Dietary Perceptions in People with Type 2 Diabetes: Accuracy of Estimated Dietary Intake and Perception of Healthy and Unhealthy Foods

A thesis submitted in fulfillment of the requirements for the degree of

Master of Science

at

University of Otago

by

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2015
i. Abstract

Misperception of one’s dietary intake is one of many barriers to dietary behaviour change. Those who have a falsely optimistic perception of their dietary intake are less likely to intend to improve their current behaviours. The accuracy of perceived intakes of common carbohydrate-containing foods is of particular importance for people with type 2 diabetes, given the importance of dietary management in achieving glycaemic control. There is evidence to suggest that perceived intakes of some foods are less accurate in people with type 2 diabetes, however the accuracy of their perceived intakes of common carbohydrate-containing foods have not been investigated.

Perceptions and beliefs regarding the healthiness of foods also influence dietary behaviours. Once again, these perceptions have not been well explored in people with type 2 diabetes. The aim of this study therefore was to investigate the accuracy of perceived intakes of common carbohydrate-containing foods and perception of the healthiness and unhealthiness of foods in New Zealand adults with type 2 diabetes.

In the first part of this study (quantitative component) the accuracy of perceived intakes were assessed in twenty-four participants. Participants completed a seven-day food diary, followed one month later by a short interview which included a tool that measured participants’ perceived intake of common carbohydrate-containing foods. Data from each of these measurements were then compared to determine the accuracy of their perceived intake, compared to their actual intake.

Participants’ perceived intake of grains, fruit, dried fruit, scones/pikelets/sweet buns/cheese puffs, pies/pastries/savouries and biscuits/crackers were significantly different to their actual intake of these foods. Furthermore, perceived intakes of fruit, dried fruit and pies, pastries and savouries were falsely optimistic. Participants perceived they ate 6.0 (3.2 – 8.8) servings more of fruit, 1.4 (0.4 – 2.4) servings more of dried fruit and -2.3 (-3.8 – -0.8) servings less of pies, pastries and savouries compared to their actual intake, per week.
In the second part of this study (qualitative component) perceptions of the healthiness and unhealthiness of foods were investigated in twelve participants. Participants attended one of three ninety-minute focus groups to discuss their perceptions. Thematic analysis was applied to analyse the findings from these discussions and four themes were identified; Perceptions of Food Components; Other Factors Perceived to Influence the Healthiness of Foods; Perceptions of Dietary Information; Challenges to Forming Accurate Perceptions. Participant perception of foods was largely consistent with dietary guidelines with the exception of some foods that are advised in moderation. Participants placed a great amount of importance on the carbohydrate content of foods which compromised their perception of some healthful foods such as fruit and starchy vegetables.

The results from this study provide insight into different dimensions of dietary perceptions in people with type 2 diabetes living in New Zealand. These findings highlight a number of requirements for achieving effective dietary management of people with type 2 diabetes. These requirements include increasing the accuracy of perceived intake, clarifying guidelines around foods advised in moderation and managing nutritional priorities, other than the carbohydrate content of foods.
The topic of this thesis was conceived following observations made by the Candidate’s supervisors during research being conducted at the University of Otago. This thesis presents findings from two research studies, which together explore multiple dimensions of dietary perceptions in people with type 2 diabetes. Data for the quantitative component of this study was obtained from research being conducted at the University of Otago. The rest of the data collected for this thesis is my own original, independent work.

Although challenging, I thoroughly enjoyed the process of conducting and writing this thesis.

Under the supervision of my two supervisors, I was responsible for:

- Applying for ethical approval for the focus groups
- Recruiting participants for the focus groups
- Developing materials required for the focus groups including promotional flyers, the participant information sheet, the consent form, the participant questionnaire and the question guide
- Planning and facilitating the focus groups
- Analysing the focus group discussions to determine themes
- Entering food diary data into the nutrient analysis programme
- Collating, tabulating and standardising data from the food diaries and interviews
- Analysing data from the food diaries and interviews
- Writing this thesis
iii. Acknowledgements

First and foremost, I would like to thank my two supervisors Dr Bernard Venn and Andrew Reynolds for their continuous support, advice and guidance throughout the process of writing this thesis. Dr Bernard Venn was responsible for submitting the ethics application for the focus groups, undertaking Māori consultation, validating the focus group transcriptions and reviewing the focus group themes. Andrew Reynolds was responsible for the provision of data for the quantitative component of this study and validating the entry of food diary data. Thank you to you both for all of the time and effort that you dedicated to my thesis. I am extremely grateful.

I would also like to thank the following people for their contributions to this thesis:

• Dr Jill Haszard for her advice on the statistical analysis of the food diary and interview data
• Dr Louise Mainvil for her guidance on the analysis of the focus groups
• Zhuoshi Zhang for her information regarding dietary guidelines used by New Zealand dietitians working with people with type 2 diabetes

Thank you also to the markers for taking the time to consider this thesis.

Last but not least, I would like to thank my family, friends and colleagues for their ongoing support and encouragement over the last year.
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1. Introduction

Misperception of one’s dietary intake is common among the general public (Basiotis, Lino et al. 2002). Such misperception may have significant health implications including being a barrier to improved health behaviours (Weinstein 1988, O'Brien, Fries et al. 2000). Through anecdotal evidence arising from University of Otago research, it was observed that misperception of dietary intake was occurring among people with type 2 diabetes (Personal Communication). Such observations in people with diabetes are not unique to New Zealand, having been found in a large Dutch study where misperception of fruit, vegetable and fat intake were more prevalent among people with type 2 diabetes, when compared to the general population (Jansink, Braspenning et al. 2012).

People that have a falsely optimistic perception of their dietary intake are less likely to believe they need to make dietary improvements (Weinstein 1988). Given the importance of dietary management in achieving glycaemic control, this is an important consideration for people with type 2 diabetes. Furthermore, it is important that accurate dietary habits are being communicated to health professionals to ensure effective, relevant advice is provided to their patient.

The accuracy of perceived intake of common carbohydrate-containing foods has not been investigated among people with type 2 diabetes. The aim of this study therefore was to investigate perceived intake of common carbohydrate-containing foods using a quantitative approach, and to qualitatively investigate perceptions of healthy and unhealthy foods in New Zealand adults with type 2 diabetes.

Given the limited research in this area, this mixed-methods approach was sufficiently flexible and allowed for ideas to evolve and be presented, as opposed to being restricted by the Candidates’ preconceived ideas. Perception of the healthiness of foods has been explored in a range of populations including the general population, youth with diabetes and their parents, and adults at risk of type 2 diabetes (Paquette 2005, Gellar, Schrader et al. 2007, Braginsky, Inouye et al. 2011, Fukuoka, Lindgren
et al. 2014). However, to our knowledge, perception of the healthiness of foods has not been explored in New Zealand adults with type 2 diabetes.
2. Literature Review

Perception can be defined as ‘the way in which something is regarded, understood, or interpreted’ (Oxford English Dictionary 1989). Subsequently, perceptions are unique to the individual and may not always represent the reality. Perception regarding the healthiness of foods and of one’s own dietary intake may be inaccurate, which has significant implications on a person’s health status.

The manifestation of inaccurate dietary perceptions could be especially harmful for people living with, or at risk of, lifestyle-related conditions such as type 2 diabetes given the importance of diet in the management of this condition. Results from the latest Adult Nutrition Survey suggest that 7% of New Zealanders are diabetic (Coppell, Mann et al. 2013). Furthermore, an additional 18.6% of adults are prediabetic, suggesting the prevalence of diabetes will increase over time in New Zealand. Type 2 diabetes is commonly associated with hyperglycaemia (an increased concentration of glucose in the blood), and excess body weight (WHO 1999). Dietary management is therefore a critical component for achieving a healthy weight and glycaemic control among people with diabetes.

Misperception of the healthiness of foods could result in poor dietary choices among people with type 2 diabetes. A number of factors including the way health messages are interpreted, social interactions, up-bringing, culture, religion, socioeconomic status and level of health literacy influence these perceptions (Nestle, Wing et al. 1998). Furthermore, the diagnosis of diabetes could also influence these perceptions. For example, carbohydrate-containing foods are often the focus of dietary advice targeted towards people with diabetes. It is logical to assume one’s perception of carbohydrate-containing foods will change following diagnosis.

Understanding the foods that people with diabetes perceive to be healthy or unhealthy, as well as the factors that contribute to the formulation of these perceptions, could help health professionals to provide more effective dietary advice.
An accurate perception of one’s own intake may also be important in the treatment and management of people with type 2 diabetes. Several studies have shown that perceived intake often does not correlate with people’s actual dietary intake (Lichtman, Pisarska et al. 1992, Brug, van Assema et al. 1994, Lechner, Brug et al. 1997, O'Brien, Fries et al. 2000, Basiotis, Lino et al. 2002, Bogers, Brug et al. 2004, Yong, Zalilah et al. 2009). If people with diabetes have an accurate perception of their dietary intake, then this is more likely to be conveyed to their health professionals. The health professional could then gain a more accurate understanding of their client’s dietary intake, which may lead to better tailored dietary advice and guidance. Furthermore, an accurate perception of one’s dietary intake could also result in a greater ability to comply with dietary recommendations and greater ownership of their condition. Investigation into the prevalence and effect of dietary misperception among people with type 2 diabetes is required.

The following literature review will discuss the following
1. Perception of healthy and unhealthy foods among the general public and among people with diabetes, or at risk of diabetes
2. Factors that influence people’s dietary perceptions
3. Implications of dietary perceptions
4. Correlation between perceived intake and actual intake
5. Factors that influence people’s perception of their dietary intake

2.1 Dietary perception among the general public

Perception of what constitutes a healthy diet appear to be largely consistent among the general population (Paquette 2005). However, some aspects including optimal red meat intake and definitions of a balanced diet appear contentious. In a large literature review of 38 studies most people perceived a healthy diet to be high in fruit and vegetables and low in fat, sugar and salt (Paquette 2005). By contrast, there were variations in people’s perception of meat. Most people believed red meat intake should be restricted, and replaced with chicken or fish. Whereas others, including children, adolescents and women of lower socioeconomic status, endorsed meat as a key part of a healthy diet. Grains and milk products were infrequently mentioned in all of the studies as constituents of a healthy or unhealthy diet.
Dietary perception may differ by gender. Compared to men, women are more likely to mention fruit, vegetables and eating less fat as key components of a healthy diet (Paquette 2005). This disparity between men and women could be the result of a number of factors such as their perceived pressure to comply with dietary guidelines, health-related goals and other perceptions related to these foods.

Women also appear to have different attitudes towards food. Among women at risk of diabetes, food was often perceived to be a challenge (Fukuoka, Lindgren et al. 2014). The women talked about their difficulties with food including self-control with foods that are perceived as ‘bad’. It was evident that they had a greater emotional attachment to food than the men in the study, and they experienced more guilt after consuming foods that they perceived to be unhealthy. During a focus group discussion one of the female participants said having certain foods was like “having a loaded gun in the house”. These mentalities could be the result of previous dieting experiences or a perceived pressure to fit certain body images.

Dietary perception may also differ by age. Specifically, there appears to be a heightened concern regarding fat, sugar and salt intake among adults aged over 55 years (Paquette 2005). These concerns are likely related to the increased risk of diet-related chronic diseases in this population, or could be the result of increased exposure to such dietary guidelines.

### 2.2 Dietary perception among people with diabetes, or at risk of diabetes

Perception of healthy eating among people with type 2 diabetes is relatively unexplored. However, dietary perceptions among adults at risk of type 2 diabetes have been investigated through a series of focus group discussions (Fukuoka, Lindgren et al. 2014). In accordance with perception among the general population, there was agreement that eating vegetables was healthy. However, there were differing levels of knowledge and perception regarding other dietary aspects such as how to apply portion control and what constitutes an overall healthy diet. For instance, some of the participants referred to the food pyramid as a guide for how much you should eat of each food group, whereas others perceived that eating healthily meant to eat a bit of everything and not too much of one food. The following quote illustrates the latter perception: “Sandwiches, we do pizza every now and then. We do fried chicken. We
do eat pretty healthy, enough of it, not too much of anything”. Furthermore, many of the participants understood the basics of healthy eating, however they failed to grasp the finer details. For example, participants acknowledged that it was important to apply portion control yet were unable to define their perception of appropriate portion sizes.

Dietary perception among youth with type 1 diabetes were explored through a study of 18 focus groups (Gellar, Schrader et al. 2007). Consistent with perception among the general public, the youth defined healthy eating as a diet that contained fruit, vegetables and was low in fat and sugar. Furthermore, they perceived a healthy diet to be low in carbohydrate-containing foods and high in vitamins and minerals. There was disagreement about how beneficial eating healthily was for diabetes management. Some participants stated that they ate more healthily because of their diabetes whereas others said that it didn’t matter how healthily you ate, provided you matched your food intake with insulin. There were also considerable differences between foods perceived to be healthy and foods perceived to be good for diabetes. Foods that were perceived to be good for diabetes included low-carb, high-protein, sugar-free and ‘free’ foods (foods that have a small glycaemic effect). Some of the sugar free and ‘free’ foods that were identified as being good for diabetes were low in nutrients or high in fat such as sugar-free cookies, sugar-free candies, cheese and red meat. These results indicate that foods perceived to be good for diabetes among youth may not always be nutrient-rich, healthy foods. Fruit, vegetables and low-fat foods were mentioned more frequently as foods that are part of a healthy diet and low-carb foods were perceived to be both healthy and good for diabetes.

2.3 Other dietary aspects that are included in dietary perceptions

Additional dietary aspects, other than the food type and food composition, are also included in people’s perception of healthy eating. These include freshness, level of processing, preparation, variety, moderation and balance (Paquette 2005, Gellar, Schrader et al. 2007, Fukuoka, Lindgren et al. 2014). There is a commonly held perception that foods prepared at home are healthier, and that canned, frozen and processed foods are not as healthy as fresh foods (Paquette 2005). Many people also report the importance of eating a variety of foods and eating in moderation. The concept of moderation is often used to justify food choices that people are uncertain
Many people also endorse balance in a healthy diet although definitions of the term ‘balance’ vary. ‘Balance’ has been defined in regards to variation in the amount eaten at different meals, variation in the proportion of different food groups, the inclusion of something from each food group, the inclusion of both healthy and unhealthy foods, and balance between health concerns and enjoyment (Paquette 2005, Gellar, Schrader et al. 2007, Fukuoka, Lindgren et al. 2014). Many of these concepts are not included in dietary guidelines which may rationalise some of the confusion surrounding these terms.

### 2.4 Factors that influence dietary perception

Perception of healthy and unhealthy foods among the general population and of people with diabetes and at risk of diabetes appear to correlate with public health recommendations (Ministry of Health 2003). This suggests that dietary perception is influenced by dietary guidelines and advice received from health professionals to a significant extent. However, it is evident that there are other aspects such as freshness, level of processing and the application of moderation and balance that influence people’s perception, which are not included in dietary guidelines.

Additional influences on dietary perceptions may include upbringing, culture and social interactions with family and friends. These factors were observed among Asian and Pacific Island people with type 2 diabetes living in Hawaii (Braginsky, Inouye et al. 2011). Furthermore, the time of the year, perceived effect of aging, emotions, boredom, family, friends and perceived addiction or lack of control have been identified as factors that influence people’s dietary behaviours (Fukuoka, Lindgren et al. 2014).

Food marketing is another significant influence on dietary perception. Among adults at risk of type 2 diabetes, food labels were the cause of some misperception (Fukuoka, Lindgren et al. 2014). For instance, some participants reported that if a food product was labeled as healthy, such as ‘the Healthy Choice dinner’, then it was perceived to be so. Such comments demonstrate how influential a simple word or phrase can be on people’s perceptions.
A number of studies have replicated the effect that tactical marketing, such as health claims, have on consumers’ perception. In one such study, researchers gave participants an identical snack but they manipulated the way that the snack was described (Provencher, Polivy et al. 2009). For one group of participants the food was described as a “high-fibre oatmeal snack made with healthy ingredients”, whereas for the other group the snack was described as “new gourmet cookies made with fresh butter and old-fashioned brown sugar”. The description of the snack significantly influenced the participants’ perception of the snack. Those given the healthy description perceived the snack to be healthier, to have a lower capacity for weight gain and to be more appropriate on a healthy food menu. These findings clearly demonstrate how clever marketing can manipulate people’s perception of the healthiness of foods.

Evidently, there is an extensive range of personal, social and environmental factors that influence people’s perception of both individual foods and the diet as a whole.

2.5 Formation of dietary perceptions

When quickly forming perceptions of foods people have the tendency to classify foods as either good or bad, and rarely in between (Oakes 2005). When given only the name of a food, ratings of the food are distributed bimodally – meaning foods are either classified as really good or really bad. Although, when people are given more comprehensive descriptions of foods, ratings tend to be more evenly distributed and people take into account a greater number of factors including fat, vitamin/mineral content, sodium, protein and cholesterol content (Oakes 2005).

The main food component that contributes to the formation of perceptions is fat content (Oakes 2005, Rizk and Treat 2014). This likely reflects a large push through media and public health campaigns for people to follow low-fat diets. Given people classify foods as either good or bad, a ‘low-fat’ health claim has the potential to significantly influence people’s perception regarding the overall healthiness of foods. For example, when considering a ‘low-fat’ product, instead of being perceived as ‘health-ier’ the products are likely to be automatically perceived as ‘healthy’ and people may disregard other food components such as sugar, salt and energy content. This is of particular concern for people with type 2 diabetes as the removal of fat from
food products is often compensated for by the addition of sugar (Colby, Johnson et al. 2010).

Taken together, these findings could suggest that in situations when people are making snap judgments about food such as when quickly doing the grocery shopping, or in situations where the whole food description is not available, they are likely to judge the food as either good or bad, dictated primarily by the perceived fat content of the food. This is particularly important given the impact of other nutritional factors, such as sugar and salt content, on the healthiness of food products.

2.6 Implications of dietary perception

Perception of the healthiness of foods influences other dietary perceptions and behaviours such as the perceived caloric content, perceived capacity to promote weight loss and the quantities consumed. There is a commonly held perception that foods that are healthy promote weight loss and foods that are unhealthy promote weight gain (Carels, Harper et al. 2006, Wansink and Chandon 2006, Carels, Konrad et al. 2007, Provencher, Polivy et al. 2009). Although typically ‘healthy’ foods do tend to be lower in calories, the potential for large quantities of ‘healthy’ foods to contribute to weight gain could be overlooked. Furthermore, foods that are marketed as healthy are also likely to be perceived to have fewer calories.

A number of studies have shown that people underestimate the caloric content of foods perceived to be ‘healthy’ and overestimate the caloric content of foods perceived to be ‘unhealthy’ (Carels, Harper et al. 2006, Wansink and Chandon 2006, Carels, Konrad et al. 2007). In such studies, participants were asked to estimate the number of calories in a pre-determined serving of a given food, which was then used to determine subjects’ perceived caloric content. When asked to compare pairs of snacks that contained one reputable ‘healthy’ snack and one disreputable ‘unhealthy’ snack, the disreputable snacks were nearly always perceived to promote greater weight gain in comparison to higher calorie reputable snacks (Oakes 2005). For example, a disreputable snack including three slices of bacon, with a caloric content of 109 calories, was perceived to promote greater weight gain in comparison to nine reputable snacks that had a greater caloric content, ranging from 154 – 569 calories. Examples of the reputable snacks include a can of tomato soup, 2 bananas/2 pears and
1 cup of low-fat cottage cheese/3 carrots/3 pears. Again, fat content was the only variable that predicted perception of the foods’ capacity to affect weight gain.

As expected, food-marketing claims, such as ‘low-fat’, also influence people’s perception of the caloric content of foods. This was clearly demonstrated in a study by Wansink and Chandon (2006). In a real life setting, participants were asked to estimate the caloric content of a ‘new line’ of M&M’s that were labeled as either ‘low-fat’ or ‘regular’. On average, the group of subjects who were given M&M’s that were marketed as ‘low-fat’ perceived the caloric content of one cup to be 260 calories less compared to people who were given M&M’s that were marketed as ‘regular’. These findings clearly demonstrate that people underestimate the energy density of foods that are marketed as healthy. These findings also confirm the importance people place on the fat content and the influence of tactical marketing claims on consumers’ perception of the healthiness and caloric content of food products.

Dieters appear to be more accurate at estimating the caloric content of ‘healthy’ foods, compared to non-dieters (Carels, Konrad et al. 2007). It is plausible that dieters develop a greater awareness of the caloric content of reputedly ‘healthy’ foods through their dieting experiences. Greater discrepancies between perceived caloric content and actual caloric content have also been observed in overweight people (Carels, Harper et al. 2006), however these findings are not consistent (Wansink and Chandon 2006, Carels, Konrad et al. 2007).

Perception of the healthiness of foods also influences the quantities that people consume. People consume greater quantities of foods that are perceived to be healthy than foods that are perceived to be unhealthy. In a randomised controlled trial, participants ate 35% more of an identical snack when it was described as healthy compared to when it was described as more indulgent (Provencher, Polivy et al. 2009). In another study by Wansink and Chandon (2006), subjects were asked to rate a pair of identical foods including M&M’s and granola, which were labeled as either ‘low-fat’ or ‘regular’. Those for whom the foods were described as ‘low-fat’ believed the appropriate serving size was 25% larger, anticipated less guilt after eating, and ate 28% more than those who ate the food labeled as ‘regular’. In this study, manipulation of these perceptions affected overweight participants to a greater extent. Overweight
participants in the ‘low-fat’ condition ate 47% more than participants in the ‘regular’ condition. People who are overweight may represent a subgroup that is particularly vulnerable to the effect of health marketing claims, as well as their own misperception of the healthiness of food products. Likewise, people with type 2 diabetes could also be affected by misperception of the healthiness and glycaemic capacity of foods due to marketing techniques. Overall, these findings demonstrate how perception of a food’s healthiness also influences perception of the appropriate serving size, and subsequent intake.

2.7 Perceived versus actual dietary intake – general public

There is often a significant discrepancy between what people say they eat and what they actually eat. Such discrepancies could be the result of a number of reasons such as wanting to please the person they are talking to or shame about their dietary intake. One other plausible reason that could explain this discrepancy is an inaccurate perception of one’s dietary intake – a concept that is relatively unexplored. A small number of studies have explored this concept by comparing objective measures of dietary intake; such as food frequency questionnaires (FFQ), food diaries and food recalls, with a subjective measure ascertained by a questionnaire or interview. These studies explore perceptions of both whole foods as well as individual nutrients such as fat, both of which are likely to influence people’s food choices. In most cases there are considerable discrepancies between subjects’ ‘actual’ intake and their ‘perceived’ intake.

In a large US study, perceived intake of five major food groups were compared with actual intake, as estimated by a 14-day food diary (Basiotis, Lino et al. 2002). In this study, records of participants’ perceived intakes came from a large survey conducted by Market Research Corporation of America (MRCA) Information Services. For each food group, there was a significant difference between subjects’ perceived intake and actual intake. However, the direction of this relationship differed by food group. People tended to overestimate their consumption of healthy foods and underestimate their consumption of unhealthy foods. Most people perceived that they ate more meat, fruit and vegetables and less grains, fats, oils and sweets, resulting in a more optimistic perception of their total diet.
Misperception of one’s dietary intake could be a potential barrier to behavior changes among the general public. Despite the attempts of extensive public health campaigns to promote dietary behaviour change, these changes often don’t occur and people still fail to meet dietary guidelines.

In the Netherlands, public health campaigns recommend increasing fruit and vegetable consumption however a large proportion of the population fails to meet these recommendations (Van Rossum, Fransen et al. 2011). Two studies in Dutch populations found that a significant proportion of people have an inaccurate perception of their fruit and vegetable intake (Lechner, Brug et al. 1997, Bogers, Brug et al. 2004). In comparison to quantitatively measured fruit and vegetable intakes, 38-40% of people had differing self-rated fruit intakes, and 30-68% of people had differing self-rated vegetable intakes. In most cases, this was explained by subjects’ overestimation of their fruit and vegetable intake. Furthermore, a significant proportion of people who were not meeting the recommendations thought that they actually were (Lechner, Brug et al. 1997). These findings suggest that people may overestimate their intake of healthy foods such as fruit and vegetables, which could also lead them to falsely believe they are meeting dietary guidelines. In both of these studies the actual fruit and vegetable intake was estimated using an FFQ, which itself involves a degree of subjectivity. Therefore participants’ overestimation may have affected the validity of the FFQ. However, if the actual intake has also been overestimated then the difference between the actual intake and perceived intake may have been underestimated. This high rate of misperception may be partly accountable for the large number of people that are not consuming the recommended amounts of fruit and vegetables in this population.

Public health campaigns also promote the reduction of saturated fat intake. As with fruit and vegetable consumption, there appears to be a major discrepancy between people’s perceived and actual fat intake. Again, this discrepancy commonly reflects a falsely optimistic perceived intake (Brug, van Assema et al. 1994, Yong, Zalilah et al. 2009).

In a study of undergraduate students, less than half of the participants were able to accurately estimate their fat intake into the broad categories of low, medium or high
In contrast to other studies, there were similar amounts of underestimators and overestimators. However, of particular concern were the people who underestimated their fat intake. These people had poorer knowledge of the fat content in foods, perceived themselves to be at lower risk of health problems and were less likely to have an intention to improve their dietary behaviours. Thus, inaccurate perception of fat intake may be a barrier that is preventing high fat consumers from meeting dietary guidelines.

Misperceptions of fat intake may also differ by gender. In another large Dutch study, there were significant differences in actual and perceived fat intake, between men and women (Brug, van Assema et al. 1994). Compared to women, men had a higher fat intake yet they were more likely to have a falsely optimistic perception of their intake. On the other hand, women were more realistic and were more likely to have an intention to reduce their fat intake. These disparities could reflect a number of stereotypical differences between men and women including household responsibilities such as supermarket shopping, meal planning and food preparation, level of interest in the nutritional benefits of food, sources of dietary knowledge, role models and dieting goals. Among women, the intention to reduce fat intake was more strongly associated with a high self-rated intake than a high actual intake. These findings suggest that women’s perception of their fat intake is a more important determinant of change of fat consumption. Therefore, misperception of fat consumption may be a significant barrier to reducing fat intake, particularly among women that are high fat consumers.

Evidently, there are significant discrepancies between what people think they eat and their actual intake. However, what appears to be particularly problematic, especially in regards to achieving dietary compliance, is that the majority dietary misperception is explained by falsely optimistic perceptions. If people believe they are already achieving their dietary goals or meeting the dietary guidelines, they are less likely to believe they need to change, regardless of their actual dietary behaviours.
**2.8 Perceived versus actual dietary intake – diabetes**

Given the importance of dietary management in the control of diabetes, an accurate dietary perception is likely to be important for successful diabetes management.

A higher rate of misperception of fruit, vegetable and fat intake has been observed in people with type 2 diabetes compared to the general public (Jansink, Braspenning et al. 2012). In a study of people with type 2 diabetes, a high rate of misperception was observed for vegetable (70%), fruit (40%) and fat intake (22%) (Jansink, Braspenning et al. 2012). Furthermore, those who had an inaccurate perception of these behaviours were less likely to be willing to change. These findings suggest there may be a higher rate of misperception of some foods in people with diabetes, which may be a barrier to behavior change.

In another study, subjects who had poorly controlled diabetes were significantly less capable of estimating their energy intake compared to subjects with better glycaemic control (Matsushita, Yokoyama et al. 2005). In this study, sixty-two diabetic adults were instructed by their doctor to consume 25–30kcal/kg per day. Energy intake was measured via a 3-day food diary, and self-rated energy intake was captured via telephone-administered interviews. Subjects were classified into HbA1c tertiles, which was used as an indication of their glycaemic control. The number of people who accurately estimated their energy intake decreased as control status worsened. These findings indicate that the ability to estimate caloric intake is associated with better diabetes control. The focus of this study was to look at subjects’ ability to recognise energy intake in calories, which is clinically relevant given that diabetic subjects may be advised to understand and control their energy intake. A potential limitation of this study is that participants were asked to estimate their energy intake in calories, opposed to wholefoods. It is likely that people would have a more accurate perception of their energy intake in whole foods, opposed to calories. Furthermore, the sample size in this study was small therefore these results should be interpreted with caution. Larger studies are required to explore the ability of people with type 2 diabetes to accurately recognize their intake of whole foods, as well as calories.
2.9 Perceived versus actual dietary intake – obesity

Misreporting is common in studies of overweight and obese subjects. It is plausible that some degree of misreporting is explained by inaccurate perception of dietary intake. One study looked into the mechanisms behind diet resistance in obese subjects and found that diet resistant subjects had significantly distorted perception of their energy intake (Lichtman, Pisarska et al. 1992). The aim of this study was to investigate if self-reported diet resistance was the result of low total energy expenditure (due to hypometabolism) or rather, due to energy intake greater than that reported. The results from this study supported the latter. In comparison to controls, the diet-resistant group significantly under-reported their energy intake by 47%. There were no differences in energy expenditure between the two groups. It is possible that the discrepancy between reported intake and actual intake was due to deliberate under-reporting however the authors argue that this is unlikely for a number of reasons including the numerous dieting attempts that subjects had made, the high-burden involved in participating in the study, and the distress that was apparent when the results of the study were made known to them. These findings suggest that misperception of dietary intake is a contributing barrier to weight loss in some obese people.

2.10 Factors that influence perceived dietary intake

Visual cues, such as how much food is on your plate or how much food is in a packet at the beginning and end of a meal, strongly influence post-meal perceptions including perceived amount eaten and satiety. Although visual cues often correlate with the amount of food eaten, they appear to have a stronger effect on post-meal perceptions than the actual amount of food.

Studies that have manipulated visual cues such as by eating in the dark (Scheibehenne, Todd et al. 2010) or out of ‘bottomless’ self-filling bowls (Wansink, Painter et al. 2005), show that the amounts of food people see is a stronger influence on their post-meal perceptions compared to the actual amounts eaten. This has significant implications for understanding the factors that influence both food consumption and perceptions of food consumption.

Over the years, some of visual cues have been manipulated through steadily increasing portion sizes. Portion sizes, determined by food manufacturers or food
providers such as restaurants and cafes, provide a visual cue or a consumption norm, which influences how much an individual can expect to consume and usually does consume. Thus, it is plausible that discretely increasing portion sizes may result in increased intake, without altering perceived intake.

2.11 Conclusion

Perception of the healthiness of foods and the accuracy of perceived intake vary. Understanding dietary perceptions and their influences and implications is critical for providing more effective dietary guidance. This is particularly important among people with diabetes as dietary compliance is the cornerstone of effective diabetes management.

Public perception of a healthy diet is reasonably consistent with dietary guidelines. However, there are a number of other factors that also influence people’s perception of healthy eating including upbringing, culture, social interactions with family and friends and marketing techniques.

Perception of the healthiness of foods has a number of implications. Foods that are perceived to be healthy are subsequently perceived to be lower in calories and to have a smaller capacity to promote weight gain, which may contribute to overconsumption of these foods. This is particularly important among people with lifestyle-related conditions such as type 2 diabetes, as weight management is fundamental to effective control of these conditions. Little research has been done to explore dietary perceptions among people with type 2 diabetes. Further investigation is required to better understand common dietary perceptions and misperceptions, among people with type 2 diabetes.

There are considerable discrepancies between what people perceive they eat and their actual intake. People tend to overestimate the amount of ‘healthy’ foods that they consume and underestimate the amount of ‘unhealthy’ foods that they consume. Such misperceptions could be a barrier to complying with health recommendations. The ability to accurately estimate one’s energy intake has been associated with better diabetes control. These findings highlight the importance of accurate dietary perception for effective dietary management of diabetes. Investigation into the
accuracy of perceived intake of foods relevant to the control of diabetes, and into ways to improve the accuracy of perceived intake among people with diabetes, is necessary for improving the effectiveness of diabetes management.
3. Methods

This study consisted of two cohorts. The first cohort based in Dunedin participated in the quantitative arm of the study: Comparison of Actual versus Perceived Intake. The second cohort based in Wellington participated in the qualitative arm of the study: The Focus Groups.

3.1 Quantitative methods: Comparison of actual versus perceived intake

The information gathered for the quantitative arm of this study came from a larger clinical trial. The data for this study were collected by the Candidate’s co-supervisor (ANR) then standardized, tabulated and analysed by the Candidate.

3.1.1 Ethics

The Health and Disability Ethics Committee (HDEC) approved this study on 29/07/2013 (reference H13/039) (Appendix A), with participants providing written consent before commencing the study. Māori consultation was undertaken through Ngāi Tahu Research Consultation Committee.

3.1.2 Participants

This was a convenience sample taken from a larger, clinical trial. Participants were adults aged 18–75 years, diagnosed with type 2 diabetes, who were not pregnant or lactating. Presence of co-morbidities did not exclude participation in this study.

3.1.3 Procedures

Each participant completed a food diary followed one month later by a short, structured interview. Interviews were conducted one month later so that the action of filling out the food diaries did not influence participants’ interview responses. The food diaries were administered through a clinical trial prior to the interviews commenced, therefore only those who had recently completed a seven-day food diary (within the last month) were invited to attend an interview. Fourteen people were excluded from this study as they had completed their food diary more than one month prior to conducting the interviews and were therefore ineligible for the current study. Twenty-four participants completed both the seven-day food diary (actual intake) and the interview (perceived intake), allowing for comparison between actual and perceived intakes. Data from the food diaries were entered into a nutrient analysis programme that uses the New Zealand food and composition database “NZ FOODfiles” (Kai-culator 2013) then collated in Excel (Microsoft Office, USA). Data
from the interviews were entered into the same Excel spreadsheet to allow for comparative analysis. The study procedures are shown in figure 1.

**Figure 1.** Flow diagram of study procedures

![Flow diagram of study procedures](image)

### 3.1.4 Dietary assessment

Seven-day food diaries were the dietary assessment method used to reflect actual intake whilst the interviews were designed to capture participants’ perceived intake. In this study, “actual” intake will refer to participants’ intake as recorded by the seven-day food diaries and “perceived” intake will refer to participants’ intake, as recorded in the interviews.

Participants completed a seven-day food diary for seven consecutive days. Each participant was guided through the process of filling out a food diary by a nutritionist trained in dietary assessment techniques. All participants had previous experience filling out food diaries prior to the data collection for this study and had received feedback to increase the accuracy of their portion size estimation and to provide the
relevant level of detail required. Participants were given a copy of the University of Otago food atlas, which provided images of standard serving sizes for many common foods. Participants were asked to use their food atlas, along with common household measures and scales, to estimate and record their actual food intake.

One month after completing the seven-day food diary participants attended a short interview. During the interviews, a tool was used to capture participants’ perceived intake of a number of common carbohydrate-containing foods (Table 1). Specifically, participants were asked how many servings of a given food they perceive they eat in a typical seven-day week, which they considered to be representative of their normal dietary habits. The order of the food groups was randomised for each participant in order to minimise the anticipated effect of fatigue on the accuracy of responses with a set order of questions. Pre-assigned serving sizes were described in the tool, which were realistic of commonly consumed amounts (Table 1). During the interview, participants were referred to the food atlas to clarify their interpretations of serving sizes, if required. The interviews were audio-recorded and then the quantitative responses were collated into the Excel spreadsheet. To allow for comparison, the Candidate later standardised all responses into the pre-assigned serving sizes for each food group.

3.1.6 Statistical analysis
The Candidate compared data from food diaries and interviews to look at differences between participants’ perceived and actual intake. Descriptive analysis on the numbers of participants whose perceived intake was greater than their actual intake, whose perceived intake was less than their actual intake, and whose perceived and actual intake were equal, was undertaken. For each food group, the direction of the difference between perceived and actual intake was determined by calculating the mean, with 95% confidence intervals for each food group. Foods are listed from largest to smallest contributor to daily carbohydrate, determined from participants’ seven-day food diaries. This data were obtained from the nutrient analysis output produced by Kai-culator. Bland-Altman plots were created using Excel to display the relationship between perceived and actual intake for the foods consumed by the highest numbers of participants. The average macronutrient distribution of
participants’ diets was also calculated from the nutrient analysis output of the seven-day food diaries produced by Kai-culator.

Table 1. Interview tool used to assess perceived intake

<table>
<thead>
<tr>
<th>Interviewer: I’m going to ask a question about what foods you eat, then run through a list of different foods. I’d like you to give a reflex response on how much of these foods you eat in a week. Are you ready?</th>
<th>How much of these foods do you eat in a week?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice-cream or sweetened yoghurt</td>
<td>Medium sized bowl</td>
</tr>
<tr>
<td>Pie or pastry</td>
<td>A medium sized unit</td>
</tr>
<tr>
<td>Scone, pikelet or sweet bun</td>
<td>A medium sized unit</td>
</tr>
<tr>
<td>Cooked rice</td>
<td>A cup</td>
</tr>
<tr>
<td>Cooked noodles</td>
<td>A cup</td>
</tr>
<tr>
<td>Any other grain</td>
<td>A cup</td>
</tr>
<tr>
<td>Fizzy or soft drink</td>
<td>A glass</td>
</tr>
<tr>
<td>Bread</td>
<td>Slice or roll</td>
</tr>
<tr>
<td>Cereal or oats</td>
<td>Medium sized bowl</td>
</tr>
<tr>
<td>Flavoured milks</td>
<td>A glass</td>
</tr>
<tr>
<td>A potato or other root vegetable</td>
<td>A medium serving</td>
</tr>
<tr>
<td>Muffin or cupcake</td>
<td>A medium sized unit</td>
</tr>
<tr>
<td>Chocolate</td>
<td>A square</td>
</tr>
<tr>
<td>Fruit juice</td>
<td>A glass</td>
</tr>
<tr>
<td>Dried fruit</td>
<td>A small handful</td>
</tr>
<tr>
<td>Biscuits or crackers</td>
<td>A medium sized unit</td>
</tr>
<tr>
<td>Fruit</td>
<td>A piece</td>
</tr>
<tr>
<td>Cake or slice</td>
<td>A medium slice</td>
</tr>
<tr>
<td>Other desserts (specify what)</td>
<td>A medium serving</td>
</tr>
<tr>
<td>Jam or honey</td>
<td>A medium spread</td>
</tr>
<tr>
<td>Alcohol</td>
<td>A glass</td>
</tr>
<tr>
<td>Lollies</td>
<td>A lolly</td>
</tr>
</tbody>
</table>

3.2 Qualitative Methods: The Focus Groups

Three focus groups were conducted on the 5th, 6th and 7th November 2014.

3.2.1 Ethics

Ethical approval was obtained from the University of Otago Human Ethics Committee (UOHEC) (Appendix C). Approval for this research was granted in September 2014 (14/165) (Appendix D). Māori consultation was undertaken through Ngāi Tahu Research Consultation Committee (Appendix E). Prior to the focus group discussion, all participants were required to read the information sheet (Appendix F)
and were given the opportunity to ask any questions before signing a consent form (Appendix G). Advertising for the focus groups commenced in October 2014.

3.2.2 Sample size
This study consisted of three focus groups with five participants initially enrolled into each. One participant did not attend the second focus group and two participants did not attend the third focus group, resulting in a total of twelve participants across the three focus groups.

3.2.3 Participants
The participants in this study were adults who self-identified as having had a diagnosis of pre-diabetes or type 2 diabetes, living in the Wellington region of New Zealand. This was a convenience sample of interested volunteers that may not be representative of a wider population with these conditions. The inclusion criteria were English-speaking adults, aged 21–75 years, with a diagnosis of pre-diabetes or type 2 diabetes. The exclusion criteria were severe speech or hearing problems, as it was perceived that this would dilute the flow of conversation and sharing of knowledge between participants. All participants accepted into the study met these criteria.

3.2.4 Sampling
Convenience sampling was adopted to recruit participants that matched the study criteria. The study was promoted by the use of flyers, social media, a local newspaper, word of mouth and contacting people who work within the non-communicable disease community (Table 2). The flyers outlined the purpose of the focus groups, proposed times and venues, and information regarding an incentive for participation (Appendix H). Interested participants made contact with the Candidate via phone or email. Participants discussed the requirements and process of the focus group with the Candidate and were sent an information sheet fully informing them of participation requirements. When engaged with the study, participants were asked to select their preferred time and venue from the three options available. A confirmation email was sent to all participants the day before their scheduled focus group, with all three of the proposed focus groups going ahead.

3.2.5 Development of the question guide
The Candidate developed the question guide with input from her two supervisors (BV and ANR). The Candidate proposed a series of draft guides which were worked on and discussed until everyone was in agreement.
Table 2: Recruitment methods for the focus groups

<table>
<thead>
<tr>
<th>Contact</th>
<th>Method</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCDHB Diabetes Nurse Specialists</td>
<td>Flyers + word of mouth</td>
<td>2 participants</td>
</tr>
<tr>
<td>Community Centre (x1)</td>
<td>Flyers</td>
<td></td>
</tr>
<tr>
<td>Community Pools (x2)</td>
<td>Flyers</td>
<td></td>
</tr>
<tr>
<td>Compass Health</td>
<td>Flyers + word of mouth</td>
<td></td>
</tr>
<tr>
<td>Diabetes Wellington</td>
<td>Flyers + newsletter + promotion through a healthy cooking demonstration</td>
<td>7 participants</td>
</tr>
<tr>
<td>Dietitian (x1)</td>
<td>Flyers</td>
<td></td>
</tr>
<tr>
<td>Gyms (x4)</td>
<td>Flyers</td>
<td>2 participants</td>
</tr>
<tr>
<td>Healthy Future Families Trust</td>
<td>Facebook</td>
<td></td>
</tr>
<tr>
<td>Independent Herald Newspaper</td>
<td>Advertisement in ‘What’s On’ column</td>
<td></td>
</tr>
<tr>
<td>Library (x1)</td>
<td>Flyers</td>
<td></td>
</tr>
<tr>
<td>Medical Centres (x10)</td>
<td>Flyers</td>
<td></td>
</tr>
<tr>
<td>Personal trainer (x1)</td>
<td>Flyers + word of mouth</td>
<td>1 participant</td>
</tr>
<tr>
<td>Sport Wellington</td>
<td>Flyers + word of mouth</td>
<td></td>
</tr>
<tr>
<td>Supermarket (x4)</td>
<td>Flyers</td>
<td>1 participant</td>
</tr>
<tr>
<td>Wellington City Council</td>
<td>Flyers + word of mouth</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>Unknown</td>
<td>2 participants</td>
</tr>
</tbody>
</table>

The main principles considered in the development of the question guide were:

- Must answer the research questions
- Adaptability and flexibility
- Maximum of 12 questions as recommended (Stewart, Shamdasani et al. 2007)
- Questions should be relatively unstructured, flexible and easy to understand
- General questions followed by more specific questions

The final question guide is presented in table 3.
Table 3: Focus group question guide

<table>
<thead>
<tr>
<th>Question</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What nutrition advice have you received from your doctor or nurse for your diabetes?</td>
<td></td>
</tr>
<tr>
<td>Where else do you get nutrition information for your diabetes?</td>
<td></td>
</tr>
<tr>
<td>Do you think you get the same message from everyone?</td>
<td></td>
</tr>
<tr>
<td>Do you feel you have the right information to make the right food choices?</td>
<td></td>
</tr>
<tr>
<td>What types of foods do you think are healthy? Why?</td>
<td></td>
</tr>
<tr>
<td>What types of foods do you think are unhealthy? Why?</td>
<td></td>
</tr>
<tr>
<td>Are there any foods that are both healthy and unhealthy?</td>
<td></td>
</tr>
<tr>
<td>Do you ever attempt to control food portion sizes?</td>
<td></td>
</tr>
<tr>
<td>How do you decide what the right portion size for you is?</td>
<td></td>
</tr>
<tr>
<td>Where do you find information and guidance of food portion size?</td>
<td></td>
</tr>
</tbody>
</table>

The Candidate used the question guide to direct the focus group discussions, whilst trying to allow openness for the participants to discuss the topic freely. Some questions were adapted, re-ordered or elaborated according to the natural flow and direction of the individual focus groups.

3.2.6 Facilitation

The Candidate was the facilitator of the three focus groups. One of the Candidate’s supervisors (BV) sat in as an observer for the first focus group in order to provide immediate feedback to the Candidate and to later check the analysis. Facilitation was undertaken in accordance with guidelines for conducting focus groups (Stewart, Shamdasani et al. 2007).

The Candidate had reviewed the published literature in this area and had developed the question guide so was familiar with the questions to be asked.

The main aims of the facilitation were:

- To be unobtrusive and to guide the discussion subtly
- To encourage interaction
- To allow the discussion to flow naturally
- To listen openly
- To probe participants when necessary
- To repeat statements back to participants to clarify their meaning and probe for elaboration, when necessary
- To remain non-authoritarian and non-judgmental
- To intervene and re-direct the discussion when required
3.2.7 Times and venues
Three focus groups were conducted. The first focus group was held from 6–7.30pm on the 5th November 2014 at the Mezzanine Floor Community Room at the Wellington Central Library. The second focus group was held from 9.30–11am on the 6th November 2014 at Room D07 at University of Otago Wellington Conference Centre. The third focus group was held from 6–7.30pm on the 7th November 2014 at Committee Room 2 at the Wellington City Council Service Centre. A variety of options were provided to participants in order to minimise anticipated attendance barriers.

3.2.8 Catering
Refreshments were provided at the focus groups in order to create a relaxed and comfortable environment. Refreshments provided included tea, coffee, lemon and water, wholegrain crackers, hummus, Brie cheese, carrot sticks, grapes and strawberries. At the morning focus group, homemade bran and blueberry muffins were provided instead of cheese and crackers.

3.2.9 Focus group structure
The focus groups followed a prearranged structure:

- The Candidate welcomed the participants as they arrived
- The participants were given name tags
- The participants filled out a short questionnaire (Appendix I) and consent form
- The Candidate introduced herself and outlined the purpose and agenda for the focus groups
- The participants introduced themselves
- The Candidate proceeded with the opening question
- The main discussion
- The Candidate concluded the discussion

The Candidate recorded participant responses on a whiteboard in order to aid the flow of discussion and provide a reference to topics mentioned along the course of the discussion. The focus groups were audio-recorded with participant knowledge and permission on a digital Dictaphone, and photographs were taken of participants’ responses that were written on the whiteboard (Appendix J).
3.2.10 Focus group analysis

Thematic analysis was determined as an appropriate method to analyse the content of the focus groups (Braun and Clarke 2006). Thematic analysis is a flexible method used to identify, analyse and report themes within a data set. Furthermore, it can provide a comprehensive, yet complex interpretation of the data (Braun and Clarke 2006). This focus group analysis was guided by Braun’s guidelines for conducting thematic analysis of qualitative data; ‘Using thematic analysis in psychology’ (Braun and Clarke 2006) and a general inductive approach (Thomas 2006).

Analysis of the focus groups involved a deductive and an inductive component. First, a deductive approach was used to report participants’ responses regarding their perceptions of healthy and unhealthy foods. The largest amount of data was generated for this question, as the main purpose of this part of the study was to understand what people with diabetes perceive to be healthy and unhealthy.

Following this, a general inductive approach was applied to generate key themes that were determined through the analysis of the raw data. A general inductive approach results in the development of themes into a model or framework, which summarises the data and conveys key themes and processes (Thomas 2006). An overview of the inductive process is shown in figure 2 (Thomas 2006).

**Figure 2.** Overview of the inductive analysis process

<table>
<thead>
<tr>
<th>Initial reading of text data</th>
<th>Identify specific text segments related to objectives</th>
<th>Label the segments of text to create categories</th>
<th>Reduce overlap and redundancy among the categories</th>
<th>Create a model incorporating most important categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many pages of text</td>
<td>Many segments of text</td>
<td>30 to 40 categories</td>
<td>15 to 20 categories</td>
<td>3 to 8 categories</td>
</tr>
</tbody>
</table>

*Note: In the current analysis ‘categories’ are referred to as ‘themes’*

The Candidate transcribed the audio recordings (Appendix K) and sent the transcriptions to BV for validation. Each transcript was then read through multiple times by the Candidate; at this stage codes were identified. Codes were formed by
identifying features of the data that were mentioned recurrently, or that were considered to be particularly meaningful in relation to the research question. The transcripts were colour-coded by focus group and then extracts were copied and pasted under relevant codes in Microsoft Word (Microsoft, USA). Some extracts were grouped under multiple codes. Codes were then written onto cue cards, and then conceptualised into four key themes.

Themes were determined by identifying patterns and links between codes, whilst considering the key research questions. Inline with guidelines for using a general inductive approach, themes were derived both in response to the key research objectives and in response to a detailed analysis of the raw data (Thomas 2006). When identifying themes, the Candidate looked for both consistency and variability within individual focus groups, and across the entire data set. The Candidate then presented these themes to BV who had reviewed all audio recordings but had not engaged in the discussion of themes. As an independent reviewer, BV considered the thematic analysis in light of his own review of the audio recordings, with all themes agreed upon between both reviewers. Four primary themes were identified, each of which include multiple sub-themes.
4. Results

4.1 Quantitative results: Comparison of actual versus perceived intake
Results of participants’ actual versus perceived intake of common carbohydrate-containing foods are presented below. Baseline characteristics of the participants (table 4) and the macronutrient distribution of participants’ diets, based on seven-day food diaries (table 5) are provided. A comparison of participants’ perceived intake (interview) versus actual intake (food diaries) is presented in table 6.

4.1.1 Baseline characteristics of participants
The majority of participants were non-smoking men of European descent on oral hypoglycaemic agents. Participants were representative of a range of formal education levels.

<table>
<thead>
<tr>
<th>Table 4. Baseline characteristics of participants (actual vs. perceived intake)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>Mean (SD) age in years</td>
</tr>
<tr>
<td>Number of men (%)</td>
</tr>
<tr>
<td>Mean (SD) duration of diabetes in years</td>
</tr>
<tr>
<td>Number of current smokers (%)</td>
</tr>
<tr>
<td>Mean (SD) HbA1c in mmol/mol</td>
</tr>
<tr>
<td>Self identified ethnicity</td>
</tr>
<tr>
<td>Number of European (%)</td>
</tr>
<tr>
<td>Number of Māori Māori (%)</td>
</tr>
<tr>
<td>Number of Other (%)</td>
</tr>
<tr>
<td>Drug groups</td>
</tr>
<tr>
<td>Number on lifestyle management (%)</td>
</tr>
<tr>
<td>Number on oral hypoglycaemic agents (%)</td>
</tr>
<tr>
<td>Number on insulin (%)</td>
</tr>
<tr>
<td>Education level</td>
</tr>
<tr>
<td>Number who did not complete tertiary (%)</td>
</tr>
<tr>
<td>Number who completed tertiary (%)</td>
</tr>
<tr>
<td>Number who achieved a further degree (%)</td>
</tr>
</tbody>
</table>

4.1.2 Food diaries (actual intake)
Thirty-eight people completed a full set of seven-day food diaries. Twenty-four of these people were eligible to participate in the current study. Mean energy intake was 8.6 MJ/day. Mean energy intake of male participants was 9.3 MJ/day and 7.7 MJ/day for female participants, both of which are in the range of estimated energy requirements (EER) for adults aged 51–70 years old (Capra 2006). Participants’
protein intake was within the recommended Acceptable Macronutrient Distribution Range (AMDR), however participants’ mean carbohydrate intake was lower than the recommended AMDR, and participants’ fat intake, and saturated fat intake, significantly exceeded the recommended AMDR (Capra 2006).

**Table 5:** Macronutrient distribution of participants’ diets based on seven-day food diaries (n=24)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Mean</th>
<th>95% CI</th>
<th>Recommended Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (MJ/day)</td>
<td>8.6</td>
<td>7.7 – 9.5</td>
<td></td>
</tr>
<tr>
<td>Males (MJ/day)</td>
<td>9.3</td>
<td>8.2 – 10.4</td>
<td>8.2 – 10.2¹</td>
</tr>
<tr>
<td>Females (MJ/day)</td>
<td>7.7</td>
<td>6.2 – 9.0</td>
<td>7.3 – 8.4²</td>
</tr>
<tr>
<td>Carbohydrate (%TE³)</td>
<td>42.8</td>
<td>40.3 – 45.3</td>
<td>45 – 65%⁴</td>
</tr>
<tr>
<td>Protein (%TE³)</td>
<td>17.8</td>
<td>16.6 – 19.1</td>
<td>15 – 25%⁴</td>
</tr>
<tr>
<td>Fat (%TE³)</td>
<td>38.7</td>
<td>36.9 – 40.5</td>
<td>20 – 35%⁴</td>
</tr>
<tr>
<td>Saturated fat (%TE³)</td>
<td>14.9</td>
<td>13.8 – 16.0</td>
<td>&lt;10%⁴</td>
</tr>
<tr>
<td>Fibre (g/day)</td>
<td>24.2</td>
<td>21.8 – 26.6</td>
<td>&gt;40g⁵</td>
</tr>
<tr>
<td>Starch (g/day)</td>
<td>132.8</td>
<td>116.6 – 148.9</td>
<td></td>
</tr>
<tr>
<td>Sugar (g/day)</td>
<td>81.8</td>
<td>68.3 – 95.4</td>
<td></td>
</tr>
</tbody>
</table>

¹ Estimated Energy Requirements (EER) of men aged 51-70y, with a low level of physical activity and a BMI of 22 kg/m² (Capra 2006)
² Estimated Energy Requirements (EER) of women aged 51-70, with a low level of physical activity and a BMI of 22 (Capra 2006)
³ TE is the Total Energy intake, calculated from participants’ seven-day food diaries
⁴ Based on the Acceptable Macronutrient Distribution Range (AMDR) for adults (Capra 2006)
⁵ Based on the European Association for the Study of Diabetes (EASD) recommendation for adults with type 2 diabetes (Mann, De Leeuw et al. 2004)

4.1.3 Interviews (perceived intake)

Twenty-four people completed a short interview in which they were asked about their perceived intake of common carbohydrate-containing foods. Participants reported their perceived intake for what they considered to be a typical 7-day week.

4.1.4 Actual versus perceived intake

A comparison of participants’ actual and perceived intake is presented in table 6. All participants reported the consumption of bread, potatoes/other root vegetables, and biscuits/crackers. Most of the participants also reported consuming fruit, cereals, pies/pastries/savouries, and cakes/slices. By contrast, fewer participants reported the consumption of alcoholic beverages, fruit juice, soft drinks, chocolate and lollies.
Most people perceived they ate more fruit, potatoes/other root vegetables, dried fruit and cereals/oats than they actually did. In contrast, most people perceived they ate less pies/pastries/savouries than they actually did. In comparison to their recorded intakes, participants perceived they ate 1.3 (-4.6 – 2.1) servings less of bread, 2.3 (-3.8 – -0.8) servings less of pies and pastries, 6.0 (3.2 – 8.8) servings more of fruit, 2.9 (-0.3 – 6.0) servings more of potatoes and other root vegetables, and 6.9 (0.8 – 13.1) more crackers and biscuits, per week.
Table 6: Actual versus perceived intake of carbohydrate-containing foods

<table>
<thead>
<tr>
<th>Food group (serving size)</th>
<th>Contribution to carbohydrate&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Number of consumers&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Perceived &gt; actual&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Perceived &lt; actual&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Perceived = actual&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Mean difference between actual and perceived intake&lt;sup&gt;6&lt;/sup&gt;</th>
<th>95% CI&lt;sup&gt;7&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread (slice/roll)</td>
<td></td>
<td>24</td>
<td>8</td>
<td>11</td>
<td>5</td>
<td>-1.3</td>
<td>(-4.6 – 2.1)</td>
</tr>
<tr>
<td>Grains and Pasta</td>
<td>13%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooked Rice (cup)</td>
<td></td>
<td>21</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>0.3</td>
<td>(-0.5 – 1.1)</td>
</tr>
<tr>
<td>Cooked Noodles (cup)</td>
<td></td>
<td>19</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>0.4</td>
<td>(-0.2 – 0.9)</td>
</tr>
<tr>
<td>Other Grains (cup)</td>
<td></td>
<td>13</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>0.6</td>
<td>(0.01 – 1.1)</td>
</tr>
<tr>
<td>Fruit</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit (piece)</td>
<td></td>
<td>23</td>
<td>20</td>
<td>3</td>
<td>0</td>
<td>6.0</td>
<td>(3.2 – 8.8)</td>
</tr>
<tr>
<td>Dried Fruit (small handful)</td>
<td></td>
<td>19</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>1.4</td>
<td>(0.4 – 2.4)</td>
</tr>
<tr>
<td>Potatoes, kumara and taro</td>
<td>9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Potato or Other Root Vegetable (medium)</td>
<td></td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>0</td>
<td>2.9</td>
<td>(-0.3 – 6.0)</td>
</tr>
<tr>
<td>Cakes and muffins</td>
<td>9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cake or Slice (medium slice)</td>
<td></td>
<td>22</td>
<td>13</td>
<td>6</td>
<td>3</td>
<td>0.1</td>
<td>(-0.7 – 0.9)</td>
</tr>
<tr>
<td>Muffin or Cupcake (medium serving)</td>
<td></td>
<td>19</td>
<td>9</td>
<td>10</td>
<td>0</td>
<td>-0.5</td>
<td>(-1.2 – 0.2)</td>
</tr>
<tr>
<td>Bread based dishes</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scone, Pikelet, Sweet Bun or Cheese Puff</td>
<td></td>
<td>19</td>
<td>13</td>
<td>4</td>
<td>2</td>
<td>0.6</td>
<td>(0.1 – 1.1)</td>
</tr>
<tr>
<td>Breakfast cereals</td>
<td>7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereal or Oats (medium bowl)</td>
<td></td>
<td>21</td>
<td>13</td>
<td>5</td>
<td>3</td>
<td>0.6</td>
<td>(-0.2 – 1.4)</td>
</tr>
<tr>
<td>Pies and pastries</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pie, Pastry or Savoury (medium serving)</td>
<td></td>
<td>22</td>
<td>4</td>
<td>16</td>
<td>2</td>
<td>-2.3</td>
<td>(-3.8 – 0.8)</td>
</tr>
</tbody>
</table>
Table 6 continued: Actual versus perceived intake of carbohydrate-containing foods

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Contribution (%)</th>
<th>Actual</th>
<th>Perceived</th>
<th>Difference</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biscuits</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biscuit or Cracker (a unit)</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>0</td>
<td>6.9</td>
</tr>
<tr>
<td>Lollies (a lolly)</td>
<td>13</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>6.9</td>
</tr>
<tr>
<td>Sugar/sweets</td>
<td>4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chocolate (square)</td>
<td>17</td>
<td>12</td>
<td>5</td>
<td>0</td>
<td>5.3</td>
</tr>
<tr>
<td>Lollies (a lolly)</td>
<td>13</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>Non-alcoholic beverages</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit Juice (glass)</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Fizzy or Soft Drink (glass)</td>
<td>11</td>
<td>4</td>
<td>7</td>
<td>0</td>
<td>-0.3</td>
</tr>
<tr>
<td>Puddings/desserts</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Desserts (medium serving)</td>
<td>14</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>Negligible carbohydrate contribution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol (glass)</td>
<td>15</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Flavoured Milks (glass)</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>-1.7</td>
</tr>
<tr>
<td>Ice-cream or Sweetened</td>
<td>21</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Yoghurt (medium bowl)</td>
<td>19</td>
<td>11</td>
<td>8</td>
<td>0</td>
<td>-0.1</td>
</tr>
<tr>
<td>Jam or Honey (medium spread)</td>
<td>19</td>
<td>11</td>
<td>8</td>
<td>0</td>
<td>-0.1</td>
</tr>
</tbody>
</table>

1 Contribution of carbohydrate was calculated as a percentage of total carbohydrate
2 The number of participants who had a perceived/recorded intake of that food group
3 The number of participants whose perceived intake was greater than their recorded intake
4 The number of participants whose perceived intake was less than their recorded intake
5 The number of participants whose perceived intake was equal to their recorded intake, excluding non-consumers
6 The difference between participants’ perceived and actual intakes.
7 *Indicates a statistically significant difference
Bland-Altman plots for foods consumed by the highest numbers of participants are presented in Figures 3-9. The Bland-Altman plots demonstrate the relationship between participants’ perceived and actual intake. Participants’ average intake of the food group is plotted on the X-axis. The difference between perceived and actual intake is plotted on the Y-axis. A positive value on the Y-axis indicates that the perceived intake is greater than the actual intake (tendency to overestimate compared to actual intake), and a negative value indicates that the perceived intake is less than the actual intake (tendency to underestimate compared to actual intake). The middle line shows the mean difference between perceived and actual intake. If there is good agreement between the two measures then this line will be close to zero. The outer lines are the limits of agreement, which indicate the amount of variation in participants’ perceived intake relative to their actual intake. For example, the plot of participants’ bread intake shows a high degree of variation – both in the size of the discrepancy between actual and perceived intake, and in the direction of this relationship.

The shape of the plot is also informative as it demonstrates how this relationship differs by average intake. For example, the plot showing participants’ intake of pies, savouries and pastries indicates that those who consume more of this food group tend to underestimate their intake by a larger amount than those who consume less of this food group.

As demonstrated by the wide limits of agreement in the Bland-Altman plots, there is a lot of variation in the relationship between perceived and actual intakes of bread, biscuits, fruit and potatoes. For some foods such as bread, cereals/oats and cakes/slices there was no clear tendency for people to either overestimate or underestimate their intake of these foods; demonstrated by a middle line close to zero. By contrast, the middle line is above zero in the plots of biscuits/crackers and fruit, and below zero in the plots of pies/pastries indicating a tendency for people to over and underestimate their consumption of these foods, respectively.
Figure 3. Actual versus perceived intake of bread

Figure 4. Actual versus perceived intake of biscuits and crackers
Figure 5. Actual versus perceived intake of fruit

Figure 6. Actual versus perceived intake of potatoes and other root vegetables
Figure 7. Actual versus perceived intake of pies, pastries and savouries

Figure 8. Actual versus perceived intake of cereals and oats
4.2 Qualitative Results: The Focus Groups

Baseline characteristics of participants from the three focus groups are displayed in Table 7. Participant response regarding perceptions of healthy and unhealthy foods are reported, followed by key themes identified through inductive thematic analysis. Four key themes emerged from the analysis of the focus groups; ‘Perceptions of Food Components’, ‘Factors Perceived to Influence the Healthiness of Foods’, ‘Perceptions of Dietary Information’ and ‘Challenges to Forming Accurate Perceptions’. Each theme is presented with a description or interpretation of sub-themes and quotations from the raw text to elaborate meaning. A summary model that integrates the key themes and highlights how they link together is then proposed.

4.2.1 Baseline characteristics of participants

The focus group participants were non-smoking men and women predominantly of European descent with type 2 diabetes (Table 7).
Table 7. Baseline characteristics of participants (the focus groups)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) age in years</td>
<td>60 (6.9)</td>
</tr>
<tr>
<td>Number of women (%)</td>
<td>7 (59)</td>
</tr>
<tr>
<td>Number of current smokers (%)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-identified ethnicity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of European (%)</td>
<td>10 (83)</td>
</tr>
<tr>
<td>Number of (%)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Number of Other (%)</td>
<td>2 (17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education level</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number who did not complete tertiary (%)</td>
<td>7 (58)</td>
</tr>
<tr>
<td>Number who completed tertiary (%)</td>
<td>1 (8)</td>
</tr>
<tr>
<td>Number who achieved a further degree (%)</td>
<td>3 (25)</td>
</tr>
<tr>
<td>Did not specify (%)</td>
<td>1 (8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-identified diagnosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of diagnosed type 2 diabetics (%)</td>
<td>10 (83)</td>
</tr>
<tr>
<td>Number of diagnosed pre-diabetics (%)</td>
<td>2 (17)</td>
</tr>
<tr>
<td>Mean (SD) duration of diabetes in years)*n=9</td>
<td>11.4 (8.6)</td>
</tr>
</tbody>
</table>

4.2.2 Part one: What foods are perceived to be healthy and unhealthy?

In general, perceptions were consistent among the participants however in some cases there were distinct differences in perceptions, both within individual focus groups and across the whole data set. The following text outlines participants’ perceptions of food groups that were discussed in the focus groups, and highlights the similarities and differences throughout each section. Paraphrased quotations that demonstrate positive/healthy or negative/unhealthy perceptions of the main food groups discussed are presented in tables 8–12.

Perception of Fruit

A common perception held by the participants was that fruit is healthy, in moderation. It was evident that the participants were cautious about the quantity of fruit that they consume over a day and at any one time. Some of the participants stated that they had been advised to have as little possible, whereas others stated that it is important to apply portion control. The following quote illustrates the latter view:

“It’s just again you’re not supposed to have too much of it, but it’s good for you, you need to have some fibre, you need some, you know there’s things in it that you do need so...”
<table>
<thead>
<tr>
<th></th>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td>Nutritionist recommended fruit</td>
<td>Bit of fruit, not too much</td>
</tr>
<tr>
<td></td>
<td>Good for you</td>
<td>It seems to be the quantity of fruit that everyone talks about</td>
</tr>
<tr>
<td></td>
<td>Has fibre</td>
<td>Doctor said no more than 2 a day</td>
</tr>
<tr>
<td></td>
<td>Has potassium</td>
<td>You aren't supposed to have too much</td>
</tr>
<tr>
<td></td>
<td>Healthy</td>
<td>Comes under portion control</td>
</tr>
<tr>
<td></td>
<td>Better to eat it than drink it</td>
<td>Was told don’t eat fruit it's got too much</td>
</tr>
<tr>
<td></td>
<td>Good to have fruit, but only have a portion and have with something else</td>
<td>Sugar in it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dietitian said I'm only allowed one piece at a time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The bulk of it is sugar</td>
</tr>
<tr>
<td><strong>Apples</strong></td>
<td>Not too bad</td>
<td>Not too sure about apples</td>
</tr>
<tr>
<td><strong>Bananas</strong></td>
<td>Quite good if blood sugars are low</td>
<td></td>
</tr>
<tr>
<td><strong>Berries</strong></td>
<td>Usually pretty good aren't they?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have antioxidants, so all berries are good</td>
<td></td>
</tr>
<tr>
<td><strong>Cranberries</strong></td>
<td>High in antioxidants</td>
<td>Conflicting information about dried cranberries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You’ve got to be careful because of the sugar concentrates</td>
</tr>
<tr>
<td><strong>Dates</strong></td>
<td>Packet says it lowers blood sugars and lowers blood pressure</td>
<td>So sweet when you taste it</td>
</tr>
<tr>
<td></td>
<td>Fresh dates are much better than dried</td>
<td></td>
</tr>
<tr>
<td><strong>Dried</strong></td>
<td></td>
<td>Very bad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The sugary things are still there</td>
</tr>
<tr>
<td><strong>Grapes</strong></td>
<td></td>
<td>Particularly bad</td>
</tr>
<tr>
<td><strong>Kiwifruit</strong></td>
<td>Not too bad because it’s high fibre</td>
<td></td>
</tr>
<tr>
<td><strong>Melons</strong></td>
<td></td>
<td>Send my blood sugars up</td>
</tr>
<tr>
<td><strong>Pears</strong></td>
<td></td>
<td>You have to be careful with some pears</td>
</tr>
<tr>
<td><strong>Pineapple</strong></td>
<td></td>
<td>In moderation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You’ve got to be careful with it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Especially be careful with tinned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not very good for you</td>
</tr>
</tbody>
</table>
The main reasons provided to justify the healthiness of fruits were fibre content, potassium and antioxidants. However, the participants were also cautious that fruit contains sugar, which was the main concern regarding the quantity consumed. Some fruits were perceived to be less healthy by some participants including grapes, melons, pineapple and some pears, due to their perceived glycaemic effect and sweetness, which was perceived to be an indication of sugar content. Some participants also stated that it is better to eat the fruit than to drink it in a juice, and some perceived dried fruit to be unhealthy, as it is concentrated in sugar. However, some of the participants were unsure about dried cranberries and dates due to conflicting information:

“Like dried cranberries... some people say they are brilliant for you, for your heart and everything else and a good substitute when you need something sweet, and then you’ll go read something else and it’ll say they’re absolutely dreadful stay well away”

Participant perception of fruit generally aligned with the Diabetes NZ guidelines (2014), with the exception of dried fruit, which was perceived to be unhealthy by some participants. Dietary guidelines recommend dried fruit as a healthy choice of fruit, although moderation is advised. Participants appeared to be more cautious about their fruit intake than is recommended in the dietary guidelines.

Perception of Vegetables

Vegetables were perceived to be healthy by all participants. A common view was that non-starchy vegetables are healthy and starchy vegetables are unhealthy, or less healthy:

“As long as they are not really starchy they are usually pretty good”

The main reason provided to justify this perception was advice received from a doctor or dietitian.

Kumara was perceived to be a healthier choice of starchy vegetable by some of the participants, as they perceived kumara to have a lower glycaemic index, whereas others did not perceive kumara to be healthier as they perceived kumara to have a high glycaemic index.
One focus group was also uncertain about peas, as they were perceived to have a high content of natural sugars:

“They do have a lot of natural sweeteners, sugar, peas have sugar “

Participant perception regarding vegetables were in alignment with dietary guidelines (Diabetes NZ 2014). Starchy vegetables, including kumara, are categorised as ‘carbohydrate-containing’ food and therefore it is advised that people have “some, but not too much”.

Among the participants, there was a general consensus that vegetables are healthy, however participants expressed caution in regards to the quantity of starchy vegetables that they consume and these were perceived to be less healthy than non-starchy vegetables.

Table 9: Perception of vegetables

<table>
<thead>
<tr>
<th></th>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Nutritionist recommended vegetables</td>
<td>Some of them are in dispute</td>
</tr>
<tr>
<td></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I was told to eat a lot of vegetables</td>
<td></td>
</tr>
<tr>
<td>Non-starchy vegetables</td>
<td>Concentrate on non-starchy vegetables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Green, leafy vegetables are healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salads are healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>As long as they are not really starchy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>they are usually pretty good</td>
<td></td>
</tr>
<tr>
<td>Starchy vegetables</td>
<td>Doctor says no more than 2 a day, preferably none</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The root vegetables aren't healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>We generally get told that they're not so healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>As long as they are not really starchy they are usually pretty good</td>
<td></td>
</tr>
<tr>
<td>Ampalaya (Bittergourd)</td>
<td>Lowers blood sugars</td>
<td></td>
</tr>
<tr>
<td>Asparagus</td>
<td>Healthy</td>
<td></td>
</tr>
</tbody>
</table>
### Table 9 continued: Perception of vegetables

<table>
<thead>
<tr>
<th></th>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Broccoli</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Not going to affect the sugar levels</em></td>
</tr>
<tr>
<td><strong>Cabbage</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Very good for you</em></td>
</tr>
<tr>
<td><strong>Capsicums</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td><strong>Carrots</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Meant to be good for you but at one stage they were saying they can send your blood sugars up</em></td>
</tr>
<tr>
<td></td>
<td><em>Usually good</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>I know I could eat carrots forever and nobody would moan about that</em></td>
<td></td>
</tr>
<tr>
<td><strong>Celery</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Wonderful vegetables</em></td>
</tr>
<tr>
<td><strong>Garlic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>I hope it goes in the healthy</em></td>
<td></td>
</tr>
<tr>
<td><strong>Kale</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Not going to affect the sugar levels</em></td>
<td></td>
</tr>
<tr>
<td><strong>Kumara</strong></td>
<td><em>Baked kumara is really good to have a piece instead of your bread</em></td>
<td><em>Doctor says no more than 2 a day, preferably none</em></td>
</tr>
<tr>
<td></td>
<td><em>I think it's lower GI</em></td>
<td><em>Less of a complex carb, has quite a high GI</em></td>
</tr>
<tr>
<td></td>
<td><em>Has fibre</em></td>
<td><em>Use finely</em></td>
</tr>
<tr>
<td><strong>Mushrooms</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Depends how you eat/cook them</em></td>
</tr>
<tr>
<td><strong>Peas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>I don’t know about peas sometimes</em></td>
<td><em>They have a lot of natural sweeteners</em></td>
</tr>
<tr>
<td></td>
<td><em>Peas have sugar</em></td>
<td></td>
</tr>
<tr>
<td><strong>Potato</strong></td>
<td><em>Has fibre</em></td>
<td><em>A lot of sugar</em></td>
</tr>
<tr>
<td></td>
<td><em>A complex carb</em></td>
<td><em>Reasonably high GI</em></td>
</tr>
<tr>
<td></td>
<td><em>Boiled potato will have a much slower (glycaemic) effect than mashed potato</em></td>
<td><em>Can sit in my tummy and make me feel really sad</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Would only use in small quantities</em></td>
</tr>
<tr>
<td><strong>Root ginger</strong></td>
<td><em>I hope it goes in the healthy</em></td>
<td></td>
</tr>
<tr>
<td><strong>Silver beet</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td><strong>Spinach</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td><strong>Squash</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Would only use in small quantities</em></td>
<td></td>
</tr>
<tr>
<td><strong>Tomatoes</strong></td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td><strong>Yams</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Would only use in small quantities</em></td>
<td></td>
</tr>
</tbody>
</table>
Perception of breads, pasta, rice and cereals

Majority of participant perception regarding the healthiness of breads and rice were in general agreement with each other’s and with guidelines. By contrast there were larger variations in participant perception regarding the healthiness of pasta and cereals.

There was a common view that ‘white’ grain products, such as bread and rice, were unhealthy. In comparison, brown rice and wholegrain options were perceived to be healthier, primarily due to differences in their glycaemic raising properties:

“Take bread for instance, you’ve got white death, and if I ate that my blood sugar levels would go up like that, whereas if I ate what some people would call saw dust, full of grains and seeds and things like that... it would go up a lot slower”

There were mixed perspectives regarding the healthiness of pasta. These perspectives ranged between both ends of the spectrum. For instance, one participant frequently stated that pasta is a healthy source of carbohydrate, whereas others perceived pasta to be only somewhat healthy, and some categorically stated that pasta is unhealthy. Among those that perceived pasta to be unhealthy, their perceptions appeared to be the result of their own glycaemic response to pasta, opposed to advice that they had received:

“I notice quite of few of the books say you can have a quantity of ... pasta...
I’ve found I can’t at all – If I have those then my blood sugars go way, way too high”

There were also mixed perspectives regarding the healthiness of cereals. Many participants perceived muesli and cereals to be high in carbohydrate and/or sugar, however oats and Weet-Bix were commonly perceived to be healthy choices of breakfast foods. Some of the participants reported that the satiating capacity of muesli compensated somewhat for its high carbohydrate content and hence they consume it occasionally:

“Yeah I do eat muesli and it’s a bit high in the carbs, but it keeps me... I don’t need anything else until lunch time so I don’t feel its that wicked”
Some of participant perception of breads, rice, pasta and cereals were in alignment with Diabetes NZ guidelines (2014), however there were some deviations. Specifically, some recommended varieties of rice were not perceived to be healthy and there were mixed opinions regarding pasta. Most participants agreed that wholegrain varieties are healthier alternatives, which are also recommended in the guidelines. The main reason provided to support a negative view of the foods in this category was the perceived effect on blood sugars.

**Table 10:** Perception of breads, pasta, rice and cereals

<table>
<thead>
<tr>
<th></th>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bread</strong></td>
<td>Most breads run at about a 50 (GI) which is medium</td>
<td>It can sit in my tummy and make me feel really sad</td>
</tr>
<tr>
<td><strong>White bread</strong></td>
<td>A &quot;no-no&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Makes my blood sugars go too high</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I wouldn't have white bread</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Just don't touch it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I don't eat it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White death</td>
<td></td>
</tr>
<tr>
<td><strong>Wholegrain bread</strong></td>
<td>I have whole grain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Makes my blood sugars go up a lot slower</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I think it is a complex carbohydrate</td>
<td></td>
</tr>
<tr>
<td><strong>Cereals/Muesli</strong></td>
<td>Weetbix, the bran one is good</td>
<td>Muesli is a bit high in the carbs</td>
</tr>
<tr>
<td></td>
<td>Muesli keeps me full</td>
<td>Some cereals can be really bad</td>
</tr>
<tr>
<td></td>
<td>Cereals are good</td>
<td>I think the cereals have fructose</td>
</tr>
<tr>
<td></td>
<td>Vitabrits have less sugar than Weetbix</td>
<td>more sugar than Vitabrits</td>
</tr>
<tr>
<td></td>
<td>Vitabrits have the same filling effect as</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weetbix</td>
<td>They are really highly sugared… like</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nutrigrain, Rice Bubbles</td>
</tr>
<tr>
<td><strong>Oats</strong></td>
<td>Oats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>They love oats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oatmeal is good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oatmeal is a very good, yeah and porridges</td>
<td></td>
</tr>
</tbody>
</table>
Table 10 continued: Perception of breads, pasta, rice and cereals

<table>
<thead>
<tr>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pasta</strong></td>
<td></td>
</tr>
<tr>
<td>The books often say that you can have it in moderation</td>
<td>Watch your portions</td>
</tr>
<tr>
<td>More on the healthy side than the unhealthy side</td>
<td>A &quot;no-no&quot;</td>
</tr>
<tr>
<td>A very good complex carbohydrate</td>
<td>Makes my blood sugars go too high</td>
</tr>
<tr>
<td></td>
<td>Unhealthy</td>
</tr>
<tr>
<td></td>
<td>Makes me feel bloated</td>
</tr>
<tr>
<td></td>
<td>I wouldn't have white pasta</td>
</tr>
<tr>
<td></td>
<td>I'm very careful with pasta</td>
</tr>
<tr>
<td><strong>Couscous</strong></td>
<td></td>
</tr>
<tr>
<td>I think they are healthy</td>
<td></td>
</tr>
<tr>
<td>We can occasionally use them</td>
<td></td>
</tr>
<tr>
<td><strong>Rice</strong></td>
<td></td>
</tr>
<tr>
<td>I could eat a whole pot and I feel ok</td>
<td>A &quot;no-no&quot;</td>
</tr>
<tr>
<td></td>
<td>Makes my blood sugars go too high</td>
</tr>
<tr>
<td></td>
<td>Has a higher (glycaemic) spike effect</td>
</tr>
<tr>
<td></td>
<td>I avoid it because it upsets my system</td>
</tr>
<tr>
<td><strong>Brown rice</strong></td>
<td></td>
</tr>
<tr>
<td>I’ve just gone back to it and found you can eat it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brown rice is better</td>
</tr>
</tbody>
</table>

Perception of cooking oils, animal fat and nuts

In general, fats were perceived to be unhealthy. However, many participants agreed that there are healthy and unhealthy sources of fats. Sources of fats that were perceived to be healthy included olive oil, canola oil, rice bran oil, fish oils, sesame oil, avocado oil and seeds. Sources of fats that were perceived to be unhealthy included palm oil, animal fat, chocolate, cream and dairy products.

There was some uncertainty regarding the healthiness of coconut oil in one focus group, as its health benefits were thought to be in dispute.

"Because the coconut oil at the moment is actually in controversy"

There were also mixed perspectives regarding the healthiness of nuts. Many participants were aware that they are a source of healthy fats, however they expressed concern about the quantity consumed, as they were perceived to be fattening. Most of participant perception regarding nuts are in alignment with dietary guidelines (Diabetes NZ 2014), which recommend the consumption of nuts in small quantities,
however some of the participants perceived that nuts were to be avoided altogether as they are too fattening.

Most of participant perception regarding sources of fats were in alignment with each other’s and with dietary guidelines. However, there were mixed perception of nuts.

Table 11: Perception of cooking oils, animal fat and nuts

<table>
<thead>
<tr>
<th></th>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal fat</td>
<td>Unhealthy</td>
<td>You are supposed to remove chicken fat</td>
</tr>
<tr>
<td>Avocado oil</td>
<td>Good</td>
<td>Has more good fats than bad fats</td>
</tr>
<tr>
<td>Canola oil</td>
<td>Healthy</td>
<td>Good for some things, like in cakes instead of butter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not bad</td>
</tr>
<tr>
<td>Coconut oil</td>
<td></td>
<td>There is some controversy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is in dispute</td>
</tr>
<tr>
<td>Fish oil</td>
<td>Healthy</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>Aren’t they a healthy fat?</td>
<td>Have a lot of fat in them</td>
</tr>
<tr>
<td></td>
<td>Healthy</td>
<td>An item I can’t have at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Be careful of quantity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All my friend ate was nuts, he's dead now</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Don’t have too many of them</td>
</tr>
<tr>
<td>Olive oil</td>
<td>Nutritionist recommended</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It’s good for you</td>
<td></td>
</tr>
<tr>
<td>Palm oil</td>
<td></td>
<td>One of the worst things you can get</td>
</tr>
<tr>
<td>Rice bran oil</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Seeds</td>
<td>Pretty good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hard to eat a lot of them</td>
<td></td>
</tr>
<tr>
<td>Sesame oil</td>
<td>Good</td>
<td>I would have no more than a teaspoon, just for flavour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Has more good fats than bad fats</td>
</tr>
</tbody>
</table>
**Perception of dairy products and eggs**

Dairy products, such as margarine, butter and cream, were generally perceived to be unhealthy, primarily due to their fat content. There were mixed perspectives regarding the healthiness of cheese. Some participants perceived cheese, or certain varieties of cheese, to be healthy, whereas others did not. In particular, some participants stated that “soft cheeses are better” than hard cheeses, as they have a lower fat content.

One focus group discussed margarine versus butter. Some participants perceived margarine to be a healthy option, whereas others perceived margarine to be extremely unhealthy and worse than butter:

“He said well I’ll just say to you, as far as I’m concerned, butter is pure, unadulterated poison”

“Yeah but so is margarine”

Low-fat dairy products, such as low-fat yoghurt and milk, were perceived to be healthy, or healthier than the full-fat alternatives, by some participants. Some participants perceived eggs to be healthy, however no reason was provided.

Dietary guidelines advise against foods that are high in saturated fats, including butter, whereas sources of poly-unsaturated and mono-unsaturated fats are recommended (Diabetes NZ 2014). Dietary guidelines recommend using spreads made from oils high in mono- and poly-unsaturated fats, which would include most types of margarine. However, only small quantities are advised. Dietary guidelines also recommend using softer cheeses, or small quantities of hard cheeses.

**Perception of meat and seafood**

A common view held among participants was that red meat and processed meat are unhealthy and lean proteins such as white meat, game meat and fish are healthy. The main distinction between perception of the two categories was the perceived fat content, which appeared to be the most important dictator of perceived healthiness of meats. However, no reasons were suggested to support perception regarding the healthiness of fish.

**Perception of legumes**

The participants infrequently mentioned legumes. One focus group discussed the healthiness of kidney beans and hummus (chickpeas), however the participants
seemed hesitant in their answers and appeared to perceive them as neither healthy, nor unhealthy:

“Something I’m not sure about is beans”

Perception of alcohol

Many participants perceived alcohol to be unhealthy, however they often stated that it is ok in moderation:

“Well it’s in the unhealthy column but it’s like everything in life, if you do it in moderation, in the right quantities and portions whatever, and frequency.”

Some participants perceived certain types of alcohol to be healthier than others, such as dry white wine and red wine. Few participants stated that they had been advised to have no more than 2 glasses of wine per day (female participants), and no more than 3 beers per day (male participant).

These perceptions align with the Diabetes NZ guidelines (2014) which state that alcohol intake should be limited to 3 drinks or fewer each day for men, and 2 drinks or fewer each day for women.

Perception of other beverages

Among participants there was agreement regarding the healthiness of other beverages, with the exception of diet drinks, with which there were mixed perspectives.

There was a commonly held view that fruit juices and fizzy drinks are extremely unhealthy, primarily due to their high sugar content.

“Certainly fizzy drinks are a real no-no, not just the orange juice it’s the fizzy drinks”

There were mixed perspectives regarding diet drinks. Some participants chose to drink diet drinks, as they are low in calories and sugar:

“I drink Pepsi Max almost exclusively. It’s the only thing I drink other than water because its 1 calorie a can and there is no sugar in it”
However, other participants expressed concerns about the content of artificial sweeteners, caffeine and salt.

One focus group discussed the healthiness of water. Most participants perceived water to be a healthy choice of drink. However one participant was concerned that water contained sugar after reading the label on a water bottle.

“No, plain water, if you look, there is sugar and I was thinking I’m wanting to drink 2 Litres of water everyday and I don’t know... there’s sugar in water”

Tea and coffee were mentioned very infrequently.

Perception of artificial sweeteners
Some participants were unsure about the healthiness of artificial sweeteners. Some of the reasons suggested were potential cancer effects, potential negative effects on blood sugars and that some people have bad side effects.

Summary of perceptions
Among the participants there was both agreement and disagreement regarding the healthiness of various foods and food groups, and perceptions that were both in alignment, and ran contrary, to New Zealand dietary guidelines for people with type 2 diabetes (Diabetes NZ 2014). In general, fruit and vegetables were perceived to be healthy. However, starchy vegetables were perceived to be less healthy than non-starchy vegetables and participants expressed caution about the quantity of fruit. White grain products, such as bread and rice, were generally perceived to be unhealthy, whereas wholegrain varieties were identified as healthier alternatives. Similarly, white meat, game meat and fish were perceived to be healthier alternatives to red and processed meats. Participants identified a number of healthy and unhealthy oils, and animal fat and dairy products were perceived to be unhealthy sources of fats. Fruit juices, full-sugar soft drinks and alcohol were perceived to be unhealthy. However, participants emphasised the importance of applying moderation when consuming alcohol. There were mixed perspectives regarding the healthiness of pasta, cereals, cheese, margarine and diet soft drinks.
4.2.3 Part two: Focus groups themes
Four themes were identified through thematic analysis of the focus groups; Perceptions of Food Components; Other Factors Perceived to Influence the Healthiness of Foods; Perceptions of Dietary Information; Challenges to forming Accurate Perceptions. The four themes are presented below, a summary model of how the themes relate is then proposed.

4.2.4 Theme one: Perception of food components
When asked to discuss perceptions of healthy and unhealthy foods, participants frequently referred to components of food to justify the healthiness or unhealthiness of certain foods (table 12). Fat, carbohydrate, sugar and salt were the most frequently discussed components of foods. Protein and fibre were also mentioned. For some participants, food components, such as fat and sugar, are the most important factors to consider when determining the nutritional quality of foods. For some participants, these factors are perceived to be more important than the actual food itself:

“I’m very interested in how much sugar there is in the products. So suddenly you focus more on not so much what you are eating, but you know, it doesn’t matter what you eat, as long as the indicators on the label are within the parameters that I’m allowed”

Perception of carbohydrate
All of the participants demonstrated some level of understanding of the glycaemic raising properties of carbohydrate.

There was general agreement among the three groups that the quantity of carbohydrate consumed is of particular importance for people with diabetes, due to the glycaemic raising effect. Participants frequently expressed caution when referring to carbohydrate and commonly stated that consuming foods with a ‘high content’ or ‘too much’ would be problematic. The following quote is an example of these perceptions:

“You can eat kale and broccoli all night long but it’s not gonna affect the sugar levels, but you do the same with starchy carbohydrate then you’re going to have a problem”

At one extreme, one participant perceived that she had been advised to have as little carbohydrate as possible, and preferably none.
Most participant perception regarding quantity of carbohydrate consumption aligns with Diabetes NZ guidelines, which recommend that people consume some carbohydrate, but not too much (Diabetes NZ 2014).

Many of the participants were aware that the glycaemic-raising effects of different carbohydrate-containing foods vary. Specifically, participants expressed caution regarding ‘processed’ carbohydrate and ‘starchy’ carbohydrate.

“If you’ve got a high lot of processed carbohydrate in your food, which includes sugar, then it’s going to be unhealthy and it’s going to react badly on your glucose levels”

Most participants did not mention the classification of carbohydrate as simple and complex carbohydrate. However, wholegrain products were commonly perceived to be healthier than ‘white’, refined grain products. Among the one focus group that did discuss the classification of simple and complex carbohydrate, there appeared to be limited understanding and confusion with other terms such as high fibre, and high glycaemic index:

“Complex carbs are usually carbs that have fibre in them… Sweet potato is less of a complex carb, it does have fibre but it’s got quite a high GI”

Among the participants there was general agreement that the quantity of carbohydrate is an important consideration for people with diabetes. The main concern was the glycaemic-raising effect of large quantities of carbohydrate. Many participants were aware that different carbohydrate-containing foods affect blood sugars differently, however, there appeared to be limited knowledge of the different types of carbohydrate.

Perception of sugar

There was a strong focus on sugar in all three of the focus groups. Sugar was perceived to be unhealthy and it was commonly cited as a reason to justify the unhealthiness of foods.

The glycaemic-raising properties were the main reason for the perceived unhealthiness of sugar. Although, one focus group stated that you need a certain
amount of sugar for body functions, for your brain, and to be happy. This focus group were also aware that there are different types of simple sugars and had been advised to watch out for anything ending in “–ose”. However, there was confusion regarding the molecular names of simple sugars, and whether they were sugar or sugar substitutes:

“*I was told that anything that ends in ‘–ose’. Glucose, fructose… You have to be very careful of. You might have perhaps a sugar substitute but it’s made with fruit sugar. You have to look at all those things, the ‘–ose’ ones*”

Few participants reported that they apply the 10% rule – choosing food products with less than 10g sugar per 100g, which is in alignment with Diabetes NZ guidelines (2014).

There was a commonly held perception among the focus groups that low-fat food products are subsequently high in sugar:

“*Low fat seems to mean high sugar doesn’t it*”

Among the participants there was an inherent assumption that sugar is unhealthy. Often sugar wasn’t explicitly stated to be unhealthy, but was frequently provided as a reason to justify the unhealthiness of other foods.

**Perception of fibre**

Few participants mentioned fibre as a healthy component of foods such as fruit, potato and complex carbohydrates. However, overall the participants seldom mentioned fibre.

**Perception of fats**

Fats were commonly perceived to be unhealthy among the participants and, like sugar, fat content was often cited as a reason to justify the unhealthiness of other foods.

Few participants acknowledged that there are good fats and bad fats, however all fats were perceived to promote weight gain. The perception that fats are fattening appeared to override participants’ acceptance of healthy fats.
The majority of the participants did not demonstrate a good understanding of the differentiation between types of fats and their overall perception appeared to be that fat is unhealthy.

Similarly, there is a strong focus on fats throughout the Diabetes NZ guidelines (2014), which recommend choosing low-fat options and advise people to be cautious of foods that are high in fats.

Fat was commonly regarded as an unhealthy component of food. Although some of the participants acknowledged that there are good fats and bad fats, the general consensus among the participants was that fat is unhealthy and fattening.

**Perception of protein**

Protein was infrequently mentioned during discussions of healthy and unhealthy foods. Few of the participants stated that certain foods are healthy due to their high protein content:

“Well they are protein, they’re not unhealthy”

**Perception of salt**

Many participants perceived salt to be unhealthy, although most participants did not provide a reason for the unhealthiness of salt. Salt was frequently cited as a reason to justify the unhealthiness of other foods such as diet drinks, bacon and chips.

**Summary**

Perceptions of food components were generally consistent among the participants. Throughout the focus groups there was a strong focus on fat, carbohydrate and sugar. All of the participants demonstrated some level of understanding of the glycaemic-raising properties of carbohydrate, and many raised concerns about both the type and amount of carbohydrate consumed. However, there appeared to be some confusion around terms used to describe carbohydrate-containing foods, such as ‘complex carbohydrate’, ‘high fibre’ and ‘glycaemic index’. Fats and sugar were identified as the two main dietary culprits. Although some participants acknowledged that there are ‘good’ and ‘bad’ fats, all fats were perceived to promote weight gain. There was also a common perception among the participants that low-fat products are high in sugar.
<table>
<thead>
<tr>
<th></th>
<th>Healthy or Positive Perception</th>
<th>Unhealthy or Negative Perception</th>
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</thead>
<tbody>
<tr>
<td><strong>Carbohydrate</strong></td>
<td>Okay if you have the right portion size&lt;br&gt;Choose complex carbohydrates&lt;br&gt;Complex carbohydrates have fibre&lt;br&gt;Complex carbohydrates keep blood sugars stable&lt;br&gt;Complex carbohydrates are less of a quick hit</td>
<td>Doctor says no more than 2 servings per day, preferably none&lt;br&gt;Look for carbohydrate content in foods&lt;br&gt;Carbohydrates become sugar&lt;br&gt;You will have a problem if you eat too much starchy carbohydrate&lt;br&gt;I would choose a lower carb option&lt;br&gt;High content of processed carbohydrates is unhealthy</td>
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<tr>
<td><strong>Sugar</strong></td>
<td>Could say healthy in moderation&lt;br&gt;Need certain amount for body functions&lt;br&gt;Need certain amount to be happy&lt;br&gt;Need certain amount for your body to work, brain&lt;br&gt;Raw sugar is slightly less refined&lt;br&gt;Depends on where sugars are from&lt;br&gt;Depends on quantity</td>
<td>Nutritionist was concerned with sugar&lt;br&gt;Advised not to have sugar in coffee&lt;br&gt;Educated myself out of having sugar&lt;br&gt;Choose foods with &lt;10g sugar per 100g&lt;br&gt;Sugar content is reason for unhealthiness of processed foods&lt;br&gt;High sugar intake could contribute to diabetes among Indians&lt;br&gt;Sugar is unhealthy&lt;br&gt;Be careful of anything that ends in -ose&lt;br&gt;Sugar is our enemy</td>
</tr>
<tr>
<td><strong>Fibre</strong></td>
<td>Usually in complex carbohydrates&lt;br&gt;In fruit, kiwifruit and potatoes</td>
<td></td>
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<tr>
<td><strong>Fat</strong></td>
<td>Could say healthy in moderation&lt;br&gt;There are some good fats&lt;br&gt;Polyunsaturated and monounsaturated are good fats&lt;br&gt;Omega 3, fish oils and fats from exercise are good fats</td>
<td>Nutritionist was concerned with fat&lt;br&gt;Choose foods with &lt;10g fat per 100g&lt;br&gt;Fat is unhealthy and bad for you&lt;br&gt;High fat intake could contribute to diabetes among Indians&lt;br&gt;Fat content is reason for unhealthiness of cheese, chips and oven fries&lt;br&gt;Fat is our enemy&lt;br&gt;Saturated and trans fats are bad fats</td>
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<tr>
<td><strong>Protein</strong></td>
<td>Not unhealthy&lt;br&gt;Reason for healthiness of kidney beans and hummus&lt;br&gt;Healthy component of bacon</td>
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<tr>
<td><strong>Salt</strong></td>
<td>Depends on the quantity&lt;br&gt;&quot;It's a thyroid, goitre thing&quot;</td>
<td>Unhealthy&lt;br&gt;Really bad&lt;br&gt;Can affect your blood pressure&lt;br&gt;Should use in moderation&lt;br&gt;Reason for unhealthiness of diet drinks, bacon and chips</td>
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4.2.5 Theme two: Factors perceived to influence the healthiness of foods

Whilst discussing perceptions of healthy and unhealthy foods, a number of factors were identified that were perceived to influence the healthiness of foods. These factors include cooking methods, quantity and portion control, the frequency and timing of meals, level of processing, glycaemic index, and the effect on psychological health.

**Cooking methods**

Many participants stated that cooking methods influence the healthiness of a food or meal. Cooking methods that were perceived to be healthy included boiling, barbecuing, steaming, blending, grilling, dry roasting and the removal of visible fat. Cooking methods that were perceived to be less healthy included frying, deep-frying and cooking in oil or fat. The added level of fat appeared to be the main factor that influenced participant perception of cooking methods. Specifically, cooking methods that required the addition of fat were perceived to be unhealthy, whereas cooking methods that required the addition of little to no fat were perceived to be healthy.

Some of the participants stated that the healthiness of particular foods depend on the way they are cooked and that something that is healthy could become unhealthy if it is cooked with an unhealthy cooking method, and vice-versa.

“Some [typically unhealthy foods] could be healthy... it just depends on the way, you know when they’re talking about cooking food, it’s the way that you cook it, say if you grill something opposed to deep fry it or just yeah... it’s the methods of cooking it”

Many participants mentioned cooking methods as a factor that can alter the healthiness of foods. The addition of fat appeared to be a common factor that distinguished between cooking methods perceived to be healthy, and those perceived to be unhealthy.

**Quantity and portion control**

Quantity was frequently mentioned as a factor that can influence the healthiness of foods. Participants stated that the healthiness of certain foods depends on the quantity of that food consumed. Participants appeared to be particularly cautious of carbohydrate, sugar, fruit, nuts and alcohol. Some participants also stated that the idea of ‘healthy in moderation’ applies to all foods.
“You could even say that about fat and sugar, healthy in moderation.”

Few participants stated that the quantity of carbohydrate and sugar is more important than the source:

“Any carbohydrate is essentially a sugar, so often a teaspoon of simple sugar is not as bad as for example if you have a whole plate of pasta”

Participants’ main concern regarding the quantity of carbohydrate appeared to be the anticipated effect on blood sugars.

A mixture of portion control techniques were mentioned such as using a smaller plate, using the size of your palm or fist as a guide and sharing with others. Some participants had predetermined perceptions of appropriate portion sizes for certain foods, and some relied on their intuition. The Diabetes New Zealand Healthy Plate concept was also mentioned by a couple of the participants:

“They gave me a plate and it divided up, you have this much carbohydrate, this much protein, this much vegetables and things like that and I find it handy”

Many participants frequently mentioned quantity as a factor that can influence the healthiness of certain foods. In particular, participants appeared to be cautious about large quantities of foods that raise their blood sugars. Portion control was also highlighted as an important factor and participants stated that they apply a range of portion control techniques.

**Meal frequency and timing**

The frequency and timing of meals was another factor that was perceived to influence the healthiness of consuming foods. There was a commonly held perception among the participants that it is best to eat small meals, more frequently, and this was perceived to be more important for people with type 2 diabetes than those of normal glucose tolerance:

“When you’re diabetic, ideally I think you should eat a lot of small portions throughout the day, but it becomes impossible, especially if you’re living with
other people, you know they don’t want to eat twelve times per day sort of thing”

Again, the main reason provided was to keep blood sugar levels stable:
“If you eat regularly, or you just have a snack or whatever then hopefully you just keep your blood sugar level up”

Many participants discussed advice that they had received regarding the ideal frequency of meals and a number of frequencies were suggested ranging from six to twelve small meals per day. Although there were discrepancies in their perception regarding the ideal frequency, there was general agreement that ‘little and often’ is best. Advice related to optimal timing and frequency of meals is not included in dietary guidelines for people with type 2 diabetes (Diabetes NZ 2014).

Some participants commented on the timing of meals. Again, there were mixed opinions regarding the optimal timing. These opinions included eating at the same times each day, eating more across the middle of the day, eating less at night, not eating too soon before bed, and having a snack before bed to prevent hypoglycemia:
“There is quite a lot of advice going around about when to eat in the day, you know my doctor said to have a small dinner ... so I tend to have more food across the middle of the day, rather than at night time and that certainly helps me”

Some of the differences in these perceptions were due to variations in advice received and due to differences in participants’ glycaemic management plans.

One of the focus groups also discussed the optimal timing for drinking water in relation to food intake. Two of the participants felt that you should not drink water too soon before or after a meal as it “affects the enzymes that break down your food”, however, the other participant said that she had been advised to have a glass of water twenty minutes before her meal so that she “would be less hungry and eat less”. However, all of these participants agreed that you should not drink water with meals. Dietary guidelines advise consuming at least six to eight glasses of water per day, however there are no recommendations specific to the consumption of water around meal times (Diabetes NZ 2014).
Many participants stated that the frequency and timing of meals is an important consideration. Although there were mixed opinions regarding the ideal frequency and timing, ‘little and often’ was generally perceived to be best.

**Level of processing**

A common view held by most of the participants was that highly processed foods are unhealthy. A number of reasons were provided including that they are high in sugar, high in salt, have a high glycaemic index and have had all the ‘good’ taken out:

> “I come from Europe where in the old days, in small villages the women went around and they bought a piece of fish or meat that they were going to cook for that night and you know, that was it. And it was all fresh produce, simply cooked and that was it. There was no processing, no sugar, no preservatives, no nothing. I think that’s really what’s wrong with the world”

**Glycaemic index**

There were mixed levels of knowledge and varying opinions regarding the usefulness of the glycaemic index. Few participants demonstrated a reasonably good understanding of the concept and some stated that they consider the glycaemic index when making food choices. However, many participants appeared to be confused by the concept, including those who said that they follow a low glycaemic index diet. Several participants were confused about what levels were good and bad:

> “With the GI index I can’t remember if it’s the lower the number the better or the higher the number the better, I’m not quite sure”

**Psychological health**

Participants from one of the focus groups frequently mentioned psychological aspects related to food choices. The two main ideas that emerged were the need and desire for a ‘break’ from their diabetes diet, and the balance between enjoyment and health concerns.

Some of the participants implied that it is important for their psychological health to have a ‘day off’ from their diet.

> “I think it’s also important when you’re under some sort of restriction, whatever it is, like that you have a treat or a break so that you know...you have something to look forward to”
Some participants also talked about their enjoyment of food, which they believed is also important when making food choices, opposed to focusing purely on nutrient quality.

“I walk past a sushi bar and I see all these young people digging into raw salmon and rice and I think ‘oh you poor sods’. But you know, for them it’s normal. And you know, a big grown man sits down and eats some leaves, you know, he has salad for lunch and I always feel like, you know…”

Some of the participants also talked about weighing up the consequences of their decisions and there was agreement that it is okay to make certain decisions provided you are aware of, and accept, the consequences. In particular, alcohol was often regarded as “a psychological thing”:

“Well when I go out I will probably have a bottle of wine but if that means that my life is shortened by two years because I like pinot noir well so be it, I’ll sign up here thank you. As long as it’s good pinot I don’t care”

The psychological effect of going with or without certain foods was another factor that was perceived to influence the overall healthiness of foods.

**Summary**

A number of factors were perceived to influence the healthiness of foods. Cooking methods were perceived to influence both the healthiness and unhealthiness of foods. Specifically, those that involved the addition of fat were perceived to make foods unhealthy. The quantity of foods was also perceived to influence the healthiness of foods. In particular, participants frequently discussed the importance of quantity in regards to foods that can raise their blood sugars. There were mixed perspectives regarding the ideal frequency and timing of meals. However, there was general agreement that little and often is best in order to stabilise blood sugars. There was also a common perception that a high level of processing was unhealthy, as this was associated with high sugar, high salt and a high glycaemic index. Among the participants there were mixed levels of knowledge and understanding of the glycaemic index and this concept appeared to be quite confusing to some. Finally, the effect of food choices on one’s psychological health was also mentioned as a factor
that can influence the healthiness of foods. Specifically, participants mentioned the importance of balancing enjoyment and health concerns and the need for a break during a restrictive diet.

4.2.6 Theme three: Perceptions of dietary information

Throughout the focus groups participants discussed dietary information that they had received or used. The main source that was mentioned was health professionals, as learning about advice received from health professionals was identified as a key objective of the focus groups. However, other sources were also mentioned. Perceptions of dietary information are discussed below.

**Advice from health professionals**

Participants frequently mentioned advice that they had received from Health Professionals and there were mixed attitudes towards Health Professionals’ advice among the groups.

It was evident that this advice contributed to participant perception of healthy and unhealthy foods, for two reasons. Firstly, the advice that participants mentioned appeared to correlate with their own perceptions. The main advice that participants perceived they had received was to limit fat and sugar intake, concentrate on non-starchy vegetables, avoid fruit juice and fizzy drinks, apply moderation when consuming alcohol and to limit their consumption of fruit.

Secondly, participants often mentioned this advice to justify their own opinions. For example:

“Like fruit, I love fruit and I was told by my dietitian that I’m only allowed one piece at a time and I’m like hell, I was like everyday for me was like six, seven pieces of fruit and I can’t do that no more, cause of the fructose is your sugar. And I’m feeling better as a result”

Participants expressed a range of attitudes towards health professionals. Participants from one focus group in particular expressed more negative attitudes, compared to the other groups. They commented that advice from health professionals is too generic, and that it is fragmented and not provided in a comprehensive way.
“I think when you just take a bite sized approach you’re not getting the whole picture and so education is critical and I don’t know that it’s being done holistically”

Some of these participants also stated that they had lost trust in their health professionals for giving them the wrong information or for not clarifying the consequences of diabetes at an early stage:

“I felt betrayed by the medical people that told me if you do this then you’ll be alright, that’s how I heard it and then later, my GP said, ‘oh no, no matter what you do you’re on a downward slope’ ”

These participants expressed the desire for more regular contact with someone who could provide continuous support:

“It’s not like a consultative, on-going process, which is really what people need”

Some participants mentioned that they had been given a variety of advice, and from a range of health professionals, which was perceived as problematic:

“I’m now going to the diabetes clinic, the doctor, the diabetes nurse specialist and a nutritionist at the hospital, also under the diabetes clinic. So I’ve had a variety of advice given to me...”

However, other participants felt very positive towards the health professionals whose care they were under:

“They actually ring me from time to time, and just check up on how I’m doing and umm you know give me information and I feel quite free to go to them on the phone and so forth”

Many of the participants mentioned advice they had received from their Health Professionals throughout the discussions. In most cases, the advice that participants had received aligned with their own perceptions. However, there were mixed attitudes towards Health Professionals. Some participants reported positive experiences with Health Professionals, whereas other participants felt that the advice they receive is fragmented, variable and not delivered comprehensively.
**Advice from other sources**

Other sources of dietary information that participants mentioned included media such as magazines, television shows, newspapers and books, Diabetes New Zealand, people with diabetes, other people, food labels and cues from their own body. In particular, the Internet was perceived to be a large source of dietary information:

“The number of websites that are around, from the American Medical Association right through to you know anything, the Internet, you can just... so many sources”

When probed about which sources of information were the most trusted, participants gave a variety of answers including their diabetes nurse, their own research and their own intuition:

“I do a lot of research online, because you’ve got that wealth of information there and at the end of the day you go with your gut feeling, no matter what, because you often do read conflicting stories online, you know there’s one doctor saying this and another doctor saying the exact opposite and at the end of the day you say you know well I feel that for me, this is the right thing to do”

Participants mentioned a variety of sources that they receive dietary information from. In comparison to advice received from Health Professionals, these sources were infrequently mentioned throughout the discussions, with the exception of the Internet, which was occasionally mentioned by some participants.

**Summary**

Among the participants there were mixed attitudes towards health professionals as a source of dietary information. The main criticisms were that advice is fragmented, not specific or tailored and not delivered comprehensively. However, by contrast, some participants spoke positively about the health professionals whose care they were under. The main alternative source of dietary information that was discussed by participants was the Internet. Some participants stated that in situations where they are faced with conflicting information, they use a combination of the Internet and their intuition to formulate an opinion.
4.2.7 Theme four: Challenges to forming accurate perceptions

A number of challenges to forming accurate dietary perceptions were identified, or became apparent, throughout the focus group discussions. These challenges include participants’ level of understanding of dietary advice and concepts, conflicting dietary information, difficulty of evaluating the healthiness of certain foods, and the misleading presentation of foods by the food industry. These challenges are discussed below.

Level of understanding

There were mixed levels of knowledge and understanding between the participants. This was evident in part by the differing levels of confidence participants demonstrated in their perceptions about diet and health. Some participants believed they had obtained all the advice possible from their health professionals and that they now require more specific advice:

“I don’t mean to sound arrogant, but I no longer get the answers I need from the nurse, so I think I’ve sort of moved passed the general knowledge, sometimes, and I need actually more specific information”

However, some participants demonstrated some difficulty understanding advice that they had received. The main areas that participants were confused about were the different types of sugars, glycaemic index, and the different types of carbohydrate including complex and processed carbohydrates.

Among the participants there was a range of levels of nutritional knowledge and understanding of key concepts. This was demonstrated through participants’ responses, and through their own identification.

Conflicting information

There was a commonly held view that there is a lot of information available, which is often conflicting. Many participants stated that information from different sources is not consistent, which was perceived to be a challenge.

“But that’s another challenge, conflicting and confusing information that comes at you”

In one focus group, they discussed that information from the same source can also change over time. For one participant, this was concerning:
“I find it disturbing that every year the so-called golden nuggets that we were given aren’t necessarily true anymore”

However, by contrast, another participant replied that it is natural for advice to change and evolve:

“For myself, I think it’s important just to have a very open mind... health research is on-going and it’s organic and it’s going to change.”

For most participants, the variability in dietary information is perceived to be a challenge, as they are left uncertain about what information to believe.

**Difficulty evaluating foods**

Many participants stated that they have difficulty evaluating the healthiness of certain foods. The main examples provided were food in restaurants, fast foods and processed foods.

For fast foods and food in restaurants, the main reasons provided were lack of knowledge of what ingredients and cooking methods are used.

“How often do you eat out now? If you eat out, you taste the food and I feel like all the food are actually quite salty”

Participants from one focus group felt that a lack of information regarding the cooking methods that are used, such as with takeaways, inhibits them from being able to make accurate judgments about the healthiness of such foods.

“You don’t know quite how they are cooked, it’s difficult to make an assessment of the quality of the food, taste is fine, value is fine, but the cooking methods...”

For processed foods, participants said that it takes time to look at the ingredients, you need to know what to look for and that it can be difficult.

Many participants expressed some concerns about the ease of making judgments about foods. This appeared to apply mostly to foods that are packaged or made by someone else.
Marketing claims and the food industry

Another challenge that was identified by the participants was the presentation of foods by the food industry:

“[The thing] I struggle with is the industry presenting foods to us in a certain way”

Many participants felt that the food industry uses techniques, such as health claims, to influence people’s perceptions of the healthiness of their products. Many participants felt that the food industry uses certain terms in order to lead consumers into believing their products are healthy, or healthier, when in reality they are not. In particular, participants were dubious of health claims such as ‘organic’, ‘light’ and the Heart Foundation’s Heart Tick:

“You get the advertising industry playing all types of cards like ‘light cream’ and things like that, when in actual fact, if you read it, it’s not much more healthy for you than ordinary cream and that sort of thing”

Skepticism of the Heart Tick was partly due to the commonly held perception that low-fat foods are subsequently high in sugar:

“Little did I realise that the heart tick stuff they take the fat out and load it with sugar”

A few participants stated that they would like a more standardised system for guiding people to choose healthy foods.

Many participants stated that marketing techniques, such as health claims, are a barrier to making accurate judgments regarding the healthiness of food products.

“To me there’s just too many people playing games in the food industry and they’re just trying to convince you that what they are selling is good for you and umm… you know there’s not just a standard terminology that can be applied across the board… it’s just very hard, I mean even if you’re looking at the information on the side of the packet it’s very difficult unless you actually know what you’re looking for”
Summary

Whilst discussing perceptions of the healthiness of foods, a number of challenges to forming accurate perceptions were identified or became apparent. Among the participants there were mixed levels of knowledge and understanding of dietary information, which were either demonstrated or self-identified by the participants. Having a high level of understanding was perceived to be problematic as some participants felt that it is hard to obtain more specific, more tailored information. By contrast, having a low level of understanding of key concepts also appeared to be challenging to some participants. Another common challenge that was identified was the amount of conflicting information between sources and within sources over time. Participants also discussed their perceived difficulty of evaluating certain foods, such as takeaways, food in restaurants and processed foods, and they were dubious of the food industry for using health claims to mislead people’s perceptions regarding the healthiness of their products.

4.2.8 Summary of focus group themes

The four themes are linked to the primary topic of the focus groups – perceptions of healthy and unhealthy foods. The relationship between these themes and perceptions of healthy and unhealthy foods are shown in figure 10.

Figure 10: Relationship between focus group themes and perceptions of healthy and unhealthy foods

The inner box represents the primary topic of the focus groups. The surrounding boxes represent the four themes that were identified. The solid lines show direct links between themes and the research topic, and the dashed lines show indirect links between themes and the research topic. A + indicates a potential positive influence. A - indicates a potential negative influence.
The four key themes are directly related to perceptions of foods. Dietary information, food components and other factors that influence the healthiness of foods all influence perceptions of healthy and unhealthy foods and challenges influence the confidence in these perceptions. Furthermore, sources of information influence perceptions of food components and other factors, and may reduce or increase challenges to forming perceptions. Perceptions of food components may also influence perceptions of other factors, such as cooking methods.
5. Discussion

Dietary management is a primary undertaking for people with type 2 diabetes, hence the precision with which people with type 2 diabetes perceive their food intake is important. Perception of the healthiness of foods is influenced by a range of factors, and is a significant determinant of dietary behaviours (Nestle, Wing et al. 1998). Until now, these perceptions have been relatively unexplored in people with type 2 diabetes. In the present study, a mixed-methods approach explored multiple dimensions of dietary perception relevant to the target population’s health outcomes.

Previous literature suggests misperception of one’s dietary intake is common for a range of foods and food components (Brug, van Assema et al. 1994, Basiotis, Lino et al. 2002, Yong, Zalilah et al. 2009). It has also been observed that misperception of some foods is higher in people with type 2 diabetes compared to the general population (Jansink, Braspenninck et al. 2012). Those who have an inaccurate perception of their intake are less likely to intend to improve their dietary behaviours. Therefore, misperception of dietary intake can be a significant barrier to dietary changes and the improvement of health outcomes. This is particularly important for people with type 2 diabetes, given the importance of dietary management in the treatment of this condition.

In this study, participants’ perceptions of the healthiness of foods were consistent with dietary guidelines with the exceptions of fruit, starchy vegetables, pasta, cereals, cheese, margarine, artificial sweeteners and diet soft drinks. Participants’ estimated intakes were significantly different compared to their actual intake of grains, fruit, dried fruit, scones, pikelets, sweet buns and cheese puffs, pies, pastries and savouries, and biscuits and crackers.

5.1 Food components
A major finding that emerged from the focus group analysis was the strong emphasis that participants placed on the macronutrient composition of foods. In particular, there was a strong focus on the content of carbohydrate, sugar and fat. This was a common theme across all three focus groups and it was evident that for many participants this was more important than the actual food itself. These perceptions
were the result of two major concerns including the glycaemic-raising potential and the weight-promoting effects of foods. The glycaemic-raising effect of foods was the most frequently cited reason to justify the perceived unhealthiness of a food, followed by the weight-promoting effect of foods high in fat.

Achieving glycaemic control is the top priority of nutritional care provided to people with diabetes (Diabetes NZ 2015), which provides reason for the large focus participants place on the glycaemic properties of foods. This focus on the carbohydrate content of foods has been observed in other diabetic populations including youth with type 1 diabetes (Gellar, Schrader et al. 2007, Mehta, Haynie et al. 2009) and Asian and Pacific Island people living with type 2 diabetes in Hawaii (Braginsky, Inouye et al. 2011). Despite the focus on the carbohydrate content of foods, participants were less concerned about the type of carbohydrate. Fibre was seldom mentioned by the participants in this study, despite being an important influence on the glycaemic potential of foods.

Foods that are marketed to be good for diabetes (i.e foods with a very low carbohydrate content) such as sugar-free baked products, often have poor nutrient quality leading to skewed perceptions when considering a whole of diet approach to health (Gellar, Schrader et al. 2007). Contrarily, the impetus placed on carbohydrate content can lead to the avoidance of foods promoted in dietary guidelines, such as fruit (Mehta, Haynie et al. 2009). Furthermore, the difficulty of evaluating the carbohydrate content and glycaemic-raising potential of some whole foods, such as whole grains and legumes, can lead to the preference of pre-packaged processed foods, as has been observed among youth with type 1 diabetes and their parents (Mehta, Haynie et al. 2009). It is plausible, through this strong focus on carbohydrate content, people with diabetes may have compromised perceptions of some aspects of healthy eating, when compared to the general population.

The findings from the quantitative arm of this study are also consistent with the concept that people with diabetes have increased concerns regarding the carbohydrate content of foods. Nutrient analysis of the seven-day food diaries demonstrated that participants’ mean energy intake from carbohydrate (43%) was below the Acceptable Macronutrient Distribution Range (AMDR) of 45-65% (Capra 2006). The
macronutrient distribution of participants’ diets was compared with the AMDR for the general New Zealand population as there is currently no AMDR specific to people with type 2 diabetes. The contribution of carbohydrate to participants’ diets was also lower than the mean contribution of carbohydrate to energy in New Zealand males (46%) and females (47%). A lower carbohydrate intake has further been observed in people with diabetes allocated to a conventional diabetes diet compared to their baseline diet (Turner-McGrievy, Barnard et al. 2008).

In this study, the deficit in energy from carbohydrate was compensated for largely by a higher proportion of fat as a percentage of energy intake (39%), compared with the AMDR of 20-35% (Capra 2006). Furthermore, participants’ energy intake from saturated fat (15%) also significantly exceeded the AMDR of <10% from saturated and trans fat combined (Capra 2006). Increased energy intake from saturated fat increases the risk of cardiovascular complications, which is already a concern in this population as type 2 diabetes is a predisposing factor for cardiovascular diseases (Rana, Liu et al. 2015).

Although the main concern among the focus group participants was the glycaemic-raising effect of foods, they did also express concerns regarding fat content, the main issue being weight-promoting effects. Participants acknowledged that there are sources of ‘healthy’ and ‘unhealthy’ fats including olive oil, nuts and avocado oil, however all fats were perceived to be fattening. One participant stated that the healthy fats are mono- and poly-unsaturated fats, and the unhealthy fats are saturated and trans fats. Public health recommendations differentiate between saturated and unsaturated fats, however the current overall message is to lower total fat consumption (Ministry of Health 2003).

Although fat was perceived to be unhealthy, dietary analysis of the seven-day food diaries suggests the fat intake of people with type 2 diabetes is higher than both the population average, and what is recommended. This finding suggests that their greater importance is placed on the carbohydrate content of foods. Although glycemic management is the primary focus of dietary advice for people with type 2 diabetes, it is important that other nutritional qualities of foods, such as the fat, saturated fat, salt, fibre, vitamin and mineral contents, are also managed. A replacement of
carbohydrates with fat (including saturated fat) may improve glycaemic control in the short-term but increases risk of cardiovascular diseases in an already vulnerable population. Clear guidelines are required for people with type 2 diabetes to better manage both these macronutrients.

Participants’ emphasis on food components, in particular the carbohydrate content, may have been influenced by the way dietary guidelines are structured. For example, Diabetes NZ guidelines (2014) are broken into sections by food, with its’ predominant macronutrient group preceding the name of the food. This emphasis on the macronutrient composition may influence the way people assess foods – prioritising the carbohydrate content before the actual food source.

5.2 Other perceptions

The participants identified a number of additional factors that influence their perceptions of healthy and unhealthy foods. These factors comprised cooking methods, the frequency and timing of meals, level of processing and the glycaemic index.

For cooking methods, the focus was on lowering fat intake by using cooking techniques that didn’t require the addition of fat, such as boiling and grilling. There were variations in perceptions of the ideal frequency and timing of meals, likely due to differences in advice they had received, dependent on their condition progression, and medications they take. Ultimately, the commonly held belief among participants was that little and often is best. The main reason provided was to keep blood sugar levels stable. Uncertainty regarding the optimal frequency and timing of meals may reflect a lack of guidance in this area in dietary guidelines (Diabetes NZ 2014).

There was also a commonly held perception that highly processed foods are particularly unhealthy. Again, the glycaemic-raising potential of such foods was the primary concern. Many participants were confused by the glycaemic index concept. Although some participants reported that they use the glycaemic index as a tool for making healthy food choices, many were unsure what score was optimal. Due to the complexity of this concept, the glycaemic index is often not included in dietary
guidelines. Similarly, participants were further confused by terms including complex carbohydrates and the names of sugars.

In order for dietary guidelines to be easy to comprehend, scientific language such as the names of sugars and concepts such as glycaemic index, should be avoided (CDC 2009). The health literacy of the target audience is an important consideration with poor health literacy being associated with poorer diabetes control (Boren 2009). Consequently, dietary messages should be easy to understand in order to reach this high-risk group. More tailored dietary information should be provided through one-on-one consultations with health professionals, dependent on the patient’s level of health literacy. The focus of such advice should be practical and focused on whole foods, opposed to scientific concepts such as the glycaemic index.

Participants also acknowledged that there are other factors that they consider aside from the nutrient quality of foods when making food choices. In particular, the psychological effect of going without certain foods, the desire for a break from perceived healthy eating, and the enjoyment of foods that are not perceived to be healthy were all identified as factors that influence their food choices.

It is critical that all aspects of health and wellbeing are considered in the delivery of health care including social, economical, spiritual, physical and psychological wellbeing (Walker, Gebregziabher et al. 2014). Health professionals must be able to engage with their patients to learn about various aspects of their life to provide tailored advice, which not only considers their physical health, but their whole wellbeing.

5.3 Quantity and portion control
Quantity was frequently mentioned as an important factor that influences the healthiness of foods. Specifically, large quantities of carbohydrate-containing foods were perceived to be problematic. Some of the participants reported using portion control techniques such as using smaller plates, sharing food with others and using household measurements such as cups, whilst others relied on their intuition. Although all of the participants acknowledged that quantity is an important factor, increasing their ability to apply portion control may be necessary.
It is essential that practical guidance for controlling portion-sizes is provided to those seeking to manage their weight and achieve glycaemic control. Clear language, articulating appropriate quantities should be adopted in guidelines to replace generic wording such as ‘not too much’. Furthermore, visual tools should be developed for health professionals to communicate with their patients about applying portion control.

Having an accurate perception of the amounts of foods that one actually eats is also important for dietary compliance. Accurate estimations of the intake of foods that have a significant glycemic-raising effect is particularly important for people with type 2 diabetes seeking to achieve glycaemic control. Findings from the quantitative arm of this study showed that many people had trouble estimating their usual intake of a number of common carbohydrate-containing foods. Participants’ perceived intakes of grains, fruit, dried fruit, scones, pikelets, sweet buns and cheese puffs, pies, pastries and savouries and biscuits and crackers were significantly different to their actual intakes of these foods.

These findings have significant implications on the communication between health professionals and their patients. Inaccuracies in perceived intakes compromise the accuracy of dietary behaviours that are communicated to health professionals, resulting in potentially less effective dietary guidance. In order to reach a large and varied target population, dietary guidelines are generic and are consequently dependent on the interpretation of the user. Recommendations such as ‘eat some but not too much’ may therefore be interpreted with ambiguity. Given the different dietary requirements of individuals, health professionals require the capacity to deliver specific dietary advice through one on one consultation. Understanding that patients’ perceived intake can vary from their actual intake is the first step in this process.

There was variation in the size of the discrepancy between actual and perceived intakes for different food groups. The limits of agreement demonstrated in the Bland-Altman plots illustrate the amount of variation of these discrepancies. For some foods the variation in discrepancies was small such as for rice, grains, noodles, cakes,
cereals and a number of drinks. By contrast, the variation in discrepancies between actual and perceived intake of foods such as bread, biscuits, potatoes, other root vegetables and chocolate was far greater.

Other studies have similarly observed that accuracy of estimating portion sizes differs by food type. Specifically, greater accuracy has been reported for foods that are more commonly consumed and are lighter in weight (Gittelsohn, Shankar et al. 1994). Solid foods such as meat and fish have been estimated with greater accuracy compared to liquid foods such as milk and soup, which were estimated with greater accuracy than amorphous foods with poorly defined dimensions such as spaghetti and apple sauce (Yuhas, Bolland et al. 1989).

In this study, the foods with which there was the least variation in discrepancies between actual and perceived intakes were those that are generally consumed in a smaller range of servings such as one bowl of cereal or one cup of rice, opposed to multiple pieces of chocolate or lollies. In contrast to previous studies, no patterns were observed between solid, liquid and amorphous foods, or by weight. Taken together, these findings suggest that the accuracy of perceived intake may differ depending on food characteristics such as weight, food type and texture, and frequency consumed.

5.4 Misperceptions of foods in relation to guidelines and inaccurate estimations of intake

Participant perception of foods that are clearly recommended such as non-starchy vegetables, or clearly not recommended such as fizzy drinks and fruit juices, were largely consistent with dietary guidelines. However, for some foods there were either mixed perceptions among the participants or the commonly held perception among the group ran contrary to these guidelines. Such perceptions were generally of foods that are recommended in moderation such as fruit, dried fruit and foods high in carbohydrate such as starchy vegetables, cereals and pasta. Advising people to restrict the amount they eat of a given food may compromise their perception of this food. For instance, ‘eat some but not too much’ may be interpreted as ‘the less the better’, or ‘preferably none’. Many studies have shown that people tend to dichotomise foods as either good or bad (Oakes 2005). Therefore, the idea that a food can be healthy, yet it should be consumed in moderation, may be hard for some people to comprehend. Extra care should be taken to explain the guidelines for foods that are advised in
moderation and more prescriptive advice pertaining to the recommended quantities of foods should be tailored and provided to patients.

The participants in the quantitative arm of this study had falsely optimistic perceptions of their intake of fruit, dried fruit, and pies, pastries and savouries. Such misperceptions are a potential barrier to improving their intake of these foods. Participants perceived they ate 6.0 (3.2 – 8.8) servings more of fruit, 1.4 (0.4 – 2.4) servings more of dried fruit and -2.3 (-3.8 – -0.8) servings less of pies, pastries and savouries, compared to their actual intake, per week. These findings are typical of a phenomenon referred to as the optimistic bias in which people have an optimistic perception of their dietary intake (Miles and Scaife 2003).

Falsely optimistic perceptions of fruit and fat intake have been observed in other populations. People tend to overestimate their consumption of perceived healthy foods such as fruit and vegetables (Lechner, Brug et al. 1997, Basiotis, Lino et al. 2002, Bogers, Brug et al. 2004, Jansink, Braspenninig et al. 2012) and underestimate their intake of perceived unhealthy foods and food components such as fat (Brug, van Assema et al. 1994, Basiotis, Lino et al. 2002, Yong, Zalilah et al. 2009, Jansink, Braspenninig et al. 2012), oils and sweets (Basiotis, Lino et al. 2002).

Optimistic bias may be the result of incorrect information or the need to protect one’s self-esteem or to avoid feeling afraid of potential consequences (Weinstein 1988). Weinstein’s ‘Precaution Adoption Process’ suggests there are three stages people must go through before they will be willing to engage in a change of behavior (Weinstein 1988). These stages include that people must learn that the hazard exists (stage 1), they must be convinced that the risk is significant (stage 2), and they must accept they are personally susceptible to this risk (stage 3).

Enabling patients to be more aware of their intake and how it impacts their health status is a crucial first step in a dietary management plan. This is critical for improving the communication between people with type 2 diabetes and health professionals, improving the appropriateness of advice provided and increasing the likeliness that beneficial changes in dietary behavior will be adopted.
5.5 Challenges (food industry and conflicting information)

A major challenge reported in the focus groups was the difficulty of evaluating certain foods. In particular, the use of misleading terms by the food industry was identified as a barrier to evaluating the healthiness of packaged food products. Participants expressed little trust in the food industry. The commonly held belief was that the food industry uses untruthful claims and conniving techniques to sell their products. Although many participants were aware of the use of misleading marketing terms such as ‘light’, ‘organic’ and ‘low-fat’, they expressed the desire for a more standardised labeling system. Further education around making educated food choices could be extremely valuable for those who feel they are lacking skills and knowledge in this area. At a regulatory level, the consideration of policies that regulate or standardise marketing techniques on food products, and a mandatory front of pack food labeling system would better support an environment that enables consumers to make better-informed food choices.

Another major challenge faced by the participants in this study was the perceived variability in dietary messages, both between sources and from individual sources over time. Many participants were frustrated that they had received different advice from multiple sources and they expressed the desire for more consistent and tailored information. These attitudes have also been observed in adults at risk of type 2 diabetes (Fukuoka, Lindgren et al. 2014). Among such adults, negative attitudes towards health professionals primarily came down to a lack of trust. Similar to the current study, one of the main reasons that contributed to a lack of trust in health professionals’ advice was the belief that they receive conflicting messages. Future research should look into what sources of information people living with type 2 diabetes use, and the consistency between these sources.

5.6 Strengths

The mixed-method approach used in this study was a major strength as the two methods complemented each other and provided more comprehensive insight into multiple dimensions of dietary perceptions.

The dietary assessment method used to measure participants’ dietary intake was seven-day food diaries. As with any form of self-reporting, it is impossible to determine people’s “true intake”. However, food diaries are regarded as the current
gold standard in dietary assessment. Therefore, it is expected that the data collected in this study are of the highest level of accuracy achieved by self-reported methods.

Another strength of this study was the study design. Participants’ perceived intakes were recorded one month following the completion of the seven-day food diaries, allowing sufficient time between measures so that the activity of filling out the seven-day records would not influence participants’ perceived intake. Although some seasonal variation of food intake could be expected, the foods assessed in this study are typically consumed all year round.

Finally, given dietary perceptions in people with type 2 diabetes are relatively unexplored, the use of focus groups was an appropriate choice of method. The focus groups allowed for new ideas to evolve rather than being constricted by the Candidate’s preconceived ideas. Furthermore, the nature of focus groups also allowed probing and elaboration of particular areas of interest to this research.

5.7 Weaknesses
The weaknesses of this study include the generalisability of results, sample size, and possibility of under-reporting.

Firstly, all participants in this study were city-living volunteers, who may differ in healthcare experience compared to other New Zealand populations such as those living in rural communities. The majority of participants were non-smoking adults of European descent living in either Wellington or Dunedin. These samples were not representative of a range of ethnicities that are prevalent in New Zealand including Māori, Pacific Island and Asian people. Although it is acknowledged that the findings from this study cannot be extrapolated with certainty beyond the participating sample, it is possible that the results are at least indicative of the perceptions of a wider population of people with type 2 diabetes living in New Zealand. Further research considering the inaccuracies of perceived intakes identified in this study should be considered in broader, more representative populations living in New Zealand.

Another potential weakness of this study is the small sample sizes. Consistent with suggested focus group sizes (Krueger and Casey 2009), five participants were recruited into each of the three focus groups. However, in the event, four of the five
people recruited attended the second group and three people attended the third group. Although the smaller than intended sample size did not appear to limit the discussions in either of these groups, it is acknowledged that a larger sample size could have generated a greater range of perspectives.

The sample size of the quantitative arm of the study was also relatively small and may not have been large enough to detect differences between actual and perceived intakes for some food groups. However, the results from this study are consistent with those of similar studies (Lechner, Brug et al. 1997, Bogers, Brug et al. 2004, Van Rossum, Fransen et al. 2011).

Finally, it is probable that there was a higher degree of under-reporting in this population than the general population. Type 2 diabetes is associated with increased body weight (Ministry of Health 2014) and a higher prevalence of under-reporting has been observed in overweight and obese people (Schoeller, Bandini et al. 1990). However, it has been suggested that under-reporting in overweight subjects is not solely intentional, but also due to inaccurate perceptions of their dietary intake (Lichtman, Pisarska et al. 1992). If inaccurate perceptions of one’s dietary intake were to also affect the more objective measure used in this study (food diaries), then the difference between perceived and actual intakes may have been underestimated. Consequently, the findings presented in this study may be a conservative representation of the extent of misperceptions in people with type 2 diabetes.

5.8 Recommendations for Future Research

There is limited research on dietary perceptions in people with type 2 diabetes living in New Zealand. Future research should look into the factors that influence this population’s perception of the healthiness of foods, the sources that they rely on, the consistency of messages between these sources and strategic ways to influence people’s perceptions so that they are in better alignment with current guidelines. Previous research has highlighted the consequences of misperception of one’s intake; those that have poor awareness of their intake are less likely to intend to change their current dietary behaviours. The current study suggests some people with type 2 diabetes living in New Zealand have poor awareness of their dietary intake of some foods, as has also been observed in other populations. Future research should
investigate ways to improve people’s awareness of their intake and the consequences of these changes.
6. Conclusion

Perceptions are a significant influence on behavior. Consequently, the way people view different foods, and food components, directly affects their dietary choices and habits. In this study there was a strong focus on the macronutrient composition of foods, which was perceived to be more important than the actual food source. The impetus placed on the carbohydrate content compromised participants’ perception of some foods.

Having the perception that one’s dietary intake is better than their actual intake is another identified barrier to behavior change. If people believe that they are already meeting dietary guidelines, or practicing the advice they receive from health professionals, then they are unlikely to believe they need to change their current dietary behaviours. The results from this study confirm that misperception of dietary intake occurs in people with type 2 diabetes. Increasing awareness of patient’s intake must be a preliminary step in dietary management plans.

In order to eliminate some of the misperceptions observed in this study, dietary guidelines must be reconfigured with added specificity. The aim of dietary guidance must be to highlight foods as more than their primary macronutrient, take a whole of diet approach, and be more prescriptive around foods that are advised in moderation.

Evidently, a larger systems change towards creating an environment that is more conducive to better-informed dietary choices is required. Stricter regulation of the labeling of food products is essential to enable consumers to take control of their dietary choices, and consequently their risk, or management, of life-style related conditions such as type 2 diabetes. To complement these environmental changes, trusted health professionals that are comprehensively trained in providing tailored nutritional guidance and that are aware of the differences in perceived and actual intakes of their patients, are required to cement change at a personal level.
7. References


Diabetes NZ (2015). Nutritional Management of Type 2 Diabetes Mellitus. Guideline: Standard of Care for the Nutritional Management of Type 2 Diabetes Mellitus in Adults, Dietitians NZ.


8. Appendices

Appendix A: Ethical approval (actual versus perceived intakes)

Dear Dr Venn,

I am again writing to you concerning your proposal entitled "Impact of postprandial walking on glycaemic variability in people with type 2 diabetes", Ethics Committee reference number H13/039.

Thank you for your e-mail of 29th July 2013 addressing the issues raised by the Committee.

The Committee is grateful for the amendments you have made to the Consent Form and Information Sheet including: i) ensuring that the time limit for data storage has been standardised and ii) that the retention of samples is now also included on both forms.

The Committee also appreciates the acknowledgement that any future research using human tissue from this study would need separate approval.

On the basis of this response, I am pleased to confirm that the proposal now has full ethical approval to proceed.

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.

Dr B Venn
Department of Human Nutrition
Division of Sciences

29 July 2013
Appendix B: Example of Kai-culator food diary data entries

A total of 80 seven-day food diaries and 34 four-day food diaries were entered into the food and nutrient database Kai-culator, representing 696 days of food diary entries. Twenty-four of the seven-day diaries were recorded a month before the intake perception tool was applied, enabling their use in the quantitative arm of this study. Below is an example of a food diary entered into Kai-culator.
Appendix C: Application for ethical approval (focus groups)

UNIVERSITY OF OTAGO HUMAN ETHICS COMMITTEE
APPLICATION FORM: CATEGORY A

Form updated: May 2014
Please ensure you are using the latest application form template available from: http://www.otago.ac.nz/council-committees-committees/HumanEthicsCommittees.htm! and read the instruction documents provided (Guidelines for Ethical Practices in Teaching and Research and Filling Out Your Human Ethics Application).

1. University of Otago staff member responsible for project:
   Surname  First Name  Title
   Venn      Bernard    (Dr)

2. Department/School:
   Department of Human Nutrition

3. Contact details of staff member responsible (always include your email address):
   Ph. 03 479 5068
   E: bernard.venn@otago.ac.nz

4. Title of project:
   Dietary knowledge and perceptions among people with pre-diabetes and type 2 diabetes

6. Indicate project type and names of other investigators and students:

   Student Researchers
   Names: Andrew Reynolds, PhD
          Hannah Lawrence, MSc

   Level of Study (PhD, Masters, Hons):
6. Is this a repeated class teaching activity?  
   NO

7. Fast-Track procedure  
   NO

8. When will recruitment and data collection commence?  
   October 2014

   When will data collection be completed?  
   March 2015

9. Funding of project  
   Is the project to be funded by an external grant?  
   NO

   If commercial use will be made of the data, will potential participants be made aware of this before they agree to participate? If not, explain:  
   No commercial use is envisaged.

10. Brief description in lay terms of the purpose of the project (approx. 75 words):  
    To explore dietary knowledge and perceptions among people with pre-diabetes and type 2 diabetes. Given the integral nature of appropriate food choice in type 2 management, we seek to ascertain the baseline level of knowledge regarding dietary advice that is specific to type 2 diabetes, understand the perceptions of ‘healthy’ and ‘unhealthy’ foods and investigate how these perceptions influence the food choices and dietary behaviours among people with type 2 diabetes.

11. Aim and description of project (include the research questions the project intends to answer, and the overall implications and benefits of the research):  
    Primary aim:  
    To explore perceptions related to ‘healthy’ and ‘unhealthy’ foods among people with pre-diabetes and type 2 diabetes

    Description of project:  
    Research questions:  
    - What is the baseline level of knowledge of dietary guidelines among people with pre-diabetes and type 2 diabetes?  
    - How do people with pre-diabetes and type 2 diabetes perceive ‘healthy’ and ‘unhealthy’ foods?  
    - How do perceptions of foods ‘healthiness’ influence dietary behaviours among people with pre-diabetes and type 2 diabetes?

    We will attempt to answer the research questions through facilitated discussion in the form of two separate focus groups.
Implications:
The self-management of type 2 diabetes is heavily reliant on an individual’s compliance with dietary guidelines. Recent evidence suggests that knowledge of dietary guidelines is insufficient for changes in dietary behaviour among adults at risk of type 2 diabetes. Rather, there are a number of factors that influence dietary behaviour including socio-political, economic and perceptual factors (Fukuoka Y et al. The diabetes Educator 2014 40: 308).

It has become apparent that an individual’s perception of the healthiness of foods influences their attitudes and behaviours associated with these foods. For example, people are more likely to underestimate the caloric content (Carels R et al. Appetite 2006;46:199-206) and consume larger amounts of a food that is perceived as ‘healthy’ (Provencher V et al. Appetite 2009;52:340-344). Consequently, inaccurate perceptions of foods ‘healthiness’ may contribute to dietary behaviours that are inconsistent with current dietary guidelines with negative impact on type 2 management.

As a result of our research we hope to gain a greater understanding of the perceptions and misperceptions of ‘healthy’ and ‘unhealthy’ foods among people with pre-diabetes and type 2 diabetes. Understanding how people with type 2 diabetes perceive the ‘healthiness’ of foods will be helpful for the effective development and delivery of nutrition guidelines that are relevant and meaningful to this target population.

12. Researcher/instructor experience and qualifications in this research area (include information regarding the principal investigator (or supervisor), co-investigators and students (if relevant) involved with the project):
Dr Venn has a PhD in Human Nutrition from the University of Otago. He is currently a senior lecturer and researcher with the Department of Human Nutrition. Dr Venn researches in the areas of carbohydrates as they relate to chronic disease prevention and treatment; glycaemic index, glycaemic load, and satiety of foods. He conducts research on carbohydrates and dietary fibre. Dr Venn is interested in carbohydrate metabolism in various population groups including youth, the elderly, those with diabetes and people of different ethnicity. He is currently conducting research using continuous glucose monitors in people with type 2 diabetes and in the general population.

Mr Andrew Reynolds is undertaking a PhD entitled ‘Glycaemic Regulation in Pre-Diabetes and Type 2 Diabetes’, supervised by Dr Bernard Venn and Professor Jim Mann. His research looks at how best to identify certain parameters of type 2 diabetes, changes in glycaemic regulation due to diet and physical activity interventions, and population diet and physical activity advice that is understood, achievable, and implemented.

13. Participants
13(a) Population from which participants are drawn:
People in the Wellington community diagnosed with pre-diabetes or type 2 diabetes

13(b) Inclusion and exclusion criteria:
Inclusion: Adults aged 21–75 with a diagnosis of pre-diabetes or type 2 diabetes that speak English fluently

Exclusion: Severe speech or hearing problems

13(c) Estimated number of participants:
We would like to run two focus groups with 8-12 participants per group. This number is in accordance with the recommendations provided by Stewart D et al. (Focus Groups SAGE Publications, Ltd). Fewer participants could result in the conversation being dominated by one or two participants, whereas a greater number of participants could reduce the inclusive nature of a focus group.

13(d) Age range of participants:
Aged 21 – 75 y

13(e) Method of recruitment:
The subjects will be recruited via convenience sampling. We will promote our project through flyers and through agencies whose services are accessed by those with pre-diabetes or type 2 diabetes. The flyers will be posted on notice boards in community centres, universities, and medical centres. We seek to work in consultation with Diabetes Wellington and to promote our project through their organisation.

13(f) Specify and justify any payment or reward to be offered
(Refer to 13f of the Filling In Your Application document):
There will be no monetary payment or reward for participating in the project. Participants will be offered an optional, free half-hour nutrition consultation, which may be redeemed once they have participated in the project.

14. Methods and Procedures: (Describe the design of the study and detail what participants will be asked to do. Provide the Committee with a copy of the interview questions to be asked of participants, or a general outline if the questions are not yet available.)
Interested participants will be screened to ensure they fit the inclusion and exclusion criteria, when they first make contact with the researcher.

Eligible participants will be invited to take part in one of two focus groups. The focus groups will be designed and conducted in accordance with the recommendations by Stewart et al (2007). Each focus group will be no longer than 1.5 hours and they will be held in a safe and comforting environment. The student researcher will be the sole facilitator and the session will be audio-recorded.

Upon arrival, participants will be asked to provide written informed consent and fill out a short questionnaire about their demographics, duration of diabetes, medications and baseline knowledge of nutrition and diabetes.

The facilitator will use an interviewer guide to conduct the sessions. The interviewer guide will include the facilitator’s introduction, a warm up exercise so that participants can get acquainted, and up to 12 questions for discussion.
To ensure the subjects feel comfortable the facilitator will start with a friendly introduction which will cover an introduction of herself, provide a brief outline of the session, outline the rules and structure of the focus group, inform participants that they are not obliged to answer all questions, inform participants that they are being recorded and inform them that any information pertaining to the subjects identity will be handled in a confidential manner.

The focus group questions will be arranged in a logical order, with the most important questions towards the beginning. The questions will be relatively open-ended and designed to probe discussion and avoid wording that is suggestive of a ‘correct’ answer. The facilitator will try to allow the participants to speak freely, whilst ensuring the discussion moves at an appropriate pace and finishes on time. The facilitator may also use discussion aids, such as sentence completion exercises and brainstorming on a whiteboard.

Throughout the session, the participants will be encouraged to actively contribute in the discussion.

At the end of the session, the facilitator will inform subjects of the purpose of the focus groups and the participants will be thanked for giving up their time to participate in the session.

The audio recordings will be used to develop a transcript of the session, in which the subjects will be unidentifiable.

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. The questions below allow the Committee to assess compliance.

15(a) Are you collecting and storing personal information (e.g. name, contact details, designation, position etc) directly from the individual concerned that could identify the individual? (Delete the answer that does not apply.)
   YES

15(b) Are you collecting information about individuals from another source?
   NO

15(c) Collecting Personal Information (Delete the answer that does not apply):
   Will you be collecting personal information (e.g. name, contact details, position, company, anything that could identify the individual)?
   YES

   Will you inform participants of the purpose for which you are collecting the information and the uses you propose to make of it?
   YES

   Will you inform participants of who will receive the information?
   YES

   Will you inform participants of the consequences, if any, of not supplying the information?
   YES
Will you inform participants of their rights of access to and correction of personal information?
YES

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

15(d) Outline your data storage, security procedures and length of time data will be kept (Mark Borrie, ITS Security Manager, can provide data security and storage options in particular while in the field):
The information will remain confidential to the study investigators. Paper copies will be kept in a lockable office and electronic data stored on departmental computers. The results of this study may be published but no individual's identity will be revealed. At the end of the project any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed.

15(e) Who will have access to personal information, under what conditions, and subject to what safeguards? If you are obtaining information from another source, include details of how this will be accessed and include written permission if appropriate. Will participants have access to the information they have provided?
Only Dr Bernard Venn will have permanent access to the personal information. Paper copies will be stored in Dr Venn's University of Otago office and any information transferred into digital form will be stored on Dr Venn's University computer. At the completion of data entry, the student will be asked to transfer the electronic file of personal details to Dr Bernard Venn and to delete the file from the student computer. The statistician will be given anonymous data.

15(f) Do you intend to publish any personal information they have provided?
NO

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 will you, undertake Māori consultation? Choose one of the options below, and delete the option that does not apply:
(Refer to http://www.otago.ac.nz/research/consultation/index.html).
YES We have ALREADY undertaken consultation.

16. Does the research or teaching project involve any form of deception?
NO

17. Disclose and discuss any potential problems or ethical considerations: The aim of the focus group is to generate group discussion on non-personal themes. If people do start to discuss personal issues, in the first instance the focus group facilitator will direct the discussion back on topic. In the unlikely event that someone becomes upset, the focus group discussion will be terminated and the facilitator will talk to that person in private.
Appendix D: Ethical approval (focus groups)

Dr B Venn
Department of Human Nutrition
Division of Sciences

29 September 2014

Dear Dr Venn,

I am again writing to you concerning your proposal entitled “Dietary knowledge and perceptions among people with pre-diabetes and type 2 diabetes”, Ethics Committee reference number 14/165.

Thank you for your email of 26 September 2014 which responded to the Committee and provided your revised documentation. Thank you for revising the exclusion criteria in the Information Sheet and for providing your list of references. We note your response that you are not expecting the focus groups to involve disclosing personal information, but that you have made plans in case a participant becomes upset during discussion.

On the basis of this response, I am pleased to confirm that the proposal now has full ethical approval to proceed.

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

cc Professor S Samman  Department of Human Nutrition
Appendix E: Confirmation of Māori consultation

Dietary knowledge and perceptions among people with pre-diabetes and type 2 diabetes

Principal Investigator 1
Name: Dr Bernadette Vena
Department: Department of Human Nutrition
Campus: DUNedin
Email: bernadette.vena@otago.ac.nz
Telephone: Not Supplied

Principal Investigator 2
Name: Man Harman Lawrence
Department: Department of Human Nutrition
Campus: DUNedin
Email: lawrence.man@otago.ac.nz
Telephone: Not Supplied

Principal Investigator 3
Name: Mrs Angela Smith
Department: Department of Human Nutrition
Campus: DUNedin
Email: angela.smith@otago.ac.nz
Telephone: Not Supplied

Is this Otago District Health Board research?
Yes

Does this research involve human participants?
Yes

Description in lay terms of the proposed research
To explore dietary knowledge and perceptions among people with pre-diabetes and type 2 diabetes. Given the integral nature of appropriate food choice in type 2 management, we seek to determine the baseline level of knowledge regarding dietary advice that is specific to Type 2 diabetes. Understand the perceptions of ‘healthy’ and ‘unhealthy’ foods and to investigate how these perceptions influence the food choices and dietary behaviours among people with pre-diabetes and type 2 diabetics.

Description in lay terms of the potential outcomes of the area of research
Our aim is to explore perceptions related to ‘healthy’ and ‘unhealthy’ foods among people with pre-diabetes and type 2 diabetes. Gathering this information will help inform diabetes nutrition education about gaps in nutrition education and barriers to achieving healthy diets.

Potential areas that are of interest to or of concern for Māori
Pre-diabetes and type 2 diabetes affects all ethnic groups in New Zealand. We are interested in engaging Māori participants into our focus groups to broaden our understanding of gaps in nutrition education.

Collaboration in this area of research
We will be approaching Diabetes Wellington for assistance with recruitment.

Potential funding bodies
These are focus group sessions that do not require funding.

Location
Wellington

Other relevant information

Relevance Score

References

Appendix F: Information sheet provided to focus group participants

Dietary Knowledge and Perceptions Among People with Pre-Diabetes and Type 2 Diabetes

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?
The aim of the project is to identify what nutritional advice people with pre-diabetes and type 2 diabetes have received and to explore perceptions of ‘healthy’ and ‘unhealthy’ foods among these groups. This project is being undertaken as part of the requirements for Hannah Lawrence’s Master of Science in Human Nutrition.

What type of participants are being sought?
We are seeking adults with a diagnosis of pre-diabetes or type 2 diabetes
Exclusion criteria:
   - Severe speech or hearing difficulty

People who meet one or more of the exclusion criteria set out above may not participate in this project, because in the opinion of the researchers and the University of Otago Human Ethics Committee, these criteria would not be suitable for the nature of this study.

Participants will be entitled to a free half-hour nutrition consultation with the student researcher following their participation in the study

What will participants be asked to do?
Should you agree to take part in this project, you will be asked to consent to take part and then to do two things:
   - 1. Fill out a confidential questionnaire. We will provide you with the questionnaire and after completing it, we will give you an envelope in which to put the questionnaire. Investigators will only access this information after the end of the session and only for the purpose of describing the group characteristics of the population. The information we would like to collect is given below.
2. Participate in a 1.5 hour focus group session with 8-12 other people. This will take the format of a discussion led by Hannah Lawrence. We are interested in discussing perceptions and knowledge of food. Hence, the discussion will have three major themes – Sources of dietary information; perceptions of what are healthy and unhealthy foods; and perceptions of what is a good diet for people with diabetes. During the discussions, Hannah Lawrence will provide nutritional information and recommend appropriate resources.

What data or information will be collected and what use will be made of it?
We will be collecting data on your age, gender, ethnicity, smoking status, how and when you were diagnosed with pre-diabetes or diabetes, what medications you take, and self-reported height and weight. The purpose of collecting this information is to describe the overall characteristics of the group in our study. There is also some more sensitive information that we would like to collect, again only to describe the characteristics of the group. For these questions on ‘qualifications, occupation and income’ we have provided a “No details given” option if you do not want to provide this information.

The information will remain confidential to the study investigators. Paper copies will be kept in a lockable office and electronic data will be stored on a departmental computer. No individual data will be published, only group results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) and every attempt will be made to preserve your anonymity. The data collected will be securely stored in such a way that only the researchers (details below) will be able to gain access to it. Data obtained as a result of the research will be retained for at least 5 years in secure storage. Any personal information held on the participants such as contact details 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. If you choose not to supply information this may exclude you from taking part in the study. You have rights of access to the personal information that you have given to us and you may correct or change this information. You will be provided with the results of the study.

Can participants change their mind and withdraw from the project?
You may withdraw from participating in the project at any time and without any disadvantage to yourself.

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:

- **Ms Hannah Lawrence**
  P: 027 829 0920
  E: hannah.lawrence12@gmail.com

- **Mr Andrew Reynolds**
  P: 027 956 5826
  E: Andrew.reynolds@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 G: Consent form signed by focus group participants

Dietary Knowledge and Perceptions Among People with Pre-Diabetes and Type 2 Diabetes

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet and understand the procedures. 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. This project involves an open-questioning technique. The general line of questioning includes nutritional knowledge and perception of healthy foods for people with pre-diabetes and type 2 diabetes. The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the focus group discussion develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.

3. Any raw data on which the results of the project depend will be retained in secure storage for five years after which it will be destroyed.

4. 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 my anonymity

I agree to participate in the focus group session.

Date ...........................

Name ..............................  Signature ......................................

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 H: Flyer used for focus group recruitment

RESEARCH PARTICIPANTS NEEDED
Dietary Knowledge and Perceptions Among People with Pre-Diabetes and Type 2 Diabetes

We are conducting focus groups to find out what nutrition advice people with diabetes receive, and to explore perceptions of ‘healthy’ and ‘unhealthy’ food

Have you been diagnosed with pre-diabetes or type 2 diabetes??

You could be eligible to participate in one of our focus groups!

What? Come along to a 90 minute focus group
When? 5th, 6th or 7th November
Where? Newtown or Wellington CBD

Refreshments will be provided

All participants will be entitled to a free half-hour nutrition consultation!!

For more information and to participate, please contact Hannah Lawrence
P: 027 829 0920  E: hannah.lawrence12@gmail.com

This project has been reviewed and approved by the University of Otago Human Ethics Committee. Reference: 14/166
Appendix I: Questionnaire filled out by focus group participants

Focus Group Questionnaire

Participant ID: __________

Date of Birth: __ __ / __ __ / __ __ __ __

Gender: Male / Female
(Please circle the appropriate answer)

Which ethnic group do you belong to?
(Please tick the appropriate box/boxes)
- ☐ New Zealand European
- ☐ Samoan
- ☐ Cook Island
- ☐ Tongan
- ☐ Niuean
- ☐ Chinese
- ☐ Indian
- ☐ Other: ________________

Which of the following applies to you?
(Please tick the appropriate box)
- ☐ I have been diagnosed with pre-diabetes
- ☐ I have been diagnosed with type 2 diabetes

What year were you diagnosed with pre-diabetes/diabetes? __ __ __ __

Are you taking any medications for your diabetes?
- ☐ Yes (please specify) ________________
- ☐ No

Do you smoke cigarettes regularly (that is, one or more a day)?
- ☐ Yes
- ☐ No

If you selected ‘No’, have you ever been a regular smoker of one or more cigarettes a day?
- ☐ Yes
- ☐ No

What is your highest academic qualification? This could be a qualification from school, polytechnic, teachers training college, university etc:
- ☐ No details given
Or state your qualification here: _______________________

Please note, your name is not attached to this form, it is only your study ID. We will only look at this information later, so even Hannah Lawrence will not know what you have answered here until well after the focus group has finished.

Thank you for taking the time to fill out our questionnaire 😊
Appendix J: Photo records of focus group discussions

Focus group A
Focus group B
Focus group C
Appendix K: Example of focus group transcriptions

The three 90-minute focus group discussions were audio-recorded and then transcribed. Below is a sample from each of the three transcriptions.

TRANSCRIPT – Focus group A

Facilitator: What nutrition advice have you been given by a health professional for your diabetes?

D – I had a one-hour chat with a wellington hospital nutritionist and umm she sent me this (Diabetes NZ guidelines), scowled at some things, smiled at other things... Didn’t recommend butter, didn’t recommend orange juice out of a bottle, did recommend olive oil, did recommend vegetables, did recommend fruit, recommended lean meat, and cheese. Probably looking at high fat and high sugar was the downer.

E – Yeah I had advice from my doctor, the doctors advice was on a tougher regime than some of the stuff I read or see, she says no more than 2 fruit in a day, and often they say more than that, and its no juice, and the same with carbohydrate, like umm bread, toast sort of thing, no more than 2 in a day, and she’d prefer I didn’t have any. She would actually prefer I didn’t have any.

Facilitator: So when she says carbohydrate....

E – Well yeah talking about those sorts of foods, like potatoes, kumara, you know the root starchy vegetables, rice. I notice quite of few of the books say you can have a quantity of white rice and pasta sort of thing, I’ve found I can’t at all – if I have those then my blood sugars go way, way too high. So white rice, pasta, white toast are just... no nos.

Facilitator: Have you been given any advice about different types of carbohydrates?

E – Yeah, so I have wholegrain. And explain to my family the difference between wholegrain and wholemeal is really interesting and there’s a real difference in how it affects your blood sugars, well mine anyway. And the same with like brown rice, which I’ve just gone back to recently and found actually you can eat it.

L – Perhaps I should explain that over the last few months my BS have been wildly out of control and I’m now going to the diabetes clinic, the doctor, the diabetes nurse specialist and a nutritionist at the hospital, also under the diabetes clinic. So I’ve had a variety of advice given to me and the latest is that I’m supposed to have 50 carbs for breakfast carbs for breakfast, lunch and dinner... Five oh carbs, each meal, to try and keep an even amount of food, well productive food, going into my system... and that I’m finding quite difficult to judge how many carbs are in quite a number of things, so, so far this regimes been going on for about 2 months and not a lot of progress so... unless there is something else going on... they are all sort of mystified about what’s going on in my body so... but I’ve had a variety of advice from using a low GI diet to currently forget the low GI diet, but again you concentrate on non-starchy vegetables,
bit of fruit, not too much, because they thought I was eating too much fruit, but I’m allowed some, and again the margarine, the low fat milk, I don’t think anyone’s mentioned that one, so low-fat milk always, yeah.

**TRANSCRIPT – Focus group B**

R – I think I view processed foods as being very high in sugar, I mean that’s basically…

M – They are not necessarily high in sugar…

R – they are cause they take the fat out and…

M – but bread doesn’t have a lot of sugar in it, umm

S – the thing you have to look at with the processed is… we are very keen on and rightly so, is keeping an eye on the sugar and everything, but the other thing they sneak in there is salt. Salt is really bad

M – Yeah but can I just stress this? People always go on about sugar, its not sugar it’s the level of processed carbohydrate in your food, if you’ve got a high lot of processed carbohydrate in your food, which includes sugar, then it’s going to be unhealthy and it’s going to react badly on your glucose levels and

R – Yeah that to me sounds a little like that’s one view of it, it’s almost like religion isn’t it, they all believe similar things but they have a different view of it umm but I know that high carbs is bad but I’m not 100% convinced, it’s variety, things that are given as… and then one day it’s different again

K – yeah and then there is the distinction in the carbs, you’ve got the starch, not the starchy, the non-starchy carbs and the other thing, and it’s the portion control with so carbs can be ok as long as it’s… I love my carbs, I’m a vegetarian and but I’ve had to reduce my potatoes and other things that you know have got a lot of sugar in them and carbohydrate becomes sugar anyway, so you know it’s portion control and what is healthy can become unhealthy if you don’t have the right portion. Like fruit, I love fruit and I was told by my dietitian that I’m only allowed one piece at a time and I’m like hell, I was like everyday for me was like 6, 7 pieces of fruit and I can’t do that no more, cause of the fructose is your sugar. And I’m feeling better as a result, and I love it but it’s a hard thing to stop. So anything can be unhealthy if it’s not in the right proportion too.

**TRANSCRIPT – Focus group C**

J – And with the GI index I can’t remember if it’s the lower the number the better or the higher the number the better, I’m not quite sure.

S – No, no, no no, no, no.

Y – Lower the number of?
J – Glucose index… so what is it? The lower the number the better?

S – Most breads run at about a 50 which is medium

S – Yes, low GI is good

Facilitator - High GI not so good?

S – Absolutely

Y – Can you explain again what is complex carbs? Is this the processed carbs?

S – Complex carbs usually carbs that have fibre in them

Y – Like sweet potato?

S – No, sweet potato is less of a complex carb, it does have fibre but it’s got quite a high GI

Y – High GI?

S – High glycaemic index, and potato is a reasonably high one as well. Complex carbs would be things like pasta. Pasta is a complex carbohydrate

J – I think wholewheat and wholegrain bread is. Its because they’re so hard to break down and they keep your blood sugars at a normal level