	40	1	5	2	1	1
1	78	74	32.8	47	1	7	2	0	1
1	85	69	41	51	1	5	2	1	1

Appendix J: Differences between NEEDNT-FFQ Time One and Two Data

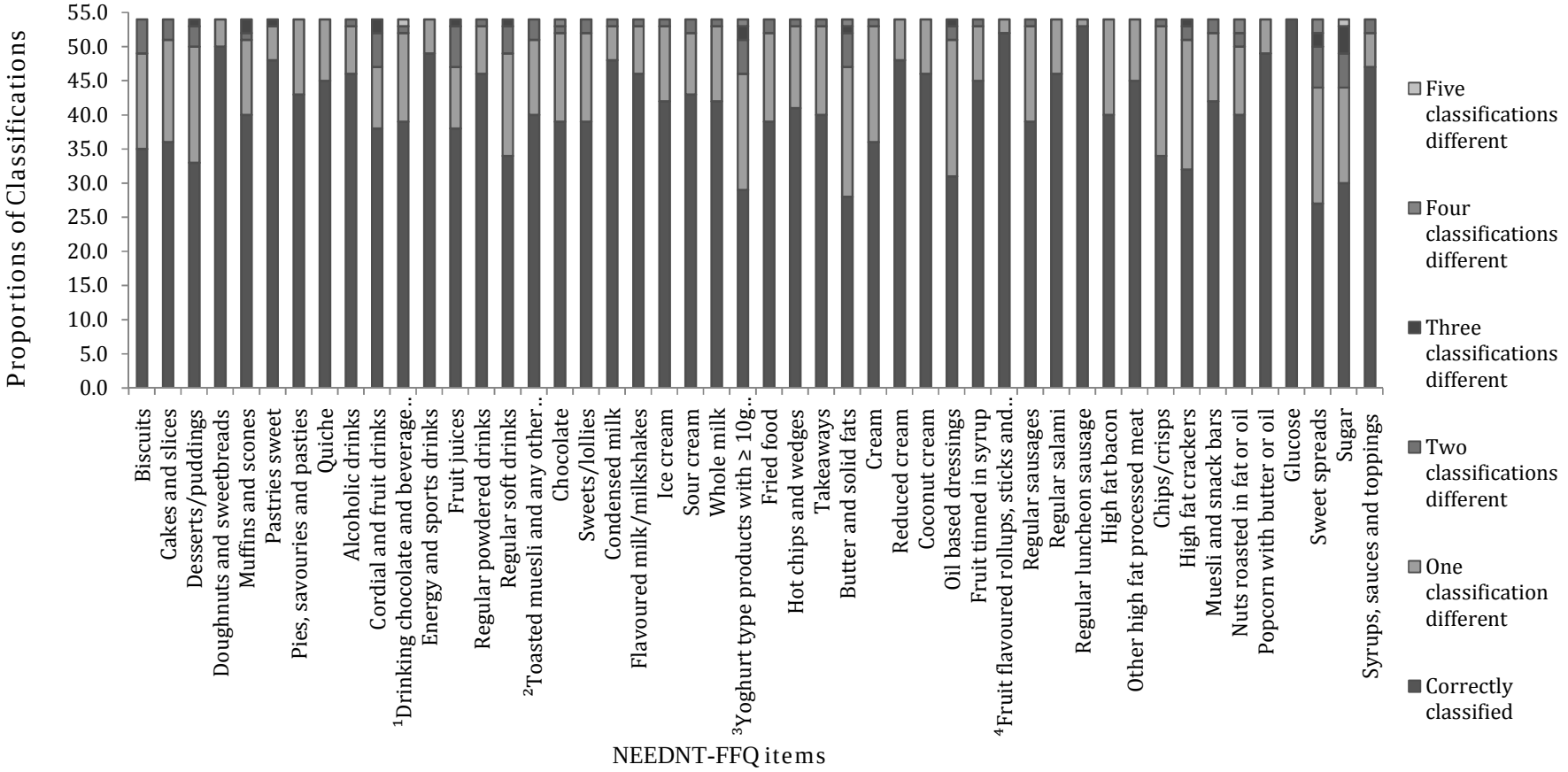
Participant ID	1 Biscuits	2 Cakes and slices	3 Desserts/ puddings	4 Doughnuts and sweet breads	5 Muffins and scones	6 Pastries sweet	7 Pies, savouries and pastries	8 Quiche	9 Alcoholic drinks	10 Cordial and fruit drinks	11 Drinking choc and beverage powders	12 Energy and sports drinks
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	2	0	0	1	0	0	0	0	1	0
3	0	1	1	0	0	0	0	0	1	0	1	0
4	1	0	0	0	0	0	0	0	1	1	1	0
5	1	0	2	0	0	0	1	0	0	0	0	0
6	0	2	1	1	0	0	0	0	0	1	0	0
7	2	0	0	0	1	0	0	1	0	3	1	0
8	0	0	0	0	0	1	0	1	0	0	0	0
9	2	1	0	0	3	0	1	1	0	0	0	0
10	1	0	1	0	1	0	0	0	0	0	0	0
11	0	0	0	0	1	0	0	0	0	0	0	0
12	0	0	0	0	0	0	1	0	1	0	1	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	1	0	0	0	0	0	0	0	0	0
15	2	0	1	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	1	1	0
17	1	0	0	0	0	0	1	0	0	0	0	1
18	1	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	1	3	0	0
20	0	0	0	0	1	0	0	0	0	0	0	0
21	0	0	1	0	0	0	0	0	0	0	1	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	1	1	0	0	0	0	0	1	0	0	0
24	0	0	0	0	0	0	1	0	0	0	0	0
25	0	1	0	0	1	0	0	0	0	2	0	0
26	1	1	1	1	1	3	0	1	0	1	2	0
27	0	0	1	0	0	0	0	0	0	1	0	0
28	1	0	0	0	0	1	0	0	0	2	0	0
29	0	0	2	1	0	0	0	0	0	0	1	0
30	2	0	1	0	0	0	0	0	0	0	0	1
31	0	0	0	0	0	0	0	0	0	2	0	1
32	0	1	0	0	1	0	0	0	0	0	1	0
33	0	0	0	0	0	1	0	1	1	0	0	1
34	0	1	1	0	0	0	1	0	0	0	0	0
35	1	2	1	0	1	1	0	0	0	0	0	0
36	0	0	0	0	0	0	1	0	0	0	0	0
37	0	1	3	1	1	0	1	0	0	2	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	2	1	0	0	3	0	0	1	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	1	1	0	0	0	0	0	0	0	0	0	0
42	1	0	0	0	0	0	0	0	0	1	0	1
43	1	0	0	0	0	0	0	0	0	0	0	0
44	0	1	0	0	0	0	0	0	0	1	0	0
45	1	0	0	0	0	0	0	0	0	0	0	0
46	0	1	1	0	2	0	0	0	0	0	0	0
47	0	1	1	0	0	0	0	0	0	0	0	0
48	0	2	1	0	1	0	0	1	0	2	1	0
49	0	0	1	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	1	1	2	0	1	0
51	0	1	0	0	1	0	0	0	0	1	5	0
52	0	0	0	0	0	0	1	0	1	0	0	0
53	0	0	0	0	0	0	0	0	0	0	1	0
54	1	1	1	0	0	0	1	1	0	1	1	0

13 Fruit juices	14 Regular powdered drinks	15 Regular soft drinks	16 Toasted muesli + cereals	17 Chocolate	18 Sweets/ lollies	19 Condensed milk	20 Flavoured milk/ milkshakes	21 Ice cream	22 Sour cream	23 Whole milk	24 Yoghurt type products
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	0	1	0	1	3
0	1	1	0	0	1	1	0	1	0	1	1
1	0	1	0	0	1	0	0	0	1	0	1
0	0	0	0	1	0	0	0	0	0	0	1
0	0	1	1	0	1	0	1	0	0	0	1
2	0	2	0	0	0	0	1	0	0	0	0
2	0	0	0	1	0	0	0	0	0	0	1
0	0	0	1	1	0	0	0	1	2	0	0
0	0	1	0	0	0	0	0	0	1	0	2
0	0	0	0	1	0	0	0	0	0	0	0
1	1	0	0	0	0	0	1	0	1	0	1
0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	1	0	0	1
0	0	0	0	0	1	0	0	0	0	1	1
2	0	2	2	0	0	0	0	1	2	0	1
0	0	0	0	0	1	0	0	0	0	0	0
0	0	2	0	1	0	0	0	0	0	1	0
2	0	1	1	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	2
0	0	1	0	1	2	0	0	0	0	0	0
0	0	1	1	0	1	1	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	0	0	0	2	1	0	0	1	3
1	0	1	0	0	0	0	2	0	0	1	2
0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	0	1	1	1	1	0	0	0	0
0	0	1	2	1	1	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	1	2	1	0	0	1	1	0
1	1	0	1	1	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	1	0	0
0	0	0	0	1	0	0	0	2	0	1	2
0	2	0	0	0	0	1	0	0	1	0	0
2	0	1	0	1	0	0	0	1	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1	0	0	0
0	1	1	2	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	1	0	0	0
2	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	4	0	0	0	0	0	0	0
0	0	3	0	0	0	0	0	0	1	0	0
0	0	0	0	0	1	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	1	1	0
0	0	0	1	0	0	0	1	0	0	0	1
1	0	0	0	1	0	0	0	0	0	0	1
0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	2
0	1	0	1	0	0	0	0	0	0	0	1
0	0	1	0	0	1	0	0	1	1	2	4
0	0	0	1	0	0	0	0	0	0	1	1
1	0	0	0	2	0	0	0	1	0	0	1

25 Fried food	26 Hot chips and wedges	27 Takeaways	28 Butter and solid fats	29 Cream	30 Reduced cream	31 Coconut cream	32 Oil based dressings	33 Fruit tinned in syrup	34 Fruit flavoured roll ups etc	35 Regular sausages	36 Regular salami
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	0	0	1	0	0	1
1	0	1	1	0	1	0	1	0	0	0	0
0	0	0	2	0	0	1	1	0	0	0	0
0	0	0	0	1	0	0	1	0	0	0	0
1	0	0	0	2	0	0	0	2	0	0	0
0	1	1	3	1	0	0	0	0	0	0	0
0	0	1	2	1	0	1	0	0	0	0	1
0	0	1	1	0	0	0	2	0	0	1	0
0	1	0	2	0	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0
1	0	1	1	1	1	0	1	1	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	1	0	0	0	0	0	0	0
0	0	0	0	0	1	1	0	0	0	0	0
0	1	1	1	0	0	1	0	0	0	0	1
0	0	0	1	0	0	0	1	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	2	0	0	1	0	1	0	1	0
0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	1	0	0	0	0	0	0	1	0
0	0	0	1	1	0	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	4	0	0	1	1	0	1	0	0
1	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	1	0	0	0	1	1	0	0	1
0	1	0	1	1	0	0	3	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0
2	2	0	0	0	0	0	2	1	0	1	0
1	1	2	0	0	0	0	1	0	0	1	0
0	0	1	0	1	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	1	1	0	0	0	1	0	1	0
0	0	1	1	0	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0	2	0
1	1	0	1	0	1	0	1	0	0	1	0
0	0	0	0	0	0	0	1	0	0	0	0
1	1	1	1	0	0	0	0	0	0	1	0
1	1	1	1	1	0	0	0	0	0	1	0
0	0	0	2	1	1	0	0	0	0	1	0
0	0	0	0	1	0	0	0	0	0	0	1
0	0	0	0	0	0	0	1	0	0	1	0
0	0	0	1	0	0	0	1	0	1	0	0
0	0	1	1	1	0	0	1	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0
2	1	1	0	1	0	1	0	0	0	1	0

37 Regular luncheon sausage	38 High fat bacon	39 Other high fat processed meat	40 Chips/ crisps	41 High fat crackers	42 Muesli and snack bars	43 Nuts roasted in fat or oil	44 Popcorn with butter or oil	45 Glucose	46 Sweet spreads	47 Sugar	48 Syrups, sauces and toppings
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	0	0	0	0	0	2	0	0
0	1	1	1	1	0	0	0	0	1	1	0
0	1	0	0	1	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0
0	0	1	1	1	0	0	0	0	1	0	2
0	0	0	0	0	0	1	0	0	1	3	0
0	0	0	0	0	0	1	0	0	0	0	0
0	0	1	1	2	0	1	0	0	0	0	0
0	1	1	0	0	0	0	1	0	0	2	1
0	0	0	0	0	0	0	0	0	1	1	0
0	1	0	0	1	0	1	1	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	1	0	1	0	0	1	2	0
0	1	1	1	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	0	0
0	1	0	1	2	0	0	0	0	3	0	0
0	0	0	1	1	1	1	0	0	1	0	0
0	0	0	1	0	0	1	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	1	0
0	1	0	2	0	0	0	0	0	1	0	0
0	0	1	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	2	0
0	1	1	1	3	0	4	1	0	4	3	1
0	0	0	0	0	1	0	0	0	0	1	0
0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	0	0	0	1	0	0
0	0	0	1	0	0	4	0	0	2	5	0
0	0	0	1	1	1	0	0	0	1	3	0
0	0	0	0	0	0	1	0	0	0	1	0
0	0	0	1	0	0	1	0	0	1	1	0
0	0	0	0	1	1	2	1	0	1	1	0
0	1	0	0	0	0	0	0	0	2	2	0
0	1	0	1	1	0	0	0	0	1	2	0
0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	1	0	0	0	0	4	0	0
0	0	0	1	0	2	0	0	0	1	0	0
0	0	0	1	0	0	0	0	0	1	0	0
0	1	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	0	0	0	0	1	2
0	0	0	1	1	0	0	0	0	0	0	0
0	0	0	0	1	0	2	0	0	0	1	0
0	0	1	1	1	0	0	1	0	2	3	1
0	0	0	1	0	2	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	1	0
0	1	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	3	1	0
0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	1	1	0	0	0	0	2	0	1

Appendix K: Misclassification Analyses Graph



[1] Drinking chocolate and beverage powders
[2] Toasted muesli and any other breakfast cereal with ≥ 15g sugar per 100g cereal
[3] Yoghurt type products with ≥ 10g sugar per 100g yoghurt
[4] Fruit flavoured rollups, sticks and straps

Figure 9.1Frequency of intake classification differences between NEEDNT-FFQ time one and two