An in-depth investigation of Pacific young people's eating habits and dietary diversity as related to the pathways of obesity

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

Degree of

Master of Science

In

Nutrition and Dietetics

At Massey University, Auckland

New Zealand

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2014

ABSTRACT

Background: Prevalence of obesity is high amongst Pacific youth aged 16-24years. To understand obesity amongst Pacific youth, exploration into their social realities, culture, diet quality and food habits is needed.

Aim: To explore dietary diversity and eating habits as well as cultural factors that influence food consumption of Pacific youth aged 16-24 years using a qualitative approach.

Methodology: A sample of 30 Pacific youth was purposively selected. Diet quality was assessed using a newly developed dietary diversity questionnaire specific to Pacific people, based on guidelines from the FAO. Eating habits, meal patterns, food choices and related cultural and social influences was explored using a qualitative face-to-face interview.

Results: Dietary diversity scores (DDS) were calculated by counting the number of established food groups (total of 26 food groups divided into 15 nutritious and 11 discretionary food groups). Food variety scores (FVS) were calculated by counting the number of individual food items consumed (n=227 foods in total; 129 nutritious foods and 98 discretionary foods) as well as within each food group. The eating habits data was analysed using a content analysis approach where trends in meal patterns, consumption at social occasions and weight status were identified.

Dietary diversity: the mean total DDS was 23.1; the mean DDS of nutritious and discretionary food groups was 14.3 and 8.83 respectively. The mean total FVS was 91, the mean FVS of the nutritious and discretionary foods was 51.7 and 39.3 respectively. The most variety in the nutritious category was identified in the Vitamin A and Vitamin C rich fruit and vegetable groups, however, only moderate amounts of food items were consumed from these groups. The most variety in the discretionary category was identified in the drinks group where intakes ranged between four and ten items out of a total 14 identified items. Eating habits: a two-meals/day pattern was observed, with over half the participants skipping breakfast and consuming snacks during the day. For sixteen participants, their food intake increased due to the availability of a large variety of freely available food in their social environments.

Weight: over half (57%) of the participants were unhappy with their weight and many of these participants have tried diet and exercise to manage their weight. Many participants perceived their unhealthy lifestyles to be the cause of overweight and obesity.

Conclusion: dietary diversity was high amongst Pacific youth, however, the variety of nutritious foods consumed were moderate in comparison to discretionary foods; indicative of a moderate diet quality. Lack of time for meal preparation, convenience, low cost and taste were the reasons for established eating habits. Vast availability of foods as well as cultural values around food consumption were reasons contributing to increased food intake at social occasions.

ACKNOWLEDGEMENT

This thesis would not have been possible without the help of many people. I would like to extend my gratitude to my academic supervisor, Rozanne Kruger, for her continued patience, support, encouragement and believing in me that I could do this.

I would like to thank Ridvan Firestone from Center of Public Health Research, for bringing forward the larger study “chewing facts on fats, what does it say about you”, without whom this particular thesis project would be non-existent. I am grateful to the research assistants at West Fono Health Trust and Evolve Youth Services for their hard work in recruiting participants and collecting the data for this study. Their time and effort put into conducting the interviews and collating the data is much appreciated.

Lastly I would like to thank my parents for their ongoing support and encouragement not just through this Masters course, but, also throughout my tertiary education journey.

CONTRIBUTORS TO THE STUDY

Researchers	Contributions
Nikita Deo– Student	Main researcher, developed dietary diversity questionnaire (DDQ), standards of practice for use of DDQ, data analysis, statistical analysis, interpretation and discussion of results, author of thesis.
Rozanne Kruger– Supervisor	Co-investigator on the larger study, main academic supervisor, development of dietary diversity questionnaire, study design, assistance with data analysis, interpretation of results and reviewed thesis.
Professor Bernhard Breier– Co-supervisor	Co-investigator on the larger study and Co-supervisor for this thesis project
Ridvan Firestone- Centre of Public Health Research, Massey University	Principal investigator and research co-ordinator of the larger study called “chewing facts on fats- what does it say about you”

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ABBREVIATIONS

AICR: American Institute for Cancer Research

AHS: Annual Health Survey

BMI: Body mass index

CVD: Cardiovascular disease

DDQ: Dietary Diversity Questionnaire

DDS: Dietary diversity score

FAO: Food and Agriculture Organisation

FVS: Food variety scores

MOH: Ministry of Health

NNS: National Nutrition Survey

NZ: New Zealand

OECD: Organization for Economic Cooperation and Development

SES: Socio-economic status

T2DM: Type 2 diabetes mellitus

WCRF: World Cancer Research Fund

WHO: World Health Organisation

CHAPTER ONE: INTRODUCTION

1.1 Prevalence of obesity

Obesity is defined as excessive or abnormal amounts of body fat mass and is classified by a body mass index (BMI) above 30 kg/m^2 (World Health Organisation., 2006a)

The rate of obesity in New Zealand is ranked third highest in the OECD countries behind United States of America and Mexico where one in three adults (aged 15+ years) are classified as being obese (The Organization for Economic Cooperation and Development., 2014). In New Zealand the highest rate of obesity is seen amongst those of Pacific Island ethnicity. According to the findings from the 2013 Annual Health Survey, 31% of New Zealand adults and 11% of children aged 2-14 years are obese which equates to 1.2 million people in New Zealand (Ministry of Health., 2013). Pacific adults on the other hand have higher rates of obesity; 68% of Pacific adults and approximately 27% of Pacific children (aged 2-14 years) are classified as being obese (Ministry of Health., 2013). Furthermore, after adjusting for differences in age and gender, Pacific children had three times more chances of being obese than their other ethnic counterparts (Ministry of Health., 2013). According to the 2013 Census data, the number of Pacific youth aged 16-24 years made up 19% of the total Pacific population which equates to approximately 57,000 youth living in New Zealand (Statistics New Zealand., 2014). Prevalence of obesity is higher in Pacific youth than any other ethnic groups. According to the data published by The Ministry of Health in 2008, approximately 23% (~19,000) of Pacific youth were obese (Ministry of Health., 2008). Furthermore, in comparison with other population groups, obesity was found to be over 2.5 times more common in Pacific youth (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011).

1.2 Consequences of obesity

Studies have shown that overweight and obesity in youth is predictive of obesity (Engeland *et al.*, 2004; Gordon-Larsen *et al.*, 2004; Singh *et al.*, 2008; Starc and Strel, 2011) and obesity-related morbidities in adulthood (Engeland *et al.*, 2004; Raitakari *et al.*, 2005; Reilly and Kelly, 2011). Increased body fat levels have been associated with increased risks of cardiovascular disease, hypertension, stroke, hypercholesterolemia, gallbladder disease, some cancers, sleep apnoea, metabolic syndrome, Type 2 diabetes mellitus (T2DM), decreased quality of life and premature death (Bray, 2004; Lawrence and Kopelman, 2004). Furthermore psychological issues have been found to be associated with obesity due to societal disapproval of fatness.

Stigmatisation and discrimination have been evidenced to be experienced on a daily basis by people with a larger body size (Bray, 2004; Carr and Friedman, 2005; Wardle and Cooke, 2005).

The latest New Zealand data on obesity related health consequences shows that 13% of Pacific adults have diagnosed T2DM which is a 3% increase from the 2006 and 2007 data (Gerritsen *et al.*, 2008; Ministry of Health., 2013). Obese Pacific children have higher risk of developing T2DM as adults (Ministry of Health., 2013). Higher percentages of Pacific adults were found to be taking medication for hypertension and high cholesterol levels than Maori and Europeans according to the last health survey (Ministry of Health., 2013). Between the years 2002 and 2003, the incidence of stroke for adults aged 35–84 years, increased by 66 percent among Pacific people. It is indicative that due to projected growth in obesity, the number of chronic health conditions linked to obesity will increase and the increase will be greater within the Pacific groups (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011).

A rapid rise in obesity has simultaneously been associated with an increase in treatment and medical expenditure which not only impacts the individual but also the economy as a whole (Finkelstein *et al.*, 2005).

1.3 Determinants of obesity

The majority of Pacific ethnic groups have been documented to have low socio-economic status in New Zealand, this was based on the area they live in and their income status (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011). Low socio-economic status has been well established to be strongly associated with obesity risks, however data linking the two in New Zealand is limited (Utter *et al.*, 2006; Gerritsen *et al.*, 2008). Young Pacific people from low socio-economic backgrounds living in high deprived areas had double to triple the risk of excess body weight (Tobias *et al.*, 2006; Duncan *et al.*, 2008; Gerritsen *et al.*, 2008). Low socio-economic status exposes Pacific people to face many disadvantages that contribute to increased risk of obesity (Duncan *et al.*, 2008).

Low socio-economic status associated with low income has been linked with food insecurity (Whitaker and Orzol, 2006b). The Ministry of Health defines food security as being the “access to adequate, safe, affordable and acceptable food (University of Otago. and Ministry of Health., 2011).

Pacific people have been over-represented among the unemployed, lower-skilled workers and low income earners in this country (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011). According to the Children's Nutrition Survey, Pacific households had experienced greater rates of food insecurity than other households in New Zealand (Ministry of Health. and Parnell, 2003). Approximately 78% of the household that had Pacific dependent children could not afford to eat properly. Nearly 18% of households with Pacific children had to sometimes use foods banks in comparison to other households (Ministry of Health., 2003b). Research also indicates that women and adolescents who come from low socio-economic background are highly likely to have inadequate nutrition status (Russell *et al.*, 1999).

There has been some evidence published by The Ministry of Health regarding Pacific adolescents' dietary habits. It was stated that Pacific adolescents were frequent consumers of sugary drinks and fast foods and a high percentage of them would skip breakfast (Ministry of Health., 2012). Nearly half of Pacific youth reported to have lunch, however they were less likely to bring food from home (Ministry of Health., 2012). These findings were similar in the Obesity Prevention in Communities (OPIC) study where not only Pacific adolescent participants from New Zealand were investigated, but also adolescents in other Pacific Island countries such as Fiji, Tonga, Samoa, Vanuatu (Utter and Pacific Obesity Prevention in Communities Project., 2008). Existing evidence suggest that people living with low socio-economic status would fall back on consuming foods that are energy dense as opposed to nutrient-dense foods, mainly because it is a cheaper form of energy which fills the stomach (Utter and Pacific Obesity Prevention in Communities Project., 2008; Ministry of Health., 2012). Whether these eating behaviours are due to nutrition transition over time or purely based on socio-economic status is debatable. What is of concern here is the quality of diet for Pacific adolescents which has not been looked at in New Zealand so far.

1.3.1 Dietary diversity, food variety and diet quality

Dietary diversity has been recognised as a key indicator of diet quality and the focus in the literature has been based on the consumption of variety of foods across and within food groups (Ruel, 2003). One's dietary diversity has been found to be determined by factors such as food availability, food access, socio-economic status and cultural norms (Hoddinott and Yohannes, 2002). Dietary diversity by definition is the number of food groups consumed over a reference period (Ruel, 2003; Clausen *et al.*, 2005; Ruel *et al.*, 2010). Food variety has been shown to be measured by the number of individual food items consumed within

and across food groups (Hatloy *et al.*, 1998; Ruel, 2003). A diet that is diverse will more likely promote intakes of essential micronutrients and energy that will be beneficial for optimal health, (Ruel, 2003; Kennedy, 2004; Clausen *et al.*, 2005) since there is no single food that contains all the required nutrients that would optimize health outcomes (Kennedy, 2004).

Several studies on dietary quality using the approach of food variety and dietary diversity scoring to establish nutrient adequacy were conducted in developing countries such as Mali, Peru and South Africa. The studies have examined nutrient adequacy in many different population groups, amongst different age groups and across genders and it has been commonly shown that low food variety and dietary diversity scores were associated with diets being nutritionally inadequate which was reflective of the high prevalence of malnutrition and its related consequences in developing countries (Hatloy *et al.*, 1998; Oldewage-Theron and Kruger, 2008; Roche *et al.*, 2008; Oldewage Theron and Kruger, 2009; Labadarios *et al.*, 2011; Oldewage-Theron and Kruger, 2011). Studies on diet quality using dietary diversity and food variety scores have not been done in western countries.

Several studies have used dietary diversity and/or food variety to investigate the association between socio-economic status, food security and nutritional status or diet quality of households (Hatloy *et al.*, 2000; Ruel, 2003; Anzid *et al.*, 2009). Socio-economic status has been found to be an indirect indicator of food security which ultimately influences household nutritional status (Hoddinott and Yohannes, 2002; Ruel, 2003). Low food variety and dietary diversity scores were found to be associated with increased risk of malnutrition amongst young people from low socio-economic backgrounds (Hatloy *et al.*, 2000). Findings have showed that dietary diversity and food variety scores can be used as proxies to reflect food security which is correlated to adequate energy intake; in other words the ability of the household to cover basic energy needs (Hoddinott and Yohannes, 2002).

In summary, the majority of dietary diversity studies have been done in low income countries to investigate nutrition adequacy in those areas where risk of malnutrition is high. The results have been consistent in linking low dietary diversity and food variety scores to nutrition inadequacy. Obesity is also a form of malnutrition, and the focus of using dietary diversity and food variety to measure diet quality must be shifted to first world environments where segments of the population are classified as having a low socio-economic status such as that seen in New Zealand amongst the Pacific population. Assessing Pacific people's diet quality will give us an

indication on how diet may pave a pathway into obesity. Currently in New Zealand no study has been done looking at diet quality of Pacific people using the dietary diversity and food variety approach in order to establish a link with obesity. Therefore exploring this could potentially explain the relationship between low socio-economic status, food security and culture and how these influence existing food habits in Pacific youth which could potentially explain why obesity arises.

There is limited evidence that establishes determinants of obesity such as socio-economic status, food security and culture amongst Pacific people and particularly between the age group of 16-24 years. Whilst previous interventions on tackling obesity have been done on Pacific adult population groups (i.e. ages 15+ years), infants, children and adolescents (aged 13 to 17 years); no work has been done amongst those aged 16 to 24 years. This age group has the capacity to be independent and understand their own and their families' health realities and the experiences entailed within it. Therefore this age group can be considered as being a key stakeholder in investigating how the social realities, cultural values and beliefs behind food have an impact on body weight.

1.4 Problem statement

There is high prevalence of obesity amongst Pacific youth; however, why this is constantly increasing is still not understood. It is known and evidenced that obesity at a young age increases the chances of obesity in adulthood, which is an independent predictor of many chronic disease conditions. To understand obesity in Pacific youth, their social realities, culture, food habits and dietary diversity must be explored.

1.5 Study Aim and objectives

The aim of this research project is to explore diet quality and eating habits amongst Pacific youth aged 16-24 years living in the Wellington and Auckland areas and how this may form a pathway into obesity.

The objectives of this study is to:

- To develop a dietary diversity and eating habits questionnaire focused on Pacific people's dietary habits
- To assess food variety and dietary diversity amongst Pacific youth
- To explore the eating habits amongst Pacific youth in relation to culture and obesity

1.6 Thesis structure

Chapter 1

The focus of Chapter One is to introduce the study, its general aim and rationale for this study.

Chapter 2

The literature is reviewed in this chapter by a description on current prevalence of obesity amongst Pacific people living in New Zealand followed by a review on the determinants and causes of obesity. This will be followed by reviewing eating habits amongst Pacific people, exploration on existing evidence on dietary diversity in relation to obesity, some socio-cultural factors influencing obesity amongst Pacific people and ending with reviewing the consequences related to obesity.

Chapter 3

This chapter describes the study methodology and procedures on data analysis relevant to the research. In addition, participant recruitment, study sample and methods of data collection will be described. Discussion on ethical issues, reliability of the data and dissemination of the research information will also be included.

Chapter 4

This chapter will focus on the key findings from the data.

Chapter 5

This chapter will discuss the findings of this study including its comparison to findings in previous studies of similar nature.

Chapter 6

This chapter concludes the thesis. It will include the strengths and limitations of the study and the implications of the results. Future recommendation for further research in this area and/or interventions will also be presented in this chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1 Prevalence of obesity

Obesity refers to the accumulation of excess fat resulting in increased risk of adverse health outcomes (World Health Organisation., 2006b). The prevalence of obesity in western countries including New Zealand has more than doubled in the last three to four decades. Approximately 1.7 billion people worldwide are obese or overweight of which 40 million are children. Obesity, which was once known to be highly prevalent in developed countries only is now increasingly present in developing countries (The Organization for Economic Cooperation and Development., 2014).

According to The Organization for Economic Cooperation and Development (OECD) (2014), the prevalence of obesity in New Zealand is amongst the highest in the world behind USA and Mexico countries (Ng *et al.*, 2014; The Organization for Economic Cooperation and Development., 2014). The latest findings from the Annual New Zealand Health Survey (2013) showed that 31% of New Zealand adults and 11% of children aged 2-14 years are obese and this equates to approximately 30% of the total NZ population (i.e.1.2 million people living in New Zealand) (Ministry of Health., 2013).

New Zealand in the last few decades has become a culturally diverse country comprising of 4.3 million people. According to the latest census data, the majority of the population are Europeans (74%), followed by Maori (15%), Asian (12%) and Pacific (7%) nationalities. Furthermore, one quarter of New Zealand's population is born overseas. Since 2006, Maori, Asian and Pacific population have increased by 6%, 12% and 11% respectively which is indicative that New Zealand is growing to be more ethnically diverse. In regards to the average population age of New Zealanders, Maori and Pacific people are considered to be a youthful population, with a median age of 23.9 and 22.1 years for Maori and Pacific people respectively compared to 41 years for Europeans (Statistics New Zealand., 2014).

In New Zealand the highest rate of obesity is seen amongst those of Pacific Island ethnicity. In the recent Annual Health Survey, 68% of Pacific adults and 27% of Pacific children (aged 2-14 years) were classified as being obese. Furthermore, post adjustments of differences in age and gender, Pacific children had three times higher risk of being obese than their other NZ ethnic counterparts (Ministry of Health., 2013). Pacific youth aged 15-24 years, make up 19% of the

New Zealand Pacific population (Statistics New Zealand., 2014)and it has been evident that obesity is 2.5 times more common amongst Pacific youth than any other national ethnic groups (Ministry of Health., 2008) . As evidenced by data published by the Ministry of Health (2008), 23% of Pacific youth were classified as being obese which impacts around 19,000 of youth living in New Zealand.

2.2 Assessment of body fatness

Obesity is commonly measured using BMI which takes into account the weight of an individual in regards to their height (BMI = weight/height^2 = kg/m^2) (World Health Organisation., 2006b) BMI is a tool universally used to measure relative body size in a clinical or research setting. Body mass index have been used on a universal scale due to its practicality of use, its strong association with body fat and its cost effectiveness. The World Health Organisation has categorised BMI into classifications where obesity is defined as BMI above 30kg/m^2 (See table 2.1).

Table 2.1: The International Classification of adult underweight, overweight and obesity according to BMI (World Health Organisation., 2006a)

Classification	**BMI(kg/m^2)**	
	Principal cut-off points	**Additional cut-off points**
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Sourced from World Health Organisation (2006)

URL: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html

Evidence on the use of BMI as a measure of body fat content has been inconsistent due to several limitations. It has been noted that BMI is only a crude indicator of body fat and the differentiation between muscle mass and fat mass cannot be distinguished by using BMI (Hu, 2008; Daniels, 2009). The relationship between BMI and body fatness have been stated to vary with age, gender and ethnicities. Table 2.2 summarises six studies that have aimed to investigate correlations between BMI and body fat levels. Five of the studies have been conducted in the last 10 years and one study was published in 2003. This was included as the study was conducted in New Zealand and showed variation of body fat levels with age. Three studies were conducted in New Zealand whereas the other three were conducted internationally.

Studies mentioned in Table 2.2 indicate that there is a potential for obesity to be overestimated amongst certain ethnic groups with using BMI as a diagnosis tool. This was particularly important for Pacific people living in New Zealand. However, despite its limitations the use of anthropometric measurements such as height and weight (use to calculate BMI) remain widely used and the least expensive method for assessing body fatness.

Table 2.2 Recent research investigating BMI and body fat variation with age, gender and ethnicity

Variation	Study	Reference	Study design	Body composition method/s used	Results
Body fat variation with ethnicity	Differences in the relationship between BMI and percentage body fat between Japanese and Australian-Caucasian young men	Kagawa, M., Kerr, D., Uchida, H., & Binns, C. W. (2006). Differences in the relationship between BMI and percentage body fat between Japanese and Australian-Caucasian young men. *Br J Nutr, 95*(5), 1002-1007.	This was a cross-sectional study that used a sample of Japanese (n=144) and 140 Australian-Caucasian (n=140) men living in Australia as well as Japanese men (n=88) living in Japan to determine ethnic and environmental influences on the relationship between BMI and percentage body fat.	- BMI - Skin fold thickness	- At a BMI of 23.5kg/m2 the Japanese men were found to have an equivalent body fat to Australian-Caucasian men with BMI of 28.2kg/m2. - This was indicative that Japanese men had more percentage body fat than Australian Caucasian at the same BMI value
Body fat variation with ethnicity	Body size, body composition, and fat distribution: a comparison of young New Zealand men of European, Pacific Island, and Asian Indian ethnicities	Rush, E., Plank, L., Chandu, V., Llaulu, M., Simmons, D., SWINBURN, B. & YAJNIK, C. 2004. Body size, body composition, and fat distribution: a comparison of young New Zealand men of European, Pacific Island, and Asian Indian ethnicities. N Z Med J, 117, U1203.	A cross sectional study using 64 European (n= 64), 31 Pacific Island (n=31) and Asian Indian (n=19)	- BMI - Dual-energy X-ray absorptiometry	- Pacific island men had a 4%lower body fat compared to European men given the same BMI level. - Asian Indian men had a 7-8% higher body fat compared to European men given the same BMI level.

Variation	Study	Reference	Study design	Body composition method/s used	Results
Body fat variation with age	Body composition of 4- and 5-year-old New Zealand girls: a DXA study of initial adiposity and subsequent 4-year fat change	Goulding, A., Taylor, R. W., Jones, I. E., Lewis-Barned, N. J., & Williams, S. M. (2003). Body composition of 4- and 5-year-old New Zealand girls: a DXA study of initial adiposity and subsequent 4-year fat change. *Int J Obes Relat Metab Disord, 27*(3), 410-415. doi: 10.1038/sj.ijo.0802236	Cross-sectional study with a longitudinal component. .	- BMI - Dual-energy X-ray analysis	- Girls who had higher% body fat >19.2 was found to have twice the amount of weight compared to girls who had a lower % body fat - The percentage fat mass over 4 years exceeded the percentage of gained from lean mass
Body fat variation with age, gender and ethnicity	Indices of fatness and relationships with age, ethnicity and lipids in New Zealand European, Māori and Pacific children	Rush, E. C., Scragg, R., Schaaf, D., Juranovich, G. & Plank, L. D. 2009. Indices of fatness and relationships with age, ethnicity and lipids in New Zealand European, Maori and Pacific children. *Eur J Clin Nutr,* 63**,** 627-33. Available: DOI 10.1038/ejcn.2008.15	Cross sectional study Data on sample was collected from the 2002 Children Nutrition survey. This study investigated body fat indices amongst on 3275 children aged between 5-14 years of age.	- BMI - Bio impedance analysis	- Cross-sectional analysis across ages showed by the age of 13, girls were found to have higher fat mass and BMI compared to boys - Percentage body fat was lower amongst girls of Pacific and Maori ethnic background compared to European girls
Body fat variation with Gender and ethnicity	The Relationship of Waist Circumference and BMI to Visceral, Subcutaneous, and Total Body Fat: Sex and	Camhi, S. M., BrayY, G. A., Bouchard, C., Greenway, F. L., Johnson, W. D., Newton, R. L., Ravussin, E., Ryan, D. H., Smith, S. R. & Katzmarzyk, P. T. 2011. The relationship of waist circumference and BMI to visceral, subcutaneous, and total body fat: sex and race	This was a cross sectional study using 1,667 adults from European, and African American ethnic background.	- BMI - CT scan - Dual-energy-X-ray absorptiometry	- Women were found to have higher fat mass than men. - For any given BMI level, women were found to have higher subcutaneous fat then men - Ethnic difference found

Variation	Study	Reference	Study design	Body composition method/s used	Results
	Race Differences	differences. *Obesity (Silver Spring),* 19**,** 402-8. Available: DOI 10.1038/oby.2010.248			European adults had higher levels of visceral fat compared to African American adults at higher BMI levels
Body fat variation with gender, age and ethnicity	Ethnic and gender differences in body fat in British schoolchildren as measured by DXA	Shaw, N. J., Crabtree, N. J., Kibirige, M. S. & Fordham, J. N. 2007. Ethnic and gender differences in body fat in British schoolchildren as measured by DXA. *Arch Dis Child,* 92**,** 872-5. Available: DOI 10.1136/adc.2007.117911	A cross-sectional study using 1251 healthy children an well as adolescents aged between 5–18 years Ethnic backgrounds included white, South Asian and African-Caribbean ethnic groups	- BMI - Dual-energy-X-ray absorptiometry	- Females had higher body fat levels than males. - Girls were found to have a 12.9% increased body fat percentage from the age of five to eighteen years. - Ethnic findings included south Asian children had highest % body fat which increased as they aged.

2.3 Determinants of weight gain

Obesity results from a complex interaction between genetics, environment and psychological factors with physiological influences of energy consumption (from foods and drinks) and energy expenditure (physical activity) (Mann and Truswell, 2012). Weight gain on a fundamental level is a result of an imbalance between energy intake and energy expenditure (World Health Organisation., 2006b). Environmental and behavioural changes over the last few decades have been indicative in influencing the rising rates of obesity by promoting excessive energy intake and minimal physical activity (Egger and Swinburn, 1997; Crawford and Ball, 2002; Banwell *et al.*, 2005; Brug *et al.*, 2010).

2.3.1 Environmental determinants

The environment people surround themselves in, influences their behaviour; both of which can be considered as modifiable factors (Friedman, 2003). Egger and Swinburn (1997) categorised the environmental influences at two levels; macro and micro level. Furthermore, three different types of environmental influences have been identified to contribute to obesity namely physical, economic and socio-cultural environments, all of which can be seen at the micro and macro levels influencing food consumption (reflection of excessive energy intake) and physical activity (reflective of energy expenditure). The findings on environmental influences that impact food habits and physical activity are summarised below in table 2.3

Table 2.3 is reproduced from an article written by Egger and Swinburn (1997) which summarises environmental influences on food intake and physical activity. This article was written in 1997; however it seemed appropriate to use this information since it sets a foundation from which further information in this literature review could be built on.

Table 2.3 Summary of identified environmental influences on food intake and physical activity (Egger and Swinburn, 1997)

Type of environment	**Physical Environment**		**Economic Environment**		**Socio-cultural environment**	
	Food	Activity	**Food**	**Activity**	**Activity**	**Activity**
Macro	Food laws and regulation Food technology Low fat foods Food industry policies	Labour saving devices Cycle ways and walkways Fitness industry policies Transport system	Food taxes and subsidies Cost of food technology Marketing costs Food prices	Cost of labour vs automation Investment in parks and recreational facilities Costs of petrol and cars Cost of cycle ways	Traditional cuisine Migrant cuisines Consumer demand Food status	Attitudes to recreation National sports Participating versus watching culture Gadget status
Micro	Food in house Choices at school or work cafeterias Food in local shops Proximity of fast food outlets	Local recreation facilities Second cars Safe streets Household rules for watching TV and video	Family income Other household expenses Subsidised canteens Home grown foods	Gym or club fees Owning equipment Subsidised local events Costs of school sports	Family eating patterns Peer attitude from food advertising Festivities	Peers activities Family recreation School attitude to sports Safety fears.

Source : An “ecological” approach to the obesity pandemic by Garry Egger, Boyd Swinburn (1997) ; page p479.

In addition to the summary of environmental influences in table 2.3, the article stated that the macro-environment determines the prevalence of obesity in a given population whereas micro-environment contributes to obesity amongst individual. Furthermore it was suggested that if macro-environment continues to become more "obesogenic" the prevalence of obesity will continue to increase (Egger and Swinburn, 1997).

Reports published by WHO (2003), World Cancer Research Fund (WCRF) & American Institute for Cancer Research (AICR) compiled a list of evidence that have been found to cause weight gain and obesity. These evidence were sourced after expert consultation, extensive reviews and evidence based grading system (World Health Organisation., 2003; World Cancer Research Fund & American Institute for Cancer Research., 2007).

Table 2.4 presents the 2003 findings from the World Health Organisation Technical Report 916 which lists a summary of factors that increases risk of weight gain and factors that decreases risk of weight gain. Table 2.5 presents the findings from the Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective report written by WCRF and AICR (2007) summarizing the evidence on causes that would increase or decrease weight gain risk.

Table 2.4 Causes of weight gain identified by World Health Organisation (2003)

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Regular physical activity High dietary intake of fibre		Sedentary lifestyles High intake of energy-dense micronutrient poor foods*
Probable	Home and school environments that support health food choices for children Breastfeeding		Heavy marketing of energy-dense foods and fast food outlets High intake of sugars-sweetened soft drinks and fruit juices Adverse socio-economic conditions (in developed countries especially for women)
Possible	Low glycaemic index foods	Protein content of the diet	Large portion sizes High proportion of food prepared outside the home (developed countries) "Rigid restraint/periodic disinhibition" eating patterns
Insufficient	Increased eating frequency		Alcohol

Source: World Health Organisation (2003) Diet, nutrition and the prevention of chronic diseases: A global perspective; Technical Report Series 916; page 63

Table 2.5 Causes of weight gain identified by the World Cancer Research Fund and American Institute for Cancer Research (2007)

Evidence	Decreased risk	Increased risk
Convincing	Physical activity	Sedentary living
Probable	Low energy-dense foods Being breastfed	Energy-dense foods Sugary drinks 'Fast foods' Television viewing
Limited suggestive	No identified evidence	
Limited-no conclusion	Refined cereals (grains) and their products; starchy roots, tubers, and plantains; fruits; meat; fish; milk and dairy products; fruit juices; coffee; alcoholic drinks; sweeteners	
Substantial effect on risk unlikely	No identified evidence	

Source: World Cancer Research Fund & American Institute for Cancer Research (2007) Food, nutrition, physical activity, and the prevention of cancer: A global perspective; page 323

Convincing and probable evidence from both the above tables showed that sedentary lifestyle and consumption of energy dense foods increased the risk of gaining weight. In addition to this it was also found that socio-economic situations in western countries as well heavy marketing of energy dense foods contributed to excessive energy intake resulting in weight gain.

To elaborate, WCRF and AICF (2007) stated that urbanisation and ways of living in such environments are increasingly sedentary. Modern foods that are supplied are highly processed and have been found to have less nutritional qualities (i.e. more energy content). Furthermore the availability and low prices of many processed foods and drinks makes it convenient for people to consume more energy than required. Building on from table 2.3, it is evident that the physical and economic environmental influences contribute to factors identified by WHO (2003), WCRF and AICF (2007) which leads to excessive energy intakes resulting in weight gain.

These findings have set a platform in exploring factors that cause weight gain amongst Pacific people living in New Zealand from a context of socio-economic position and current dietary behaviours

2.3.2 Socio-economic factors as determinants to weight gain

The socio-economic factors that have been used to determine socio-economic status (SES) include education, occupation and income (Statistics New Zealand, 2011). New Zealand studies along with international studies illustrate that obesity is prevalent amongst population groups that are of low SES or live in highly deprived neighbourhoods (Ministry of Health., 2003a; Tobias *et al.*, 2006; McLaren, 2007; Gerritsen *et al.*, 2008; Utter *et al.*, 2009; Ogden and Statistics, 2010).

In New Zealand, the majority of the Māori and Pacific population groups have been documented to have low SES as well as high prevalence of obesity (Utter *et al.*, 2006; Gerritsen *et al.*, 2008; Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011; Ministry of Health., 2013).

International studies indicate SES as a mediator for health promoting behaviours where population groups with high SES had better nutritional knowledge and as a result a better diet (Irala-Estevez *et al.*, 2000). A review by Hanson and Chen (2007) found that adolescents with low SES reported having poor nutritional habits and did less exercise compared to adolescents who were from high SES (Hanson and Chen, 2007). In New Zealand poor nutritional habits were more evident amongst young Pacific people compared to other ethnic counterparts. Poor nutritional habits included skipping of breakfast and frequent consumption of sugary drinks as well as fast foods, all of which have been associated with increased risk of obesity (Ministry of Health. and Parnell, 2003).

2.3.2.1 Socio-economic status and food security

Low SES associated with low income/finances has further been linked with food insecurity (Whitaker and Orzol, 2006a). The Ministry of Health defines food security as being the “access to adequate, safe, affordable and acceptable food” (University of Otago. and Ministry of Health., 2011). The experience of food insecurity has been stated to vary in nature, where many factors play a role such as unequal access and availability of healthful foods as well as financial and employment status of a household (Carter *et al.*, 2010). In the New Zealand setting, it is people of Maori and Pacific ethnicities who are disproportionately affected by low food security due to their low socio-economic statuses and this was consistently evident in three national nutrition surveys done in

New Zealand (Parnell *et al.*, 2001; Parnell *et al.*, 2003; University of Otago. and Ministry of Health., 2011).

Pacific people living in New Zealand have been over-represented amongst the unemployed, lower-skilled workers and low income earners which have an influence on their household food security (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011). As a consequence to low income, it becomes difficult to afford nutritious food on a daily basis when other essential expenditures needs to be catered for, such as rent, electricity, food and travel (Burns, 2004).

It is amongst these groups of the population where accessing a variety of healthful food is difficult. This is due to highly deprived areas having fewer good quality supermarkets and an increased number of fast food outlets (Rush *et al.*, 2009a; Te Hotu Manawa Māori. *et al.*, 2009). Pearce and co-workers (2007) found that it was closer to travel to takeaway outlets in highly deprived areas than it was travelling to a supermarket. For example it was found in the study that fast food outlets were at a reach of within 0.7-0.8 km whereas supermarkets were 1.2-1.3km away for people who live in low socio-economic areas (Pearce *et al.*, 2007).

From the literature it is clear that people who experience difficulty in accessing food due to financial reasons are more likely to be overweight or obese (Burns, 2004; Rush *et al.*, 2009a; Food Research and Action Center., 2011). Drewnowski (2004) stated that low food security was associated with less food expenditure and a low-quality diet, where a reduction in food cost led to a diet that was more energy dense (Drewnowski, 2004). Obesity in this respect may be mediated by poverty through low costs of energy dense foods which potentially reinforces palatability of high fat, high sugar foods to satisfy or fulfil their energy needs. (Drewnowski and Specter, 2004; Rush *et al.*, 2009a). Food insecurity has been shown to attenuate perception and attitudes towards eating nutritious foods. In a multi-ethnic study amongst youth, it was found that healthy eating was perceived to be inconvenient amongst those who were placed in the food insecure group since the taste of the food was considered unappealing (Widome *et al.*, 2009). Furthermore food insecure youth were more likely to adopt habits of consuming fast foods more commonly than family meals. Such food consumption practices lead to higher fat intakes being observed, resulting in food insecure youths being highly likely to be in the BMI category which was beyond the 95th percentile (Widome *et al.*, 2009)

2.3.2.2 Diet quality and diversity

The term dietary diversity refers to the number of food groups as well as the number of various food items within and across food groups consumed over a reference period (Ruel, 2003). Dietary diversity is widely recognised as an important indicator of diet quality and have been found to be determined by factors such as socio-economic status, food availability, food access and cultural norms (Hatloy *et al.*, 2000; Hoddinott and Yohannes, 2002; Arimond and Ruel, 2004; Anzid *et al.*, 2009), where lower socio-economic status or lower income is more likely to lead to a diet that is less diverse and vice versa.

Many studies have been done in developing countries where it has been found population groups living in such environments have a lack of availability, access and utilization of a variety of foods; hence, resulting in diets that are limited with higher intakes of starchy staples, and lesser intakes from animal foods, fruits and vegetable, and as a result contributing to a high prevalence of malnutrition (Onyango, 2003; Arimond and Ruel, 2004; Oldewage-Theron and Kruger, 2008; Arimond *et al.*, 2010; Oldewage-Theron and Kruger, 2011; Arsenault *et al.*, 2013).

Dietary diversity have been found to be predictor of nutrient adequacy (Onyango, 2003; Torheim *et al.*, 2004; Oldewage-Theron and Kruger, 2008; Oldewage-Theron and Kruger, 2011) and it has been indicated that a diet that is diverse will more likely promote intakes of essential micronutrients and energy that will be beneficial for optimal health. (Ruel, 2003; Kennedy, 2004; Clausen *et al.*, 2005). Health promotion messages historically recommend consumption of a variety of foods as a way of fostering a diet that is nutritionally optimal and beneficial for health (Kennedy, 2004). Such recommendations also exist in New Zealand where guidelines have been put in place with the aim to prevent nutritional deficiencies (through diet adequacy), obesity as well as development of chronic diseases that are related to diet (Ministry of Health., 2003a).

While many studies have looked at the relationship of dietary diversity in addressing malnutrition and nutrition deficiencies in developing countries, limited studies have been done on investigating the relationship between dietary diversity and obesity. There were only three studies conducted internationally that investigated the relationship between dietary diversity and obesity. Table 2.6 summarises the findings from these studies.

Table 2.6 Summary of studies using dietary diversity in relation to obesity

Title	Reference	Methods	Results
High dietary diversity is associated with obesity in Sri Lankan adults : an evaluation of three dietary scores	Jayawardena, R., Byrne, N. M., Soares, M. J., Katulanda, P., Yadav, B. & Hills, A. P. 2013. High dietary diversity is associated with obesity in Sri Lankan adults: an evaluation of three dietary scores. BMC Public Health, 13, 314. Available: DOI 10.1186/1471-2458-13-314.	Randomised controlled trial using six hundred adults to assess dietary intake using 24 hour diet recall. Dietary diversity parameter was established by calculating dietary diversity scores (DDS) by counting the number of food groups consumed, dietary diversity scores with portions (DDSP) and food variety scores (FVS).	Out of 12 food groups, minimum food groups consumed was 2 and maximum was 11. Cereals were found to be commonest food group consumed at low DDS. Meat products were consumed by a significant portion of the population at higher DDS. Adult BMI above >25kg/m^2 were found to have highest dietary diversity parameters Mean BMI, waist circumference and energy intakes gradually increased with DDS, DDSP and FVS category People living in lower estate areas had lowest dietary diversity and food variety scores Ethnic differences - Indian-Tamils had lowest values for all three dietary diversity parameters, compared to Sinhalese, Muslim and Sri Lankan Tamils.
Dietary diversity score is related to obesity and abdominal adiposity among Iranian female youth	Azadbakht, L. & Esmaillzadeh, A. 2011. Dietary diversity score is related to obesity and abdominal adiposity among Iranian female youth. Public Health Nutr, 14, 62-9. Available: DOI 10.1017/S1368980010000522	Cross-sectional study using a sample of 289 females aged between 18-29 years. Dietary intake was assessed using a validated semi quantitative food frequency questionnaire. Dietary diversity score was calculated based on the food groups in the US Department of Agriculture Food Guide Pyramid. DDS were categorised in quartiles.	Those at lowest DDS quartile were at higher risk of obesity Participants with lower DDS had higher BMI and waist circumference measurements compared to participants at higher DDS Risk of obesity was significantly lower amongst participant who were at higher vegetable diversity quartile There was a significant and positive correlation between DDS and total energy intake (P > 0.05).

Title	Reference	Methods	Results
Evaluation of the Dietary Diversity and Nutrient Intakes in Obese Adults.	Kim, S. H., Kim, J. Y., Ryu, K. A. & Sohn, C. M. 2007. Evaluation of the dietary diversity and nutrient intakes in obese adults. *Korean Journal of Community Nutrition,* 12**,** 583-591.	Case controlled study using 138 obese adults (103 males and 35 females) above 20 years of age with BMI >25kg/ m^2. Dietary intake was assessed by three days dietary records. Nutrient adequacy was established using nutrients adequacy ratio Dietary diversity was established trough calculating dietary diversity scores (by counting the number foods groups consumed from the five major food groups namely dairy, meat, fruits and vegetables) and food variety score (by counting the number of individual food items consumed).	Energy intakes were higher in males than females, Obese adults had low DDS of 3.63 out of 5 major food groups and food variety sore of 14.1 out of a total of 24 food items identified to be consumed daily.

From reviewing the evidence on dietary diversity and obesity from the above studies, the relationship has been found to be mixed; in two of the studies it was indicative that low dietary diversity was associated with obesity (Kim *et al.*, 2007; Azadbakht and Esmaillzadeh, 2011) whilst one study indicated high diversity was associated with higher BMI (Jayawardena *et al.*, 2013).

Kennedy (2004) argues that dietary diversity is controversial in relation to overweight and obesity. With health promotion messages recommending population groups to "eat a variety of foods", even though it helped population groups meet their micronutrient intakes, the relationship between eating a variety of foods were not the same for macro-nutrient intakes especially from fats and saturated fats (Kennedy., 2004). Evidence suggests that eating a variety of foods increases food consumption which may lead to excessive energy intake and increased risk of weight gain, overweight and obesity (Raynor and Epstein, 2001; Jayawardena *et al.*, 2013). The limitations identified with the use of food variety guidelines included the clarity of the recommendations. Kennedy states that some individuals perceived the variety guidelines as a way to eat foods that were also unhealthy (Kennedy, 2004).

The relationship between consuming a variety of food and obesity has been found to be varied depending on the types of foods consumed. For example, the above study by Azadbakht and Esmaillzadeh (2011) found that the risk of obesity was lower amongst those participants who consumed a high variety of fruits and vegetables. Another study conducted in Boston found an inverse relationship with vegetable consumption and excessive energy intake (McCrory *et al.*, 1999). Likewise, a study by Kennedy (2001), found that consumption of fruits and vegetables was associated with lower energy intake, hence a lower BMI (Kennedy *et al.*, 2001). Raynor and co-workers found that decreasing variety in high fat foods, and fats, oils and sweets groups and increasing variety in vegetables and low fat breads over a course of 18 months was associated with decreased energy intake and weight loss (Raynor *et al.*, 2004)

Therefore evidence is suggestive that it may not be the variety per se, but the variety in selected food groups that is associated with increasing risk of overweight and obesity. Raynor and co-workers (2004) suggested that changing variety in certain food groups may help in reducing energy and fat intake which could lead to sustainable weight loss and maintenance (Raynor *et al.*, 2004). Similarly Jayawardena and co-workers (2013) in

their study recommended that a reduction on dietary variety of highly palatable and energy rich foods may be a way to lower excessive weight gain. At the same time, in order to avoid nutritional deficiency, foods high in nutrients (such as low fat milk, vegetables, fruits) and low calories should be encouraged (Jayawardena *et al.*, 2013).

In regards to the food variety consumption in New Zealand, the existing recommendation states that people should "eat a variety of foods from each of the four major food groups each day; vegetables and fruit, breads and cereals, preferably wholegrain, milk and milk products preferably reduced or low-fat options and lean meat, poultry, fish, shellfish, eggs, legumes, nuts and seeds" (Ministry of Health., 2003). Furthermore for a quantitative approach on eating a variety of healthy foods, these recommendations have further been divided into 'servings' stating to consume: "three or more servings of vegetables, two or more servings of fruit, at least six servings of breads and cereals each day, preferably whole-grain varieties, eat at least two servings of low- or reduced-fat options for milk and milk products , consume at least one serving a day of lean meat, poultry, chicken, seafood, eggs, nuts and seeds, or legumes" (Ministry of Health., 2003).

The percentage of the Pacific population meeting this recommendation as indicated by the latest NZ Nutrition Survey 2008/09 (Ministry of Health. and University of Otago., 2011; Mackay *et al.*, 2012) have been summarised as follows:

- 40.9% of males and 48.9% females were meeting the 3 or more serving of vegetables daily
- 54.3% of males and 62.4% females were meeting the 2 servings of fruits each day
- 32.3% males and 43.4% of females were consuming light grain or heavy grain bread
- 25.2% males and 33.1% of females were consuming reduced fat milk
- 52.9% males and 58.2% females were consuming fresh or frozen fish or shellfish at least once a week

In addition to this, higher consumption of processed meats were also prevalent amongst Pacific people where 43.1% males and 44.7% females were consuming processed meats once to twice per week (Mackay *et al.*, 2012). Concerns regarding overconsumption of processed meats have been found to be associated with increased risk of number of chronic diseases due to high saturated fat and sodium content (World Cancer Research Fund & American Institute for Cancer Research., 2007). Overall the data is indicative that only half the Pacific population are meeting the recommendations

set out by Ministry of Health (2003). Taking into consideration of this specific ethnic group not meeting the recommendations and their current dietary habits as well as their nutrition status, their diet quality therefore becomes a concern.

2.3.3 Diet related behaviours contributing to weight gain

Environmental factors have been shown to influences the dietary behaviour of individuals, leading to excessive energy consumption as well as minimal energy expenditure (Friedman, 2003). The most common diet related behaviours identified to contribute to weight gain includes breakfast skipping, consumption of sugary drinks and fast foods which will be discussed in sub-sections below.

2.3.3.1 Breakfast skipping

New Zealand evidence indicate that skipping breakfast has been associated with increased BMI and this association was more commonly observed amongst Pacific and Maori ethnicities as well as those from low SES (Utter *et al.*, 2006). Historically Pacific people did not consume breakfast early in the morning; their first meal would be consumed later in the day around 11am (Muimuiheata, 2009). Breakfast consumption have been found to contribute to better nutrient intakes and have also been associated with managing healthier body weight (Wyatt *et al.*, 2002; Rampersaud *et al.*, 2005; Szajewska and Ruszczynski, 2010; de la Hunty *et al.*, 2013)

The causal relationship between breakfast skipping and obesity is weak. It was found in a systematic review that one of the limitation in studies investigating the association between breakfast skipping and obesity, was the variation in definition of breakfast skipping (Szajewska and Ruszczynski, 2010). However, it has been observed that breakfast consumption could act as a mediator in encouraging healthful behaviours (Rampersaud *et al.*, 2005; de la Hunty *et al.*, 2013).

Breakfast consumption was found to be positively associated with adequate intake of energy, dietary fibre, vitamins (such as folate, thiamine, riboflavin, vitamin A) and minerals (such as calcium, iron and zinc) (Affenito *et al.*, 2005; Chitra and Reddy, 2007; Ministry of Health., 2012).

According to the latest New Zealand Nutrition Survey it was found that 59 percent of males and 75% of females aged 15-18 years skipped breakfast every day (Ministry of Health. and University of Otago., 2011). Younger Pacific people were found to be at risk of having low vitamin A, calcium, folate iron selenium status (Ministry of Health. and University of Otago., 2011). This does not prove that the sub-optimal status is a result of skipping breakfast but can be reflected back to the previous study that this outcome could potentially be contributed by skipping breakfast.

Skipping breakfast have been found to contribute to irregular meal patterns and was associated with increased frequency of unhealthy snacking in between meals (Sjoberg *et al.*, 2003; Savige *et al.*, 2007). A New Zealand study by Utter and co-workers (2007) found that those who skip breakfast are less likely to meet the recommendations for fruits and vegetable intakes and are highly likely to consume unhealthy snacks (such as those high in fat, sugar and salt) which could impact on body weight. Therefore it is suggestive that consuming breakfast meals could minimize snacking and overeating during the day which lessens the possibility of overconsumption of calories (Savige *et al.*, 2007; Utter *et al.*, 2007).

2.3.3.2 Consumption high-sugar fizzy/soft drinks

Sugary drink's nutritional characteristics include being high in sugar and energy and being poor in nutrients (Ministry of Health., 2012). According to several systematic reviews and meta-analysis it has been found that excessive consumption of sugary drinks is associated with increased body weight as well as increased risk of obesity and other health outcomes such as type 2 diabetes mellitus, cardiovascular diseases and many cancers (Malik *et al.*, 2006; Vartanian *et al.*, 2007; World Cancer Research Fund & American Institute for Cancer Research., 2007; Gibson, 2008; Malik *et al.*, 2010).

The current data on consumption of sugary drinks in New Zealand have been disproportionate with excessive intakes seen amongst younger population groups. According to the latest New Zealand Nutrition Survey it was found that both males and females aged between 15–30 years were more likely to consume sugary drinks (Ministry of Health. and University of Otago., 2011). Furthermore excessive consumption were found amongst young Pacific people aged 15-18years (77% of male and 66% females) (Ministry of Health. and University of Otago., 2011). The current intake is indicative of

non-compliance to the dietary guidelines which states to “limit consumption of fruit juice, cordial, energy and soft drinks because of their sugar content” (Ministry of Health., 2003a).

The reasons for excessive consumption of sugary drinks have in particular been related to low cost and increased availability (Vartanian *et al.*, 2007). Furthermore it has also been found that sugary drinks have an inability to induce satiety hence encourage excessive intake of sugary drinks which leads to excessive energy consumption (Bellisle and Drewnowski, 2007; Vartanian *et al.*, 2007; Wolf *et al.*, 2008)

2.3.3.3 Consumption of takeaways and fast foods

Convenience, busy lifestyle as well as heavy marketing have been factors influencing consumption of fast foods (Ministry of Health., 2012). Fast foods have been found to be high in energy, low in micronutrients and fibre and excessive in portion size contributing to excessive energy intake and increasing risks of weight gain and obesity (Pereira *et al.*, 2005). Various studies have found that consumption of fast food was associated with low diet quality and increased risk of obesity (Paeratakul *et al.*, 2003; Bowman *et al.*, 2004; Schmidt *et al.*, 2005). The WHRF and AICR (2007) state that consumption of fast foods more than two times a week is associated with increased risk of obesity (World Cancer Research Fund & American Institute for Cancer Research., 2007). The prevalence of fast food consumption in New Zealand were seen amongst the younger population groups between ages 15-30 years compared to older population groups according to the latest National Nutrition Survey(Ministry of Health. and University of Otago., 2011). Ethnic findings illustrated that 37% and 28% of young Pacific males and females were consuming takeaway foods more than three times a week (Ministry of Health. and University of Otago., 2011). In line with probable evidence from WHRF and AICR (2007) it is indicative that younger populations groups living in New Zealand are at increased risk of weight gain, overweight and obesity.

2.3.4 Socio-cultural factors influencing food consumption

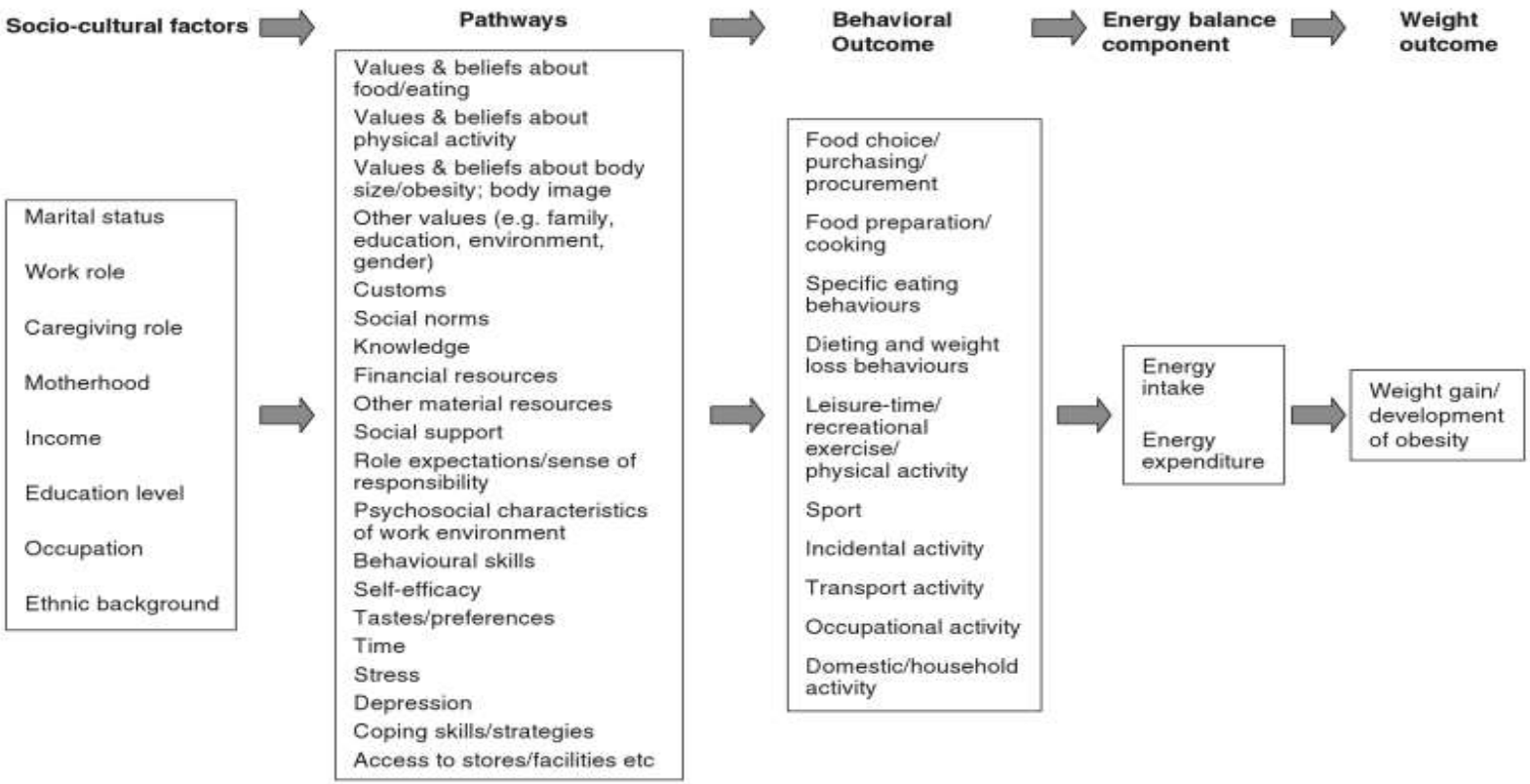
Evidence states that obesity is distributed socio-culturally i.e. the rate of obesity is variable according to socio-economic position, social roles and circumstance, and cultural factors (such as norms, values and beliefs) (Egger and Swinburn, 1997). While most studies have

focussed on establishing the association between socio-economic status (i.e. income) and obesity, very little is known regarding the effects that social and cultural factors have on behaviour which influences food consumption and body weight, especially amongst Pacific youth. The little information that is present however has been derived from reports written for government agencies.

Ball & Crawford (2010) believed that the difficulty in measuring cultural factors such as values and beliefs, contributed to the gap in literature regarding the association between cultural influences and obesity. Ball & Crawford introduced a conceptual model (Figure 2.1) of socio-cultural influences on obesity that takes into account the mediating socio-cultural influences on behaviours on food consumption and physical activity which results in a particular weight outcome. The model attempts to provide a framework that would enable researchers to make plausible links on how socio-cultural factors influence behaviours around food consumption and physical activity which could potentially lead to obesity. Ball & Crawford (2010) emphasized that this model could be applied and amended by future researchers as new evidence are discovered.

This model identifies the socio-cultural factors such as ethnicity, socio-economic status (based on either income, education or occupation) which influences obesity risk through mediating pathways (such as values and beliefs about food consumption, values and beliefs about body weight/image, social norms etc.) that lead to behavioural outcomes (such as food choices, food preparation, specific eating behaviours). The behavioural outcomes dictates energy balance outcomes (such as excessive energy intake and/or minimal energy output) which results in either an increase or decrease in body weight.

Figure 2.1 Ball and Crawford (2010) proposed conceptual model of pathways linking selected socio-cultural factors with obesity



Source: Obesity Epidemiology: From Aetiology to Public Health; Chapter 8; page 111

One of the objectives for this thesis project was to explore how cultural factors influence eating habits amongst Pacific youth which could potentially help explain the prevalence of obesity. Although the socio-economic position and circumstances amongst Pacific people have been discussed in section 2.3.2 and 2.3.2.1, taking a lead from Ball and Crawford's (2010) conceptual model, the next few sections will focus on exploring existing information on the pathways such as beliefs and values about food and eating and body image which may help explain current eating behaviour leading to excessive energy intake and increased risk of weight gain amongst Pacific people living in New Zealand.

2.3.4.1 Social norms, cultural values or beliefs about food and health

Food plays a central role amongst Pacific peoples and is an integral part in all social occasions (Ministry of Health., 2003b). Certain foods have been found to have significant values and are associated with wealth and prestige such as yams, pork, fish, taro, corned beef, coconut cream and desserts including traditional pies, cakes ice-cream and fruit salad all of which have been identified as being high status foods (Ministry of Health., 2003b; King *et al.*, 2010). Cultural practices such as feasting is an important cultural ritual in most Pacific communities as this provides a setting for families, communities as well as social exchanges (Ministry of Health., 2003b; Ministry of Health., 2012). In a report by the Health Sponsorship Council (2007), it was stated that Pacific people accepted some of these traditional high status foods were unhealthy and people were found to continue to over-eat at social occasions, however, the consensus was that social occasions were not a regular affair (Health Sponsorship Council. *et al.*, 2007). Food exchange is of great importance amongst Pacific people. Sharing of food has been found to bring people together and show love, respect, appreciation as well as express hospitality (Ministry of Health., 2003b; Health Sponsorship Council. *et al.*, 2007; King *et al.*, 2010). Food has also been found to show kinship and identity as it is considered an indicator of social status (Moata'ane *et al.*, 1996; King *et al.*, 2010).

Deviation from country of origin (migration) has impacted the sources and types of foods consumed by Pacific people. In New Zealand, Pacific people are exposed to more variety of foods which are of variable qualities compared to what they were consuming in the Pacific Islands (those foods included mainly unprocessed, locally obtained foods from the land and sea) (Vainikolo *et al.*, 1993; King *et al.*, 2010). In a Ministry of Health report on Pacific youth, it was indicated that there is a shift from foods sourced from

home to consuming foods prepared at fast food outlets and takeaway places which contribute to excess energy intake (Ministry of Health., 2008).

Takeaway consumption amongst Pacific people was reported to be influenced by takeaway outlets being close to residential vicinity which encouraged excess intake of takeaway foods (Health Sponsorship Council. *et al.*, 2007). Excessive sugary drink consumption was found amongst some Pacific families as it was considered to cost less compared to purchasing milk (Health Sponsorship Council. *et al.*, 2007). Findings also have suggested that preference for foods and drinks amongst Pacific people were based on taste, affordability and ease of access (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011; Ministry of Health., 2012). For example fast foods such as pies, burger, pizza and salty snacks were the most eaten food items by young Pacific people (Health Sponsorship Council. *et al.*, 2007; Ministry of Health., 2008).

Pacific people have been found to have a holistic worldview on health; however, the limited data available in New Zealand suggest that there is little connection between diet and health amongst some Pacific people (Health Sponsorship Council. *et al.*, 2007). The only time the connection between physical health and diet was clearly made was when a health event took place that required immediate management (Health Sponsorship Council. *et al.*, 2007). For example in a study done by Moata'ane and co-workers (1996), it was found that some Tongan people did not understand the importance of dietary management in type 2 diabetes mellitus and their perception was that a disease is not serious until provided with medication (Moata'ane *et al.*, 1996).

Pacific people in New Zealand are generally aware of the benefits of healthy eating (particularly consuming fruits and vegetables) as related to physical health. However, due to financial constraints, low socio-economic position and lack of knowledge regarding food quality, preparation and purchasing habits in a western society, Pacific peoples' ability to change their food habits independent of cultural factors is hindered (Bell *et al.*, 1997; Sullivan *et al.*, 2004; Health Sponsorship Council. *et al.*, 2007; Lanumata *et al.*, 2008).

2.3.4.2 Brief exploration on perceptions on Body Image

Some studies found that Pacific people desired functional bodies compared to their western counterparts for whom aesthetic appeal was important (Wilkinson *et al.*, 1994; Williams *et al.*, 2006). Pollock (2001) suggested in his study that body image for Pacific women was related to their gender-based functionality which was built around fertility and reproduction (Pollock, 2001). This carried a cultural significance as it was underpinned by kinship relations. A Pacific woman was considered attractive and ideal if she was “full-bodied”, had “wide hips”, “strong legs” and could bear children successfully (Pollock, 2001; Kopelman *et al.*, 2006)

Similarly, Pacific men valued functional bodies compared to aesthetic appeals. The functionality amongst Pacific men was related to their roles within their Pacific societies which included being the warrior, the provider, the fisherman, the hunter-gatherer, the agriculturist etc. (Meleisea and Meleisea, n.d.). As a result of these responsibilities, Pacific men was considered being stronger, taller, active and robust. A body type similar to Pacific men have also been found to be valued and idealised by men from western and non-western cultures according to two cross cultural studies (Ricciardelli *et al.*, 2007a; Ricciardelli *et al.*, 2007b).

The disparity in associating obesity and body image was existent more amongst Pacific compared to non-Pacific people. The reason this disparity came about was that prior studies on Pacific peoples’ body image assumed that Pacific people valued and hence desired a large body size (Craig *et al.*, 1996; Ahio, 2011).

In a study by Craig and co-workers (1996) “Do Polynesian still believe that big is beautiful?” illustrated that Pacific people valued bigger body size (Craig *et al.*, 1996). This was however, referenced to western anthropological observations where bigger bodies in this study were referenced to obesity, which according to Pacific participants was associated with fatness or having adiposity that contributed to health issues (Craig *et al.*, 1996)

The question that arises from the literature is how one defines “big” or “large” body size. Gould (1994), reported that prior research conducted by European researchers’ observed native cultural groups and referenced “bigness” against their own body size and cultural ideals (Gould, 1994). In this regards, European researchers were correct in

observing Polynesians to be bigger in body size. However, it was suggestive that Polynesians do have a bigger body size in terms of stature, muscularity, robustness, body shape, wider shoulders, thicker mid-sections and stronger touted legs compared to European standards and that there was no evidence of obesity that was observed amongst Pacific people (Gould, 1994). More recent evidence have also supported the finding Pacific people have a lower percentage body fat compared to their ethnic counterparts (Rush *et al.*, 2004; Rush *et al.*, 2009b; Camhi *et al.*, 2011)

There is an issue regarding an interchangeable use of terms such as “big” and “large” in the literature referring to obesity or a measure of adiposity related to adverse health outcomes. Therefore, there is no clear evidence that states that Polynesian people idealise bigger body size that is related to “obesity”. Bigger body size amongst Pacific males and females were idealised based on their gender roles and functionality within their culture. The view on extreme obesity was not likely to be valued. Literature however, makes an exception for Pacific chiefs where bigger body size have been associated with body fatness, which in turn signified high status and prosperity (Gould, 1994; Brewis *et al.*, 1998; Metcalf *et al.*, 2000; Teevale, 2009).

Only recently have studies established a change in perspective in body image ideals especially amongst Pacific adolescents. Utter and co-workers (2009) conducted a study in New Zealand amongst adolescents from different ethnic background and found that concerns were raised of “being big” amongst Pacific participants (Utter *et al.*, 2009). In the Obesity Prevention in Pacific Communities (OPIC) study it was found that four out of every ten young Pacific persons perceived themselves as being overweight and more than 50 percent of them were trying to lose weight (Utter and Pacific Obesity Prevention in Communities Project., 2008). Similarly in a study by Teevale (2009) who investigated obesity in Pacific adolescents found, that obese Pacific adolescents who were dissatisfied with their body weight engaged in more weight controlling behaviours than healthy weight subjects (Teevale, 2009). It has also been found through reports published by The Health Sponsorship Council (2007) that Pacific people living in New Zealand are becoming aware of the types of food that impact body weight and that younger Pacific adults were becoming more conscious of the foods they eat and making healthier food choices such as consuming foods like salads at social occasions and

cutting down on sugary drinks (Health Sponsorship Council. *et al.*, 2007; Mackay *et al.*, 2012).

Overall, obesity is known to be associated with body fatness and this theory is not foreign to the Pacific population. Historically a large body size amongst Pacific people was idealised in regards to gender functionality and nowhere was it associated with obesity or elevated adiposity. From westerners point of view Pacific people are bigger in built, however the studies mentioned above showed no association with big body size and excess body fatness but rather the opposite (Utter *et al.*, 2009).; furthermore, the awareness of health consequences was also found amongst the adolescent participants as well as their parents (Health Sponsorship Council. *et al.*, 2007).

In summary of the socio-cultural factors influencing food consumption, Pacific people generally choose food based on availability, affordability, taste, as well as convenience, whilst at the same time being guided by cultural values and traditions impacting food habits (Ministry of Health., 2008; Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011; Ministry of Health., 2012). Furthermore, the increased awareness of obesity and its related consequences on health has encouraged some Pacific people in taking up weight management actions, however some remains at high risk due to their socio-economic constraints (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011; Ministry of Health., 2012).

2.4 Health implications and cost of obesity

Accumulation of excessive fat seen in obesity can lead to detrimental health outcomes (Ministry of Health, 2008). Overweight or obesity in adulthood have been found to increase the risk of chronic health conditions such as type 2 diabetes (T2DM), cardiovascular disease, hypertension, stroke and certain cancers, leading to premature death or a reduced quality of life (National Heart Lung and Blood Institute., 2012)

A New Zealand study found that increased BMI and waist circumference was associated with increasing prevalence of chronic diseases amongst adults and adolescents (Turley *et al.*, 2006; Utter *et al.*, 2009). Evidence on a national and international level have been convincing that increased BMI, WC and waist to height ratios have shown to be associated with increased risk

of CVD (Huxley *et al.*, 2010; Ashwell *et al.*, 2012), diabetes (Huxley *et al.*, 2007; Nyamdorj *et al.*, 2009; Qiao and Nyamdorj, 2010) and mortality (Seidell, 2010; Flegal *et al.*, 2013).

Turley et al (2006) found in their study that New Zealand adults in the high BMI or WC category were 3.5 times more likely to have T2DM (Turley *et al.*, 2006) . Type 2 diabetes mellitus has been found to be a stronger contender in health consequences as a result of obesity where approximately 90% of people diagnosed with T2DM are obese or overweight (New Zealand Health Strategy. and New Zealand Disability Strategy., 2001). Type 2 diabetes mellitus increases the risk of developing chronic diseases even further (such as the ones mentioned above, in addition to blindness, kidney failure and amputations). New Zealand data demonstrate that Pacific adults carry the burden and increased risk of developing T2DM due to obesity being highest amongst this ethic group (68%) (New Zealand Health Strategy. and New Zealand Disability Strategy., 2001). It was found in the latest Health Survey that one in eight Pacific adults have been diagnosed with T2DM (Ministry of Health., 2013).

Obesity amongst young people leads to obesity and obesity-related comorbidities in adulthood (Engeland *et al.*, 2004; Gordon-Larsen *et al.*, 2004; Reilly, 2006; Singh *et al.*, 2008; Reilly and Kelly, 2011; Starc and Strel, 2011). Along with being at high risk of previously mentioned health consequences, psychological factors such as low self-esteem; behavioural issues, stigmatisation and discrimination were also consequences associated with obesity amongst young people (Bray, 2004; Carr and Friedman, 2005; Wardle and Cooke, 2005; Haines *et al.*, 2007; Stewart *et al.*, 2009).

The associated health care cost with obesity is enormous and have been shown to increase over the years due to higher incidences of obesity-related adverse health outcomes. The WHO, estimates that obesity consumes between 2% and 7% of individual nation's health budget annually. In a recent study conducted by Swinburn and co-workers (2014), it was found that overweight and obesity directly cost the New Zealand health system $624 million dollars per year. This was equivalent to 4.4% of New Zealand's total health care expenditure in 2006 (Swinburn *et al.*, 2014). Even though the expenditure is in line with WHO obesity related health cost estimates, the trend in costs in New Zealand have increased over the last three decades (2.5% in 1991 vs 4.4% in 2006). In relation to obesity's contribution to chronic diseases, obesity was costing the New Zealand health system six million dollars for just T2DM in 2008. Due to Pacific people being at high risk of T2DM and its associated co-morbidities, the cost has been forecasted to increase to 1770 million NZ dollars by 2021/22 (Ministry of Health, 2008). The

financial burden and the increasing health consequences associated with obesity highlights the fact that obesity is only increasing, and have been predicted to continue increasing.

2.5 Summary

The prevalence of obesity is found to be high amongst Pacific people; more particularly the risks of obesity are higher for the younger Pacific population. The prevalence of obesity has been associated with low socio-economic position and high risk of food security.

The diet quality of Pacific people, particularly younger Pacific people, is of concern. Measuring diet quality through a measure of dietary diversity in a westernised setting is a new concept since prior studies have been conducted in developing countries. The results have been consistent in linking low dietary diversity and food variety scores to nutrition inadequacy which contributed to malnutrition. Obesity is also a form of malnutrition and by assessing Pacific people's dietary quality and establishing how nutritionally diverse or poor their diets are, will provide a different dietary point of view regarding the obesity pathways. This is of particular concern for Pacific youth where current evidence is indicating that nutrition inadequacy is prominent amongst younger Pacific age groups.

Obesity is found to be underpinned by socio-cultural factors such as cultural values, traditions and environmental influences that have shown to influence food habits amongst Pacific people. The perceptions of traditional views on body image have changed where larger body size is now considered unhealthy. A sense of awareness also exists amongst people on the health consequences associated with obesity. However, for some Pacific people, literature states that due to socio-economic constraints, making changes to eating habits is difficult. On the whole, obesity puts Pacific people at high risk of developing chronic disease which not only impacts quality of life but also the economy.

Chapter 3: Methodology

3.1 Introduction

This research study forms part of a larger qualitative study in Pacific youth called “Chewing the facts on fats - what does it say about you?”. The aim of the larger study is to carry out in-depth interviews with Pacific youth gathering data on their social-cultural realities as related to pathways of obesity and then to train them to conduct similar interviews with their parents and grandparents, to explore the historical cultural context of food and socialization patterns across generations as it is related to food and body size. The dietary component in the larger study will form the basis of this Master’s thesis. The larger study acknowledges that the burden of obesity is the highest amongst Pacific people living in New Zealand and due to this increasing prevalence, the current interventions or programs do not seem to be effective enough to tackle the issue. Additionally, previous work has been done on older people who have higher risk of health conditions such as T2DM, stroke and cardio-vascular disease, all of which have obesity as a risk factor. Other work has been done focusing on children, adolescents (aged 13-17years), adults and older adults, however insufficient evidence is available amongst the 16-24 year age group. This age group makes up 19% of the total Pacific population living in New Zealand. Furthermore, this age group is important due to their level of independence and their capacity of understanding their own and their family’s social realities. If given the opportunity, people of this age can make a huge contribution in addressing obesity issues related to their culture and social environment. The overall objective with the larger study is to achieve a knowledge base on pathways into obesity in the context of social, cultural and historical realities amongst Pacific people and how these have changed across generations. Furthermore this study will establish information on the social, cultural and historical meaning and relationship with food and diet amongst Pacific people which could help in health promotion. The larger study will be conducted in three phases. Phase One will include interviewing Pacific youth participants in order to gain information on socio-cultural realities, Phase Two includes training the participants to interview their parents and grandparents and Phase Three will include exploring the data and developing programs and or potential areas of research to build upon the current research findings. For this particular Masters project the focus was only on investigating dietary diversity and related dietary factors and eating habits that may impact diets of Pacific youth in Phase One of the larger study.

3.2 The study design

This particular Masters project has been conducted during Phase One of the larger study using an exploratory, qualitative, cross sectional approach. In this study, diet quality was assessed by exploring dietary diversity, food variety and eating habits of Pacific youth within a cultural and social context to identify factors contributing to obesity.

3.2.1 The exploratory-qualitative nature of the study design

A qualitative research design is by definition exploratory in nature, gaining ideas and insights on a research question or topic (Punch, 2013) . It enables researchers to come up with a hypothesis or an explanation on how variables could potentially be related (Punch, 2013). In this particular study the exploratory design is used to gain insights on how social, cultural and historical factors could potentially be related to obesity amongst Pacific people, especially amongst Pacific youth. By no means does an exploratory research design attempt to accept or reject these hypothesis but opens up the opportunity for that hypothesis to be used further for descriptive or quantitative research designs (Punch, 2013). Exploratory research provides meaningful information or definitive explanations for a selected group but not for the entire population, since participants are not necessarily selected randomly or in large numbers. This design is therefore used to generate theories around research questions due to the qualitative nature of the data being collected (Punch, 2013).

Some of the pros and cons of using exploratory research design is that it helps define a problem or problems and can aide in prioritising the most important issues that would need to be addressed. This approach is very successful when there is limited data available about the topic or problem being studied. Therefore this method provides room for flexibility in gaining insights, developing a hypothesis, and generating theory about the research topic (Punch, 2013).

There are several methods that can be used in the qualitative-exploratory study design. Some of these methods include literature reviews, in-depth interviews, focus groups and case studies (Patton, 2005). This particular study will use in-depth interviews with participants in gathering information for the study. There are many reasons why an in-depth interview was an appropriate method to use as opposed to other exploratory methods

mentioned above. The interviewer gains first-hand information as well as experiences from the participants. Potential candidates for the in-depth interview can be anyone who can provide relevant information regarding the topic under investigation (Patton, 2005). In regards to this study a potential participant is someone from Pacific background, aged between 16-24 years including both males and females.

Several advantages of using the in-depth interview method for this exploratory study include the assurance that participants will feedback and respond to the questions asked during the interview. Further that there is also an opportunity for interviewers to prompt the participants either verbally or non-verbally to gain better in-depth explanations or responses to open ended questions. By doing so, it provides an opportunity for participants to explain and clarify questions which increases the accuracy of the information collected. Interviewers can also use their expertise, knowledge and interpersonal skills to explore unintended topics that may be raised by the participants which can be related to the study (Berg and Lune, 2004; Boyce and Neale, 2006).

Such interview methods can also be an opportunity for interviewers to record what they physically observed during the process, which potentially may offer interviewers additional information on the overall assessment process (Boyce and Neale, 2006). Due to the fact that the interview process is a way of personal interaction, it helps interviewers build rapport with participants which could help them feel at ease during the interview process (Berg and Lune, 2004; Boyce and Neale, 2006). When participants are comfortable talking to the person in front of them, it allows them to create conversations that can be meaningful to them and the conversational flow of the interview process can also hit sensitive topics which can be valuable for the research. The interview method has a flexible nature and it can be scaled as appropriate for the situation or participant. Interviews can be conducted in several different locations, at different times and it can therefore be structure around the circumstances and schedules of the participants (Boyce and Neale, 2006).

The disadvantage for using in-depth interviews is that it can be quite time consuming as well as costly to train the interviewers, schedule and conduct, record and analyse the interview. (Boyce and Neale, 2006). However this method of data collecting is less invasive and does not require much from the participants except for their consent and time (Boyce and Neale, 2006). It is however, important to ensure that the interviewers are well trained and that they

have a good base knowledge regarding the research topic, that they feel confident in conducting the interview and are able to record responses from the participants since it is these technical issues which could lead to error if not addressed (Berg and Lune, 2004; Boyce and Neale, 2006). The interviewers need to be aware of their tone of voice, the way questions are paraphrased or asked, and the potential to take inadequate notes due to a good flow of the conversational process. If too much flexibility is allowed in the process it can result in interviews being inconsistent (Boyce and Neale, 2006). A lot of information can be gathered from one interview process and the information is more subjective which could make analysis difficult. Therefore, it is really important to have a plan on how to analyse the results before conducting the interviews (Berg and Lune, 2004; Boyce and Neale, 2006).

3.2.2 The cross sectional nature of the study design

The cross-sectional study is a type of observational study which involves collecting data from a specific population and aims to provide information on the population being studied (Hulley *et al.*, 2007). For example, the observational study will be conducted on a certain number of Pacific youth participants however the findings will be generalized to the entire Pacific youth population.

The cross sectional design is used to gather information that would describe characteristics of a specific group and by no means is it used to determine causal relationship within variables, nor is it used to manipulate variables. This information gathered would therefore be used to develop other methods in order to investigate the observed characteristics. Cross sectional data is usually collected at one time point only (Hulley *et al.*, 2007).

Data for cross-sectional studies can be collected using questionnaires and/or interviews as well as other measures. It has many advantages such as savings on costs, having better control over precision of the data collected, and ensuring that specific data is collected (Hulley *et al.*, 2007). Disadvantages include not being able to determine causal relationships and limited generalisability depending on the sample size. Some cross-sectional studies require a large sample size and a disadvantage here is the potential for bias when selecting sample (Hulley *et al.*, 2007). The study design of this study can be described as a cross-sectional, exploratory study design. The aim is to investigate dietary diversity, food choices and eating habits of Pacific youth through quantitative questionnaires, followed by a qualitative exploration of their eating habits.

3.3 Ethical concerns

The ethics application for this study has been approved by the Central Health and Disability Committee (Ref: 13/CEN/22). Participants were sent a consent form outlining the details of the study and all the rights the participants had when taking part in this study. The interview process will cover topics such as body image, weight, family, diet and social life. To some individuals these topics could therefore be sensitive. The participants were also provided an opportunity to decide if they did not want to further participate in the study. They were given the opportunity to withdraw from the study at any stage if the process got too uncomfortable for them. To make sure that the participants' responses were kept private and confidential, codes were used to identify each participant rather than their names. Each question had a number allocated to it to, therefore questions were also coded.

3.4 Diet quality

Investigating diet quality of a specific population provides a snap shot of the aspects of diet quality amongst Pacific youth, supplemented with a qualitative description that could provide an explanation as to why obesity could be the result of their diet quality.

Diet quality in this study was established by identifying dietary diversity (number of food groups consumed) and food variety (total number of food items consumed) within a seven day period. The method to establish diet diversity and food variety is through developing a dietary diversity questionnaire. The dietary diversity questionnaire was developed based on guidelines developed by the Food and Agriculture Organisation of the United Nations (FAO) for measuring household and individual dietary diversity in developing countries to assess nutritional quality of their diets (Kennedy *et al.*, 2011). The guidelines suggests that individual foods should be grouped into nine nutritional food groups (including flesh foods (meat, poultry, fish); eggs; dairy products; breads, cereals and starchy vegetables; legumes and nuts; vitamin A rich fruit and vegetables; other fruits; other vegetables; oils and fats). According to the guidelines, even though validation of such questionnaire has been done, it is however not culture, location or population specific, therefore, before this questionnaire is implemented it is important to adapt it to the local context.

3.4.1 Process of developing the dietary diversity questionnaire tool

A description of the foods and drinks consumed in a Pacific and New Zealand setting was identified by exploring existing research data including the New Zealand Nutrition Survey (Ministry of Health. and University of Otago., 2011) and with assistance of Pacific people. The food lists were finalised and grouped according to the recommended nine nutritious food groups (flesh foods (meat, poultry, fish); eggs; dairy products; breads, cereals and starchy vegetables; legumes and nuts; vitamin A rich fruit and vegetables; other fruits; other vegetables; oils and fats. In addition to the nine nutritious groups, six energy dense (discretionary) food groups were added into the questionnaire (including drinks; alcohol; sauces; miscellaneous items (spreads and flavourings); sweets; takeaways). This process was not mentioned in the dietary diversity guidelines however due to the large availability of foods identified in this setting and also the nature of this study to explore foods eaten that contribute to obesity, the addition of discretionary foods to the questionnaire was needed.

There were a few considerations that had to be made when developing the questionnaire; with one of them being the reference period of food consumption. The guideline suggests a reference period of 24 hours to reduce the risk of recall error as it does not put too much strain on the participants' memory (Kennedy *et al.*, 2011). However the 24 hour food consumption will not capture habitual dietary intake. Other suggested timeframes include 3 or 7 days of food consumption, however it will take longer for participants to think what they ate during those periods (Kennedy *et al.*, 2011). For this particular study choosing a 7 day consumption period was appropriate to be able to establish differences between weekday and weekend day food consumption, this is regardless of the disadvantage of using 7 days reference period. Although this may be a bit more challenging to participants to recall intakes, no quantities or exact days of intake are required, only an indication of whether a particular food was consumed at all over the last seven days (Kennedy *et al.*, 2011).

Another factor we considered when developing the questionnaire was to incorporate the consumption of food eaten outside of home, to capture consumption of meals that are prepared and purchased outside of home especially since this is becoming an increasingly common practice in western societies. According to the guidelines this question is usually the last question in the questionnaire (Kennedy *et al.*, 2011).

It was contemplated whether or not to incorporate atypical consumption (i.e. consumption of food during festive occasions). However the guidelines do not recommend that the

questionnaire should be implemented during festive celebrations or public holiday as food intake will not reflect a typical diet. However food consumption questions during special occasions were asked separately when assessing eating habits.

The final questionnaire was thoroughly reviewed in a focus group with Pacific people. Several aspects were scrutinized: to ensure that the team and the interviewers carrying out the survey knew exactly what the aim of the questionnaire was, to assess their understanding of the questions, and the requirements for completion of the questionnaire. The food items on the list were scrutinised and assessed in regards to the appropriateness for inclusion and also if the names of the food items would be locally recognized. Additions of foods were made as deemed appropriate. The review also ensured the team understood differences between meals and snacks and being able to explain less common foods such as legumes.

All the subsequent modifications were made to refine the questionnaire. Some food groups had food items added to them, some food items had to be moved to another food group and some food groups had to be combined due to similar nutritional characteristics. For example breads, cereals and starchy vegetables were combined into one group because they were all a source of carbohydrates in the diet that are recognised as being eaten as part of a meal by this group. In regards to oils and fats, the team deliberated on whether to place oils and fats as a nutritious food group or discretionary group however a consensus was reached that even though they were categorised as a nutritious food group in the guidelines, it was placed in the discretionary category for this study due oils and fats being an added source of energy which in the context of obesity should be used with discretion. Meanwhile information gathering was also done in finding easier ways to define terms used in the questionnaire such as asking participants what they ate instead of what foods they consumed. The team also recognised the season the questionnaire will be implemented and hence the availability of foods during that season such as feijoa and persimmon. These were overcome by having an option where additional foods consumed could be named. Furthermore the availability of traditional food items and how easily the participants can access them were recognised. The final questionnaire had 15 food groups which were categorised into a nutritious category and a discretionary category. The eight food groups under the nutritious category included meat, fish and poultry; eggs; dairy products; cereals, roots and tubers; legumes and nuts; vitamin A rich fruit and vegetables; other fruit and juice; other vegetables. The seven food groups in the discretionary category included Oils and

fats; Drinks; Alcohol; Sauces; Miscellaneous items (spreads and flavourings); Sweets; Takeaways (See appendix 1). The final questionnaire was written in the language that is nationally recognised which in this case was English, the food group and food items has been appropriately allocated and agreed on by the team, including the interviewers that would conduct the in-depth interviews.

3.5 Eating Habits

Exploring habits regarding Pacific eating habits is really important for this study especially if the "why" questions are being explored. This part of the study aims to find out what Pacific youth usually eat during meal times, whether or not they snack and if their intakes differ during weekdays and on weekends. In addition to that, eating on special occasions was also be explored. Eating habits can also provide an insight on what could potentially influence participants to eat what they eat and why they eat.

Eating habits were explored via a qualitative eating habits questionnaire. The qualitative data analysis involved content analysis and ethnographic description to explore the meaning of the data. The questionnaire was developed to explore specific cultural dietary practices around social events in Pacific communities. The questionnaire included topics on appetite, weight issues, whether or not breakfast, lunch, dinner and snacks in between meals were consumed, including a more in-depth assessment of usual food intakes at meal and snack times during weekdays and on weekends. Food consumption on special occasions and changes in usual food intakes were also explored. This questionnaire was used in a one-on-one interview setting to collect data similarly to dietary diversity information gathering.

3.6 Recruitment process

Participants were recruited by two primary health service providers; West Fono Health Trust and Evolve Youth Services. West Fono Health Trust provides affordable healthcare services across several locations in Auckland (Manurewa, Henderson, CBD, and Block House Bay). Some of the services that are provided through this health trust include medical, dental community support, pharmacy and health awareness services. West Fono Health Trust was formed in 1990 to provide health services that would benefit population of Pacific ethnicity and those with high needs. Since then it has grown and renamed as Pasifika Healthcare to West Fono Health Trust. West Fono works towards reducing inequalities in communities living in Auckland, by finding strategies to deliver health services that are culturally appropriate across their 4 clinics

located in Auckland. Evolve Youth Services is a youth health organisation which is situated in Wellington that is run by youths. Evolve works according to the youth development model which gives an emphasis to young people's health and their connection with their family, community, education and employment circles. Their focus is to build strength as well as resilience in supporting young people to make wise and positive decisions. Evolve provide various services including health care, counselling, and social support, as well as support with gender and sexuality issues.

Both these health service providers run health programs that targets Pacific youth ages 16-24 years and have built a good rapport with them and their families. They also promote research opportunities to Pacific health and disability workers. Across the two centres, 30 participants were recruited by team members that work at these two primary health services. Due to the larger study having three phases, the number of participants will increase as each phase progresses when family members become involved. However, for the purpose of this Masters project, the 30 participants selected in phase 1 of the study were included in the sample.

The recruitment phase involved researchers' consulting each Primary Health Care providers in identifying potential participants. A sample of participants was drawn from each centre based on their age, gender and ethnicity. Participants were sent an invitation to participate in this study, an information pack outlining the study details and consent form.

The method of sample selection was based on purposive or judgmental sampling. Purposive sampling was appropriate for this type of study due to participants being selected according to certain characteristics i.e. age, gender and ethnicity. The sample number was chosen based on theoretical saturation. The theoretical saturation in this particular study determined the minimal number of interviews that would need to be carried out. According to saturation calculation, anywhere between 15 to 20 interviews can be conducted to provide some significance to the study however the number of participants recruited were 30 which is sufficient to allow for dropouts.

3.7 Data collection

An in-depth interview was conducted with participants. The basis of carrying out a one on one interview was to explore the quality of diet amongst the participants, their eating habits, the importance of food at social occasions and how cultural values could have an impact on food habits and intake amongst the Pacific population.

The interview process and data collection were done by health workers and nurses who work at both the primary health care centres as well as tertiary students enrolled in PHD or Masters' degrees. These individuals were trained as research assistants in order to carry out the interviews with the participants.

3.7.1 Training the interviewers

Once the two questionnaires were finalised, interviewers were trained on how to collect the data using the questionnaire. There was a standard of practice document developed for the dietary diversity questionnaire that outlined how the interview will be carried out. The training involved re-emphasizing the use of dietary diversity (the what, why, when and how), familiarizing themselves with the food groups as well as the individual food items. There were also demonstrations on how to phrase and paraphrase questions which was applicable for both questionnaires. The dietary diversity questionnaire is more straightforward as it only requires collection of data on whether or not the participants consumed listed food items over the reference period of 7 days (only requires a yes or no). The information collected on eating habits are quite subjective and will require interviewers to gain in-depth answers from the participants. Interviewers were therefore trained in ways to prompt the participants so they can elaborate on their answers and provide as much detail as possible. The research assistants were also trained to take anthropometric measurements correctly in order to reduce inter-examiner error.

3.7.2 The interview content and process

Each interview lasted approximately 90 minutes. The data was collected on various topics such as demographics of the participants, cultural perspectives and diet and nutrition which will be further discussed.

The useful demographics data for this study included information on anthropometric measurements and ethnicity. The anthropometric data such as body weight and height (used to calculate BMI) and waist and hip circumferences (to calculate waist-to-hip ratio) were collected via standardised procedures (Marfell-Jones *et al.*, 2006). Calibrated scales were used to measure body weight; height was measured using a wall measuring tape and waist and hip circumferences was measured using a measuring tape on the day of the interview.

The information on cultural perspective was collected on the topics of attitudes and lifestyle, food practices, body size (perceived, ideal and actual), roles of value and belief system on body size, acculturation, knowledge, understanding of current health policies and programs to prevent obesity and ideas on preventive interventions. The data specific to cultural perspectives was collected through a lifestyle questionnaire by research assistants in the same interview setting. The lifestyle questionnaire was designed from the Kohala Health Research Project and has also been validated so it can be used in New Zealand.

The diet and nutrition part of the interview was assessed in two dimensions. Firstly the data was collected on diet quality through the dietary diversity questionnaire which was explained previously. The data on the dietary diversity part was obtained via interviewers directly reading out the questions from the questionnaire and filling out the questionnaire according to participants' responses. The second dimension was to assess the eating habits of the participants. This was done using the eating habits questionnaire as previously mentioned, and was obtained by interviewers asking questions directly from the questionnaire as well as using appropriate probing questions when further explanations were required. The research assistants were required to record all the answers provided by the participants and was allowed to paraphrase the questions where participants did not understand the question.

3.8 Data analysis

The data analyses were divided into two categories; a descriptive data analysis for dietary diversity and a qualitative content analysis for eating habits.

3.8.1 Diet diversity analysis

The software Microsoft Excel 2010 was used to enter and analyse the descriptive data for the exploration of dietary diversity. Due to the qualitative nature of the research and the subsequent small sample size, further statistical analysis was inappropriate. Upon analysis the 15 food groups from the dietary diversity questionnaire were disaggregated into 26 food groups where 15 food groups were categorised under the nutritious category and 11 food groups were categorised under the discretionary category. This was an expansion to the guidelines on analysis of dietary diversity where it was stated that foods should be divided into nine nutritious food groups to assess dietary quality (Kennedy *et al.*, 2011). However previous research (Arimond *et al.*, 2010) showed that precision of dietary diversity indicators

was improved when greater disaggregation of food groups is used. Table 3.1 illustrates the disaggregation of the food groups into nutritious and discretionary categories for analysis.

Table 3.1: Disaggregation of food groups

DDQ used in the study (15 food groups)	**Disaggregation for analyses (25 food groups)**
NUTRITIOUS FOOD GROUPS (8 food groups)	***NUTRITIOUS FOOD GROUPS (15 food groups)***
Meat, fish and poultry	Meat
Eggs	Fish
Dairy products	Poultry
Breads, cereals, roots and tubers	Eggs
Legumes and nuts	Milk and milk products
Vitamin A rich fruit and vegetables	Cheese
Other fruit and juice	Cereals
Other vegetables	Bread
DISCRETIONARY FOOD GROUPS (7 food groups)	Roots and tubers
Oils and fats	Legumes
Drinks	Nuts
Alcohol	Vitamin A rich fruit and vegetables
Sauces	Vitamin C rich fruit and vegetables
Miscellaneous items (spreads and flavourings)	Other fruit
Sweets	Other vegetables
Takeaway	***DISCRETIONARY FOOD GROUPS (11 food groups)***
	Discretionary flesh
	Discretionary dairy
	Discretionary bread, cereal and starchy foods
	Oils and fats
	Drinks
	Alcohol
	Sauces and flavourings
	Spreads
	Sweet snacks
	Savoury snacks
	Takeaways

From the dietary diversity questionnaire, several analyses approaches were used:

- Calculation of dietary diversity and food variety scores (which included an overall score, score from the nutritious category and score from the discretionary category) to establish high, medium or low diet diversity and variety using cut offs from the guidelines (Kennedy *et al.*, 2011)

- Food variety within and across food group i.e. the number of foods eaten within each group to establish high, medium or low food variety using cut offs established by Matla (Matla, 2008)
- The types of foods consumed from each food group by the majority of the participants.

3.8.2 Eating Habits analysis

For the qualitative eating habits data, a content analysis approach was used to identify trends and themes within the core categories. Data was coded and core categories emerged including:

- Consumption of meals and snacks during the week and weekends with exploration on
    - Regularity of meal consumption patterns during the week and weekends
    - Pattern of snack consumption during the week and weekends
    - Types of foods consumed at each meal
- Food consumption at social occasion with exploration on :
    - Increased intake at social occasions
    - Decreased intake at social occasions.
- Cultural influences on food consumption with exploration on:
    - Cultural-spiritual beliefs
    - Pacific culture and traditions

The perceptions on body weight and current lifestyle were also explored using content analysis. The following themes emerged from the data:

- Families perspectives on large body size
- Peers perspective on large body size
- Participants who perceived to have healthy lifestyle
- Participants who perceived to have an unhealthy lifestyle

The findings will be presented according to the above core categories and underlying themes with ethnography to provide direct quotations from the participants to support the findings.

The conceptual model of pathways linking socio-cultural factors with obesity by Ball and Crawfords, (2010) was adopted to assist in interpreting cultural finding from this study. The model was applied and made specific according to what was needed to be explored from this study. Figure 3.1 illustrates the selected topics that were adopted from the original model.

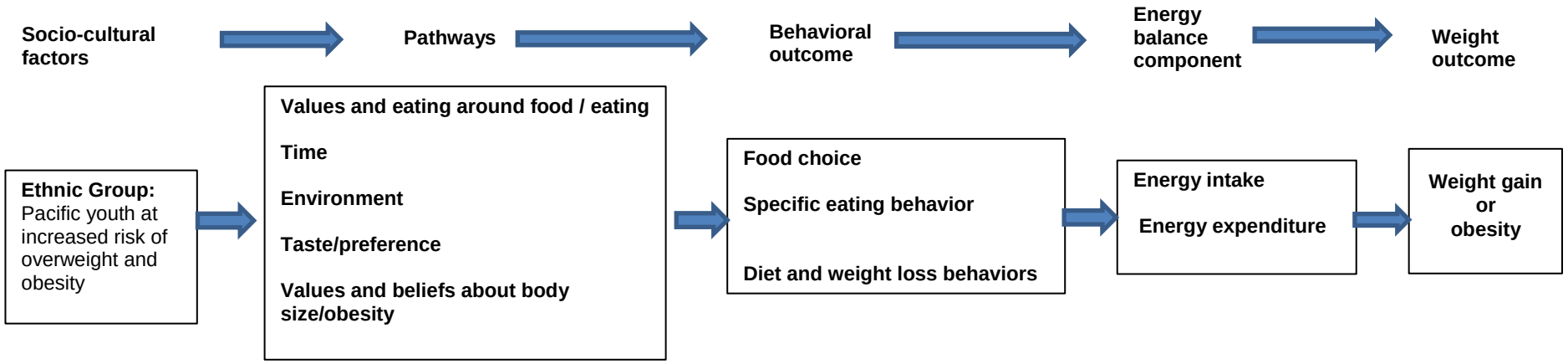


Figure 3.1: Adopted Conceptual model of pathways linking selected socio-cultural factors with obesity (Ball and Crawford, 2010)

CHAPTER FOUR: RESULTS

4.1 Introduction

The findings on diet quality and eating habits will be presented in this chapter. The aim of this study was to explore diet quality and eating habits amongst Pacific youth aged 16-24 years living in the Wellington and Auckland areas of New Zealand in order to find out how this may pave a pathway into obesity from a diet and nutrition perspective. The objectives set out to achieve this aim include establishing the dietary diversity and food variety of the participants in order to establish the nutritional quality of the diets amongst the participants. Furthermore to elaborate the understanding of diet quality, this study also explores eating habits as well as social and cultural factors that influence eating habits and eating practices.

This study used an exploratory, qualitative approach to explore diet quality amongst Pacific youth. A cross-sectional study design was implemented in the two centres. A self-developed questionnaire was used to gather data through an individual interview process. Thirty participants were recruited for this study. Table 4.1 illustrates the demographic information of the participants including their specific ethnicity, mean age, and anthropometric information.

Table 4.1 Summary of participants' characteristics

Characteristics	**Mean (s.d.)**	**Number of participants**
Ethnicity (N=30)[#]		
New Zealand European		3
Maori		1
Samoan		12
Cook Island Maori		2
Tongan		7
Niuean		4
Chinese		9
Indian(Pacific)		1
Other		10
Gender (N=30)		
Male		13
Female		17
Age (years) (N=30)	20 (2.5)	
BMI (kg/m^2) (N=29)*[,1]	31 (6.9)	
Waist to hip ratio (N=26)[$, 2]	0.8 (0.0)	

Pacific people have a mixture of ethnic backgrounds. Even though the numbers of participants are 30, their background can be categorized into several ethnicities.

* BMI reference values interpreted using WHO definitions (World Health Organisation., 2006a)

$ Waist to hip ratio classification interpreted using WHO publication (World Health Organisation., 2011)

[1,2] subject number not 30 due to participants not consenting certain anthropometric measurements to be taken.

The mean BMI of this group of young Pacific people was 31 kg/$m^{2,}$ which is indicative that on average the participants were classified under the obese category (>BMI of 30kg/m^2) and in regards to the waist to hip ratio of 0.8, the data indicates that the mean WHR was similar to the cut off for low risk. Participants on average were under the low health risk category.

4.2 Measuring Diet Quality using dietary diversity and Food variety

The data collected from the interview on the foods consumed during the reference period was collated and allocated into individual food groups. For analysis on dietary diversity (DD) individual food items were allocated into food groups. The dietary diversity questionnaire was developed based on guidelines developed by Food and Agriculture Organisation of the United Nation (FAO) for measuring household and individual dietary diversity (Kennedy et al., 2011). The original nine nutritious food groups from the FANTA guidelines (flesh foods (meat, poultry, fish); eggs; dairy products; breads, cereals and starchy vegetables; legumes and nuts; vitamin A rich fruit and vegetables; other fruits; other vegetables; oils and fats) were expanded to include both nutritious food groups and discretionary food groups which contain foods consumed regularly but contribute mainly energy dense foods. The final questionnaire had 15 food groups (meat, fish and poultry; eggs; dairy products; cereals, roots and tubers; legumes and nuts; vitamin A rich fruit and vegetables; other fruit and juice; other vegetables; oils and fats; drinks; alcohol; sauces; miscellaneous items (spreads and flavourings); sweets; takeaways). The food groups were divided into nutritious and discretionary categories. Nutritious categories contain food groups with nutrient dense foods whereas discretionary categories contain food groups with energy dense and nutrient poor foods. Previous research (Arimond et al 2010) showed that precision of dietary diversity indicators was improved when greater disaggregation of food groups is used. For this reason, the food groups were expanded for the analyses to include 15 nutritious and 11 discretionary food groups (See table 3.1)

Dietary diversity scores was categorised into low diversity (0-3 food groups), medium diversity (4-5 food groups) and high diversity (≥ 6 food groups) which was determined following the dietary diversity guidelines (Kennedy *et al.*, 2011)

Dietary diversity was assessed by counting the number of food groups consumed by the participants, irrespective of the quantity of food consumed. Food variety was assessed using a food variety score (FVS) which was done by counting the number of individual food items consumed during the 7 days reference period. The number of foods eaten was irrespective of the quantity consumed. Differences between consumption of nutritious and discretionary food items were analysed by establishing the mean values as well as the

minimum and maximum number of food groups and individual food items consumed in each category. Food variety scores were also classified into low (<30 food items consumed), medium (30-60 food items consumed) and high variety (>60 food items consumed) (Matla, 2008).

Table 4.2 illustrates the number of food groups and individual food items consumed through dietary diversity scores (DDS) and food variety scores (FVS).

*Table 4.2 Mean value and range of Dietary diversity scores and Food variety scores**

	Females (n=17)	Males (n=13)	Total (n=30)
DDS (n=26)[1, #]	22.6±2.15 (18-25)	23.9± 1.83 (21-26)	23.1 ± 2.11 (18-26)
DDS nutritious food groups (n=15)[2, #]	13.9 ± 1.89 (9-15)	14.75± 1.484771 (12-15)	14.3 ±1.76 (9-15)
DDS discretionary food groups (n=11)[3]	8.61±0.78 (7-11)	9.17 ± 0.83 (8-11)	8.83 ±0.83 (7-11)
FVS (n=227)[4, ^]	90.6 ± 37 (32-167)	91.7 ± 33.8 (49-158)	91.0 ± 35.1 (32-167)
FVS Nutritious foods (n=129) [5, ^]	52.4 ± 23 (17-93)	50.6 ± 19.80 (24-90)	51.7 ± 21.4 (17-93)
FVS discretionary foods (n=98)[6, ^]	38.2 ± 15.5 (15-74)	41.1 ± 15.3 (23-73)	39.3± 15.2 (15-74)

*The results represent the mean ± standard deviation and (minimum value–maximum value); 1) DDS (abbreviated for dietary diversity score) is the total number of food groups analysed; 2) Food groups that contain nutritious foods; 3) Food groups that contain discretionary foods; 4) FVS (abbreviated for food variety scores) is total number of food items identified for analysis; 5) Total number of nutritious foods items identified for analysis; 6) total number of discretionary food items identified for analysis; # Total Dietary diversity score: low =0-3 food groups, medium = 4-5 food groups, High > 6 food groups (Kennedy *et al.*, 2011); ^ Food variety scores: low < 30 individual foods, medium = 30-60 individual foods, High > 60 individual foods (Matla, 2008)

The mean total DDS was 23.1 indicating 23 out of 26 food groups were consumed during the 7days reference period which is indicative of high dietary diversity. The mean DDS in the nutritious and discretionary groups were 14.3 and 8.83 respectively; both indicating high diversity.

The food variety scores show that out of 227 food items, 91 food items were consumed on average which indicates high variety. Out of 129 nutritious foods identified, on average 52 food items were consumed. Similarly, 98 discretionary food items were identified out of which 39 foods items were consumed with higher consumption seen in males than females. The findings on nutritious foods FVS and discretionary foods FVS indicates moderate variety within the two categories.

4.2.1 Exploring food variety within each food group

Food variety was further investigated by exploring the number of food items consumed within each food group. Table 4.3 illustrates the variety of foods consumed within each food group.

The findings from table 4.3 show not all 227 identified food items in the dietary diversity questionnaire were consumed by the participants. There were a few participants that consumed all the items from certain food groups such as poultry (n=6, 20%); eggs (n=24,80%); cheese (n=6,20%); cereals (n=1,3%); legumes(n=1, 3%); nuts and seeds (n=1, 3%); other fruits (n=1, 3%); discretionary flesh foods (n=4, 13%); discretionary breads, cereals and starchy vegetables group (n=2, 7%); sweet snacks (n=3, 10%) and takeaways (n=1, 3%) (See Table 4.3).

The highest mean variety in the nutritious food category was found in the Vitamin A rich fruits and vegetables group. The total number of food items identified in this group was 23 from which 19(63%) participants consumed between three and eight food items from this group. The highest mean variety in the discretionary food category was found in the drinks group. The total number of items identified in this group was 14 where 24 (80%) participants consumed between 4 and 10 drink items. Takeaways was also found to have a high mean variety with a total of 13 items identified of where 25 participants consumed between 3 and 9 takeaways items (See Table 4.3).

The lowest mean variety in the nutritious foods category was found to be in the legumes group with a mean of 0.6. There were a total of three food items consumed in this group of which 17(57%) participants did not consume any food items from the legumes group. The eggs group consisted of only one food item that was consumed by 24 (80%) participants. The cheese group was also found to have a low mean variety score of 0.9. More than half the participants (n=16, 53%) consumed one out of two items from this group (See Table 4.3).

The lowest mean variety on the discretionary food category was found to be in the alcohol group. There was a total of 14 items identified in this group of which 23 (77%) participants were found not to consume any alcohol items. This finding indicates that alcohol consumption amongst this group of participants was low.

Table 4.3 Food variety (count of food items) consumed within food groups (n=30)

	Nutritious food groups															Discretionary food groups										
Food groups[+]	**Meat**	**Fish**	**Poultry**	**Eggs**	**Dairy**	**Cheese**	**Breads**	**Cereals**	**Starchy vegetables**	**Legumes**	**Nuts and seeds**	**Vit A rich fruits and veg***	**Vit C rich fruits and veg***	**Other fruits**	**Other vegetables**	**Discretionary flesh foods**	**Discretionary dairy products**	**Discretionary breads and cereals**	**Fats and oils**	**Drinks**	**Alcohol**	**Sauces and flavouring**	**Spreads**	**sweet snacks**	**Savoury snacks**	**Takeaways**
	n=7	n=9	n=4	n=1	n=8	n=2	n=8	n=10	n=8	n=3	n=5	n=23	n=18	n=7	n=16	n=5	n=7	n=5	n=8	n=14	n=7	n=11	n=10	n=11	n=9	n=13
Mean (s.d.)[#]	2.2 (1.3)	2.9 (2.0)	1.8 (0.9)	0.8 (0.4)	1.8 (1.0)	0.9 (0.7)	3.7 (1.6)	4.9 (2.5)	2.7 (2.0)	0.6 (0.8)	1.9 (1.4)	7.83 (4.3)	5.9 (3.2)	2.8 (1.8)	5.9 (3.3)	2.6 1.4	2.7 (1.4)	1.6 (1.5)	3.90 (1.5)	6.90 (2.9)	0.63 (1.3)	6.1 (1.9)	2.8 (2.1)	6.1 (2.7)	4.2 (2.1)	6.2 (2.9)
Range used[1]	0-5	0-7	0-3	0-1	0-4	0-2	1-7	1-10	0-7	0-3	0-5	0-17	1-13	0-7	0-12	0-5	0-5	0-5	1-7	2-13	0-4	2-10	0-7	1-11	0-8	1-13
Breakdown of usage	0=3 1=7 2=6 3=11 4=2 5=1	0=5 1=4 2=3 3=6 4=4 5=5 6=2 7=1	0=1 1=7 2=9 3=7 4=6	0=6 1=24	0=1 1=13 2=10 3=3 4=3	0=8 1=16 2=6	1=2 2=5 3=8 4=3 5=9 6=2 7=1	1=3 2=2 3=5 4=4 5=2 6=6 7=4 8=1 9=2 10=1	0=3 1=7 2=5 3=8 4=1 5=2 6=2 7=2	0=17 1=10 2=2 3=1	0=5 1=8 2=5 3=9 4=2 5=1	0=1 1=0 2=1 3=3 4=1 5=3 6=2 7=4 8=6 9=1 10=1 11=2 12=1 13=0 14=0 15=1 16=2 17=1	1=1 2=2 3=2 4=11 5=1 6=2 7=2 8=2 9=3 10=0 11=1 12=2 13=1	0=1 1=10 2=3 3=6 4=4 5=4 6=1 7=1	0=1 1=0 2=5 3=2 4=5 5=3 6=1 7=3 8=0 9=5 10=3 11=1 12=1	0=1 1=7 2=7 3=7 4=4 5=4	0=7 1=11 2=4 3=5 4=1 5=2	0=7 1=11 2=4 3=5 4=1 5=2	1=1 2=6 3=3 4=7 5=8 6=4 7=1	2=1 3=2 4=4 5=4 6=5 7=2 8=0 9=7 10=2 11=1 12=1 13=1	0=23 1=2 2=1 3=1 4=3	2=2 3=0 4=3 5=5 6=8 7=6 8=3 9=2 10=1	0=3 1=6 2=9 3=3 4=3 5=0 6=4 7=2	1=2 2=0 3=3 4=3 5=5 6=5 7=4 8=3 9=1 10=1 11=3	0=1 1=2 2=3 3=6 4=6 5=3 6=4 7=3 8=2	1=2 2=0 3=3 4=5 5=3 6=1 7=8 8=2 9=3 10=1 12=1 13=1

+ This analysis is based on counting the number of food items eaten overall and from individual food groups. Therefore, *n* underneath each food group name represents the number of food items available within each food group.

*Fruits and vegetables (veg) food groups are separate to vitamin A rich fruits and vegetables and Vitamin C rich fruits and vegetables. This categorization was based on the vitamin A and Vitamin C contents in fruits and vegetables and the health benefits it entails.

Data presented as mean (standard deviation)

[1] Range comprises of minimum and maximum number of food items consumed within each food group

4.2.2 Exploring types of food consumed within each Food group

Investigating the types of foods consumed could help explain the foods that the participants had accessed to and utilised over the seven day reference period. Furthermore it also can be indicative of diet quality in regards to the amount of foods consumed from each food group. Table 4.4 illustrates the food items used from each food group by more than half (n ≥ 15; 50 %;) of the participants during the seven day reference period.

Table 4.4 Food groups and food items used by ≥ 50% of the participants (n ≥ 15)

Nutritious Foods			Discretionary foods		
Food Group (n)*	**Usage of food group (%)#**	**Types of food consumed by participants**	**Food Group (n)***	**Usage of food group (%)#**	**Types of food consumed by participants**
Meat n=7	29%	Beef 26 Pork 16	**Discretionary Flesh food** n=5	60%	Sausage 18 Crumbed or battered chicken, fish or beef 17 Cured meat 16
Fish n=9	22%	Tinned fish 19 Fresh fish white 18			
Poultry n=4	50%	Whole chicken/, thighs/drumsticks 26 Chicken nibbles 20			
Eggs n=1	100%	Eggs 24			
Dairy n=8	38%	Yoghurt 20 Full cream milk 17 Low-fat milk 16	**Dairy products discretionary** n=7	43%	Ice cream 21 Dairy food (e.g.calci yum) 21 Cream or sour cream 16
Cheese n=2	50%	Hard cheese 21			
Breads n=8	50%	White or brown bread 30 Bread rolls 19 (63) Whole grain bread 18 Crackers 17	**Discretionary Breads, cereals and starchy vegetables** n=5	20%	Instant noodles/pasta 17
Cereals n=10	60%	Rice 27 Weetbix 20 Pasta 17 Unsweetened breakfast cereals 17 Porridge 16 Muesli 15			
Starchy Vegetables n=8	25%	Potato 22 Taro 15			
Legumes n=3	0%	-			
Nuts & seeds n=5	40%	Pecan/walnut/almond/ cashew 20 Peanuts 16			
Vitamin A rich fruits and veg n=23	26%	Carrots 28 Broccoli 24 Lettuce 24 Pumpkin 16 Capsicum, red 16			
Vitamin C rich fruits and veg n=18	33%	Tomatoes 24 Cauliflower 20 Orange 20 Mandarin 18 Cabbage 18 Capsicum: green, yellow, orange, black 17			
Other fruits n=7	43%	Banana 26 Apple 22 Avocado 18			
Other veg n=16	38%	Onions 28 Garlic 23 Cucumber 18 Mushroom 18 Peas 17			

Nutritious Foods			Discretionary foods		
			Drinks n=14	43%	Soft drinks 28 Juice (<100% pure fruit)21 Flavoured milk 19 Tea 18 Juice (100% pure fruit 17 Imitation drinks 15
			Alcohol n=7	0%	
			Sauces and flavourings n=11	64%	Mayonnaise,/ creamy dressings 28 Sugar 26 Soy sauce 25 Tomato/mustard/BBQ/sweet/chilli sauce 24 Salt 24 Salad dressing 16 Gravy, homemade 15
			Spreads n=10	10%	Peanut butter 15
			Sweet snacks n=11	73%	Chocolates 29 Chewing gum 22 Lollies 21 Chocolate biscuits 19 Cakes 18 Plain biscuits 17 Sweet bakery items 15 Desserts and puddings 15
			savoury snacks n=9	44%	Chips/crisps 27 Savoury bakery items 20 Prepackaged bars 18 Rice crackers/ cheese crackers18
			Fats and oils n=8	50%	Oil 26 Butter 25 Margarine 20 Coconut cream 19
			Takeaway n=13	54%	Hot chips, French fries, Kumara chips 26 Hamburgers 22 Fried Chicken 20 Pies, sausage rolls 19 Sandwiches, wraps, pitas 18 Pizza 18 Sushi 17

*n is the number of food items within each food group

# indicates to what extent the food group is utilized by more than half the participants (n ≥ 15)

Highlighted numbers: yellow refer to food usage of food groups beyond 50%

The highest amount of food consumed by 15 or more of the participants' was found in the sweet snacks group. Legumes and alcohol food groups were not consumed at all by 50% or more participants which indicates general low usage of these food groups.

The percentage or extent of the food groups used was lower for the nutritious category compared to discretionary category. A higher usage of food groups (i.e. usage of food groups beyond 50%) was found in 5 out of 11 food groups in the discretionary category and 5 out 15 food groups in the nutritious category. This indicates that for more than half the participants (n ≥15), discretionary foods and nutritious contributed towards 45% and 33 % of their diet respectively.

Out of all the food groups, the participants did not use all the food items in either of the groups except for eggs, which only had one item. Higher percentages of food group usage in the discretionary category was seen in the sweet snacks (73%), sauces and flavouring groups

(64%) and discretionary flesh foods group (60%). In the nutritious category, cereals (60%) were found to have the higher percentage usage followed by 50% usage of poultry, cheese and breads equally. This indicates that consumption of discretionary food items is slightly higher than consumption of nutritious foods amongst this group of participants. Overall the results from Table 4.4 shows even though the participants are consuming foods from all except two food groups, the variety of foods consumed within each of the groups is fairly low.

4.3 Eating habits

This part of the study explores different factors related to body weight and food habits. Firstly, the participants' perception of their body weight as well as their appetite will be explored. This will be followed by exploring eating patterns and the factors that influence eating patterns both during the week and on weekends and finally at social occasions. The second part of the eating habits explores participants' perception on their current lifestyle as well as the cultural and spiritual factors that influence eating habits and body image.

4.3.1 Exploring Appetite

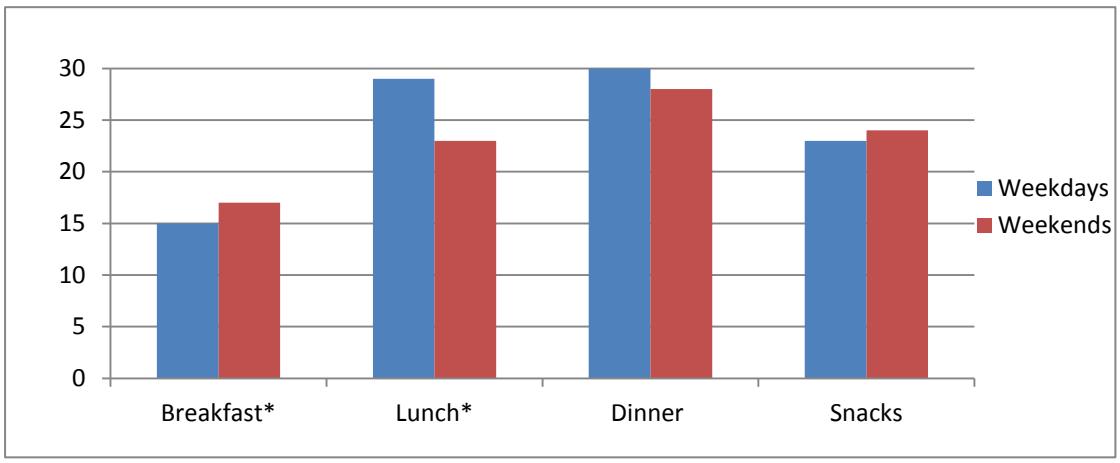
The majority of the participants reported having a good appetite where they were able to eat and enjoy moderate sized meals without difficulty and being able to snack in-between meals (n=19; females = 11; males = 9). A few participants (n=8; females =5; males = 3) reported having a fair appetite where they were able to eat moderate sized meals since finding it hard to complete large meals, resulting in them infrequently snacking in-between meals. Only two female participants reported having poor appetites where they never feel like eating or they generally do not enjoy eating.

4.3.2 Food consumption patterns

An exploration on food consumption patterns throughout the day have been done by assessing consumption of meals (such as breakfast, lunch and dinner) and snacks, both during the week and on weekends. Exploring differences in consumption patterns between weekdays and weekends will aid in finding the similarities and differences in food consumption patterns that might contribute to excess weight. Furthermore it will also provide details on the type of food and the time of day that foods are usually eaten. Figure 4.1 illustrates the comparison of usual meal and snack consumption during the week and on weekends.

The findings on what participants typically consume during meal times will be discussed in sub-sections according to meal types.

Fig 4.1 Comparison between usual consumption of meals and snacks on weekdays and weekends amongst Pacific youth (n=30)



*Number of participants that reported on breakfast and lunch consumption during weekends was 29 due to missing data for one participant.

The findings from Figure 4.1 illustrates that breakfast was the least consumed meal during weekdays and weekends compared to lunch and dinner. Lunch and dinner consumption was greater during weekdays than weekends. Snacking habits was similar at both times of the week.

The findings from Figure 4.1 are elaborated further in Table 4.5 where patterns of meal consumption are illustrated as well as the frequency of snacking on weekdays and weekends.

The data from Table 4.5 revealed that six out of 30 participants (n=6, 20%) reported having breakfast, lunch, dinner and consumed snacks (am, pm and evening snacks) during weekdays and on weekends. Some participants consumed all three meals and snacks during weekdays (n=12, 40%) but not on weekends (n=7, 23%). More than half the participants (n=19, 63%) have an afternoon tea snack on weekdays compared to weekends (n=15, 50%). Those participants who skip one or more meals were found to snack at some point during the day (n=10, 30%). Although a few of the participants consumed late night snacks on weekdays (n=4, 13%), none of the participants did so on weekends.

Breakfast was consumed by half the participants on weekdays (n=15, 50%) and slightly more on weekends (n=17, 57%). Participants reported that they don't have time to consume breakfast on weekdays (n=2, 7%) and a few reported waking up late and always being in a rush (n=3, 10%) which is why they are unable to consume breakfast on weekdays. Lunch and dinner were found to be the main meals on weekdays (n=29, 97%) however, the number of participants consuming lunch on weekends was lower (n=23, 77%). Lunch could potentially be consumed late on

weekends due to participants waking up late and taking part in different activities on weekends. Dinner was consumed by all of the participants on weekdays (n=30, 100%) and by most on weekends (n=28, 93%); however evening snacking was observed to be done more on weekends (n=15, 50%) compared to weekdays (n=9, 30%). This could also be potentially due to different timings of meal consumption and activities during weekends.

Table 4.5 Frequency of meals and snacks consumed during weekdays and weekends (n=30) #*

	Weekdays							Weekends						
Participants	**Breakfast**	**AM Snack**	**Lunch**	**Afternoon Snack**	**Dinner**	**Evening snack**	**Late night snack**	**Breakfast**	**AM Snack**	**Lunch**	**Afternoon Snack**	**Dinner**	**Evening snack**	**Late night snack**
1	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		
2	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓	
3	✓	✓	✓	✓	✓		✓			✓		✓		
4	✓		✓		✓			✓				✓		
5		✓	✓	✓	✓			✓		✓		✓		
6			✓		✓					✓			✓	
7	✓		✓		✓					✓		✓	✓	
8			✓	✓	✓	✓				✓		✓	✓	
9	✓		✓	✓	✓					✓		✓	✓	
10			✓	✓	✓	✓			✓	✓	✓	✓	✓	
11			✓		✓	✓	✓	✓				✓	✓	
12	✓	✓	✓	✓	✓	✓		✓		✓		✓		
13	✓		✓	✓	✓			✓		✓	✓	✓		
14			✓		✓		✓		✓	✓	✓	✓	✓	
15			✓	✓	✓					✓	✓	✓		
16	✓			✓	✓			✓		✓	✓	✓		
17	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	
18			✓		✓					✓	✓	✓		
19			✓	✓	✓			✓		✓		✓	✓	
20	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	
21	✓		✓	✓	✓			✓		✓	✓	✓		
22	✓	✓	✓	✓	✓	✓	✓	✓					✓	
23			✓		✓	✓		✓			✓	✓	✓	
24	✓		✓	✓	✓			✓		✓		✓	✓	
25			✓		✓			✓		✓		✓		
26			✓		✓						✓	✓		
27			✓	✓	✓					✓	✓	✓		
28			✓		✓	✓				✓		✓	✓	
29			✓	✓	✓			✓			✓	✓		
30	✓		✓		✓					✓		✓		
Total	15	6	29	19	30	9	4	17	5	23	15	28	15	0

*number of participants was 30

#analysis is based on the frequency of meal and snacks consumption (count of each meal and snack consumed by participants)

The next few parts of the analysis will explore the timing of meals as well as the types of foods consumed on weekdays and weekends.

4.3.2.1 Breakfast

The majority of breakfast consumers consumed breakfast earlier on weekdays compared to weekends (see Table 4.6).

Table 4.6 Breakfast consumers: time of the day on weekday's vs weekends

Time of the day	Weekdays (n=15)*	Weekends (n=17)*
<6am	0	
6-8am	10	4
8-10am	5	13

*is the number of participants who consumes breakfast

The foods eaten for breakfast were broken down into food groups. Table 4.7 demonstrates the food groups consumed during the week and on weekends by the participants.

Table 4.7 Comparison of the types of foods consumed for breakfast on weekdays and weekends

Foods consumed during weekdays (n=15)#	**n**	**Foods consumed during weekends (n=17)#**	**n**
Cereal		**Cereals**	
• Weet-bix with milk	8	• Weet-bix with milk	4
• Porridge with milk	7	• Porridge with milk	6
• Cornflakes with milk	1	• Cornflakes with milk	2
• Coco-pops with milk	1	• Up and go-liquid cereal and milk	1
• Rice-bubbles with milk	1	• Nutri grain with milk	1
• Up and go-liquid cereal and milk	1	• Koko rice*	2
	1		
Bread with Spread		**Bread with Spread**	
• Bread(Toast-white or brown)	7	• Bread (toast/sandwich- white or brown)	14
Beverages		**Beverages**	
• Tea	3	• coffee	1
• Coffee	2		
• Water	1		
Milk based products		**Milk-based products**	0
• Yoghurt	1		
Fruit		**Fruit**	
• Apple	2	• Apple	1
• Banana	2	• Banana	1
Cooked Breakfast		**Cooked Breakfast**	
• Dinner leftovers (meat and starch vegetables or rice)	2	• Dinner leftovers (meat and starch vegetables or rice)	3
• Bacon	1	• Bacon	5
		• Eggs	8
		Takeaway foods	
		• Bakery meat pies and rolls	2
		• Fried chips and chicken	1

number of participants reported to consume breakfast.

*Koko rice is also known as chocolate rice made using koko which is a traditional food to many Pacific Island people.

Cereals were the main food source at breakfast on either time of the week. Weekend breakfast meals consisted of more variety of food groups compared to weekdays, including more cooked foods (e.g. Takeaway food, bacon & eggs) and higher protein-rich foods (e.g. bacon, eggs). Fruit consumption at breakfast was minimal. The only dairy food consumed by majority of the participants was milk consumed with breakfast cereals.

The breakfast food patterns observed amongst the participants include:

- Breakfast cereals were eaten with milk,
- Bread was consumed with some sort of spread,
- Dinner leftovers consisted of meat and starchy vegetables.

4.3.2.2 Lunch

More than half of the participants consumed lunch between 12 and 2pm on weekdays (n=21, 70%) vs weekends (n=16, 53%). Lunch was generally consumed less, and later on both weekdays and weekends (Table 4.8).

Table 4.8 Lunch consumers: time of the day on weekday's vs weekends

Time of the day	Weekdays (n=29)*	Weekends (n=23)*
<12pm	2	0
12-2pm	21	16
>2pm	6	7

*is the number of participants who consumes lunch

The types of food consumed for lunch on both weekdays and weekends are summarised in Table 4.9

*Table 4.9 Comparison of the types of foods consumed by participants reporting to eat lunch on weekdays and weekends**

Foods consumed during weekdays n = 29 #	**n**	**Foods consumed during weekends n=23**	**n**
Sandwiches with a protein filling		Sandwich with protein filling	
• Chicken	4	• Chicken	9
• Tuna	2	• Tuna	1
• Ham	3	• Ham	2
• Eggs	2	• Eggs	1
			1
Sandwiches with spread filling		Sandwiches with spreads	0
• Nutella	1		
• Peanut butter	1		
• Jam	1		
Fruit		Fruit	
• Kiwifruit	1	• Apple	2
• Banana	1	• Banana	2
• blackcurrants	1	• Feijoa	1
• Raisins	1		
• Feijoa	1		
• Apple	5		
Packaged snacks		Packaged snacks	
• Muesli bar	3	• Muesli bar	1
• Rice Crackers	3	• Rice crackers	1
• Packet potato chips	1	• Packet potato chips	2
• Packaged Cookies	2		
Takeaway		Takeaway	
• Hamburgers	4	• Hamburgers	3
• Fried foods	4	• Fried foods	6
• Sub-sandwiches	4	• Sub-sandwiches	1
• Bakery	3	• Bakery goods	1
• Japanese	3	• Chinese	1
• Indian	1		
• Pizza	1		
Beverages		Beverages	
• Soft drinks	1	• Soft drinks	2
• Smoothie	1	• coffee	1
• Fruit-based beverage	1		
Rice	3	Rice	4
		Pasta	4
Fish	2	Fish	5
Poultry(chicken)	1	Poultry (Chicken)	9
		Meat (Beef)	7
		Pork	1
Vegetables		Vegetables	
• Lettuce	2	• Packaged frozen mixed vegetables	5
• Tomatoes	1		
• Coleslaw	1		
• Cucumber	1		
Starchy vegetables		Starchy Vegetables	
• Taro	1	• Taro	4
• Potato	2	• Potatoes'	5
Milks based foods		Milk based foods	0
• Cheese	1		
• Yoghurt	1		
• Smoothie	1		

number of participants reported to consume lunch

The results from Table 4.9 illustrate that sandwiches (with protein filling) and takeaway foods made up most of the lunch choices on both weekdays and on weekends. The results illustrate that takeaway foods made up most of participants of lunch choices on weekdays (n=20, 67%) compared to weekends (n=12, 40%).Reasons for choosing takeaway foods due to limited time to prepare food:

"Busy with sports"
"Too tired" [to prepare lunch]"

Sandwiches with protein filling were consumed by more participants on weekends (n=14, 47%) than weekdays (n=11, 37%) however sandwiches with spread filling was consumed by more participants on weekdays (n=3, 10%) than weekends (n=0). A larger proportion of participants consumed cooked meals including meat, poultry or fish and starch and vegetables on weekends (n=22, 73%) than on weekdays (n=3, 20%).

There were more variety of fruits, vegetables and milk based foods observed to be consumed on weekdays than weekends

The typical lunch food patterns observed amongst the participants include:

- Fried chicken consumed with chips and soft drinks,
- Meat and rice or starch vegetables (leftovers of cooked meals),
- Meat based sandwich with salad and fruit,
- Sandwiches with protein or spread filling,
- Takeaway foods,
- More dairy foods and fruits on weekdays than weekends,
- More cooked meal on weekends.

4.3.2.3 Dinner

Most participants consumed dinner between 6 and 8pm on weekdays (n=14) and weekends (n=18). More participants were consuming dinner late (between 8-10pm) on weekdays (n=13) compared to weekends (n=8) (Table 4.10).

Table 4.10 Dinner consumers: time of the day on weekday's vs weekends

Time	Weekdays (n=30)*	Weekends (n=28)*
<6pm	3	2
6-8pm	14	18
>8pm	13	8

*is the number of participants who consumes lunch

The types of food consumed for dinner by the participants on weekdays and weekends is summarised in Table 4.11

*Table 4.11 Comparison of the foods consumed for dinner on weekdays and weekends**

Dinner consumption during week days n =30	**n**	**Dinner consumption during weekends n=28**	**n**
Meat (Beef)	18	Meat (Beef)	5
Fish	6	Fish	4
Poultry (chicken)	20	Poultry (chicken)	8
Eggs	2		
Non-starchy vegetables		Starchy vegetables	
• Potatoes	9	Potatoes	5
• Taro	4	Taro	3
• Kumara	2		
• Yam	1		
• Cassava	1		
Non-starchy vegetables		Non-starchy vegetables	
• Carrots	1	• Coleslaw	1
• Green leafy vegetables	4	• Carrots	2
• Broccoli	1	• Pumpkin	2
• Mixed vegetables	9	• Mixed vegetables	2
• Pumpkin	1		
• Cabbage	2		
• Coleslaw	2		
Takeaway		Takeaway	
• Hamburgers	2	• Hamburgers	2
• Fried foods	4	• Fried foods	3
• Sub-sandwiches	2	• Roast	2
		• Chinese	1
Rice	14	Rice	2
Noodles	5	Noodles	2
Bread with spread		Bread with spreads	
• Bread- white/brown/sandwich/toast	7	• Bread- white/brown/sandwich/toast	3
Sauces /gravy	2	Sauces/gravy	2
Traditional delicacies		Traditional delicacies	
• Chopsuey	5	• Chopsuey	2
Pasta	7	Sweet snacks	3
		Beverages	
		Tea	1
		Coffee	1
		milo	1

*The dinner consumption reported by the number of participants differed on weekdays and weekends

The data presented in Table 4.11 show that the majority of the participants consumed meat, rice/starchy vegetables with non-starchy vegetables for dinner consistently throughout the week. There was more variety of protein foods consumed on weekdays than weekends. Poultry (in particular chicken) was found to be the main type of protein consumed for dinner

on weekdays by the majority of the participants (n=20, 67%), followed by beef as the second most-consumed protein on weekdays (n=18, 60%). The same pattern was observed on weekends, but by fewer participants.

Typical dinner meal pattern observed amongst the participants:

- Meat/fish/poultry with starchy vegetables/ rice with salads,
- Chopsuey with rice or starchy vegetables,
- Same pattern on weekdays and weekend,
- Less variety on weekends.

4.3.3 Foods eaten at social occasions

Foods eaten at social occasions have been found to differ to the usual food consumption practices amongst majority of the participants (n=23, 77%). In regards to gender differences, more females (n=15) reported that they eat differently at social occasions than males (n=8). The types of social occasion recognised by the participants include sports events, work events, youth gatherings, national festivities, school/university events, family gatherings, parties, wedding, funerals and birthdays (Table 4.12). The data have shown that food consumption at social occasions is different from the usual consumption where some participants reported having an increased (n=18, 60%) or decreased (n=7, 23%) consumption and some participants found no change (n=5, 17%) in their food consumption at social occasions. In order to clarify the motivations behind increased or decreased food consumption habits at different social occasions, the results will be presented separately.

4.3.3.1 Increased consumption

Increased food consumption or overeating was found to be done typically at certain culturally specific occasions such as birthdays, weddings and family gatherings and/or funerals events. Several reasons were outlined as to why increased food consumption occurred at these specific social occasions. Four specific themes were identified namely cost, availability, type of food presented, and the environment within which these occasions occur. These themes will be presented below with ethnographic descriptions:

- Cost appeared to influence increased food consumption at these social occasions. Participants felt that when “free” food were available, they had the freedom to eat as much as they liked, as the burden of cost for meals is removed from their responsibility at that event.

"The food is free/ takin charge of the freedom"
"Eat a lot on birthday/wedding/family events (due to) free food"

- Along with free food or low cost burden of foods at social occasions, the rather large variety of food available at these occasions was another reason influencing increased food consumption.
  "Eat a lot and taste variety of food"
  "Eat more food try other dishes"
  "Eat more variety and amount increases"

- The specific types of foods presented and eaten at traditional or cultural social occasions have also been found to contribute to increased food consumption. Traditional foods including sweet and sour luau (fish), octopus, taro, kina, pork as well as sweet and salty treat foods such as cakes, scones, cookies and potato crisps are commonly consumed.
  "Usually it is (eat more) traditional Tokelauan foods"
  "Eat bigger portion especially on Chinese food and pork"
  "Amount (eaten) increases; tend to eat more sweets/deserts"
  "Eat more junk food"

- The environment within which the occasion takes place was also found to contribute to increased food consumption. Social occasions provide an environment where people socialise, talk and interact over food. Participants reflected that more foods are typically consumed whilst simultaneously eating food and enjoying the company of friends and families.
  "I like to eat more than I tend to; I don't know maybe because there's more people and because I like to talk and socialize with others"
  "No control or eat much more (due to) good times, good friends and good food"

4.3.3.2 Decreased consumption

On the contrary to increased food consumption at social occasions, a few participants reported eating less food compared to their usual intakes (n=5, 17%). This was typically apparent at different types of social occasions than mentioned above, namely get-togethers with friends or others outside of the family circle. Ideally gatherings with friends occurred in environments such as schools, universities, and meetings. Specific themes

identified as reasoning behind these decreased intakes include cost, personal sensitivity, and cultural context relating to type of foods and traditions around those.

- Cost was again considered an important aspect related to eating less food, as these occasions were particularly attended at places outside of the family circle where food need to be bought and are not free. Participants found that buying foods when they go out with friends were expensive, hence resulting in decreased purchases and intakes.
  "Out with friends, tend to eat little because of the cost".

- Personal sensitivity or "shyness" played a large role in determining the amount of food that are consumed. In this instance a decrease in portion sizes of foods to be consumed resulted from participants feeling shy and embarrassed to eat a lot of food at social occasions where their friends are present.
  "I say that I am full but I'm not and it's because I'm shy".
  "I eat smaller portions of food, too embarrassed".

- The nature and up-bringing of the participants dictated the decreased food consumption since they were not used to eating food in front of so many people and in a different environment.
  "Always eat way less but feel full easily since from my childhood, I am shy eating in front of others or any other place, other than my own house".

- There was also a degree of consciousness amongst participants for their friends or others attending the same event. They would decrease their food consumption to ensure that enough food is available to all others attending the event.
  "Eat less, because I am with a lot of people and because I want them to eat too".

- Some participants are aware that social occasions attended outside of the traditional context would have many unhealthy foods available. They became quite conscious about consuming unhealthy foods in front of a lot of people.
  "I tend to eat less and eat healthier when I am around people"
  "Going for salads and staying away from fatty foods".

The foods commonly eaten at the recognised social occasions have been presented in Table 4.12.The data has been organised into social occasions with the most variety of food consumed to the least variety of food consumed.

Table 4.12 Comparison on the types of foods consumed at different social occasions (n=11)[#]

Social occasions - Typical foods consumed		
Weddings	**Funerals**	**Birthdays**
Breads and cereals Rice Pasta	Bread	Bread
Fruit Grapes	-	-
Starchy Vegetable Taro Yams Kumara	Taro Corn Kumara Yams	Taro Kumara Yams
Vegetables Mushroom	Pumpkin	-
Salads Potato salad coleslaw Green salad Seafood salad	Potato salad Coleslaw Corned beef salad Fresh salad	Potato salad Seafood salad Crab meat salad
Meat Pork (Carved ham) Lamb Beef Corn beef	Pork (carved ham) Beef (Steak) Lamb chops	Pork Beef/lamb (BBQ)
Fish mussels prawns Raw fish Fried fish Oysters Octopus	Mussels Kina Crayfish Fish Squid Fish fingers	Raw fish Mussels Prawns) Fried fish/oyster
Poultry Chicken	Chicken	Chicken (BBQ) Fried chicken Chicken nuggets Chicken nibbles
Milk/ milk products Cream Ice-cream	Ice-cream	-
Sweet snacks Cake Chocolate mousse Cheese cakes	Cakes/puddings Scones Cookies Lollies	Cakes Lollies Chocolate
Salty snacks -	Crackers Packet chips Creamy dips	corn crisps packet potato chips Creamy dips
Takeaway/fast food Sausage roll	Pizza Fried potato/hot chips	Sausage rolls Pizza Sandwiches Chinese takeaway
Beverages -	Soft drinks Tea Milo Coffee	Soft drinks Alcohol : Beer Fruit juice
Traditional foods Chopsuey^ Hangi Mixed vegetables!	Sweet and sour lau (fish) Chopsuey Hangi! Boil up	 - -
Miscellaneous Chowmein (Chinese) Curry (Indian)	Sweet and sour egg foo Yong(Chinese) Ham sandwich	Curry

represents the number of social occasions identified by the participants

^Island style chopsuey is made with meat and bean vermicelli in soya sauce with/without vegetables. Ideally is served with rice/taro/green banana. **!** Foods cooked on heated stones in a pit

Table 4.12 continued Comparison on the types of foods consumed at different social occasions (n=11)[#]

Social occasions - Typical foods consumed			
Church events/affair	**School or university events**	**Family gatherings**	**Parties**
Breads and cereals Rice Buns/rolls	-	-	Bread (sandwich)
Fruit -	-	-	-
Starchy Vegetable -	-	Taro	-
Vegetables -	-	-	-
Salads Potato salad		Green salad seafood salad Potato salad	Chicken/ beef salad
Meat Sausage	Beef	sausages Pork Beef	Ham
Fish -	-	Fish oysters mussels	-
Poultry Chicken thighs	Chicken (BBQ)	Chicken	Chicken
Milk/ milk products Ice-cream	Ice-cream	-	Ice-cream
Sweet snacks Candy floss Toffee apples Pancakes	Chocolate Cakes	-	Chocolates Lollies Cake
Salty snacks Nachos	Packet potato chips Packet corn chips	-	Packet corn chips
Takeaway/fast food -	Pizza Fried potato/hot Chips	Sausage rolls	Fried fish and potato chips
Beverages -	Soft drinks	-	Soft drinks
Traditional foods Chopsuey^ Koko alaisa *	-	Funafuna pork Palusami□ Chopsuey^	-
Miscellaneous Meat filled sandwiches Pumpkin soup	-	-	-

Represents the number of social occasions identified by the participants

^Island style chopsuey is made with meat and bean vermicelli in soya sauce with/without vegetables. Ideally is served with rice/taro/green banana

*Rice with coconut cream and koko Samoa- chocolate rice

□ Coconut cream with meat/raw fish cooked in taro leaves.

Table 4.12 continued Comparison on the types of foods consumed at different social occasions (n=11)[#]

Social occasions - Typical foods consumed			
Sports events/ meetings/gathering	**Work events (meetings, conference)**	**Youth gatherings or meetings**	**National festivities (e.g. mother's day, Christmas)**
Breads and cereals			
-	-	Bread Garlic bread	Pasta
Fruit			
Banana	-	-	-
Starchy Vegetable			
Potato chips or wedges	-	-	Taro
Vegetables			
	-	-	Broccoli Mushroom
Salads	-	-	-
Meat			
Steak Sausages Meat patties	-	Corn beef Sausages	Sausages lamb
Fish			
-	-	-	-
Poultry			
-	-	Chicken	Chicken
Milk/ milk products			Cheese Cream
Sweet snacks			
Biscuits	Cakes Fudge Lollies	Lollies Cakes &slices	-
Salty snacks			-
-	Potato chips (packet) & dips	Potato chips (packet) Crackers Creamy Dips	
Takeaway/fast food			
-	Pizza Kebabs Sausage rolls	Macaroni cheese Pizza's Garlic bread Hamburgers Fried foods	-
Beverages	-		
Isotonic beverages Water Alcohol		Soft drinks	Soft drinks
Traditional foods			
		Chopsuey Rice Faapapa*	
Miscellaneous			
Club sandwiches	Club sandwiches	Restaurants meal (buffets)	Macaroni cheese

Represents the number of social occasions identified by the participants

* Rice faapapa- rice balls

A high variety of foods were consumed at weddings, funerals and birthdays. Both nutritious foods (such as breads, rice, kumara, taro, yam, salad vegetables, chicken) and non-nutritious foods (such as corned beef, cakes, lollies, chocolates, potato crisps, soft drinks, fruit juice and takeaway) were identified to be consumed at these occasions. Seafood such as mussels, prawns, fish, oysters, octopus, crayfish, squid and kina was found to be the most consumed food group at weddings and funerals.

Nearly all occasions involved consumption of one or more non-nutritious foods. Traditional foods (Chopsuey, sweet and sour luau (fish), Hangi, boil-up, koko alaisa (koko rice), funafuna pork, Palusami and rice faapapa were consumed at weddings, funerals, church events, family gatherings and youth gatherings.

Low consumption of foods was found to be at work events and during national festivities. There were no nutritious foods available at work events but rather sweet snacks, salty snacks and takeaways. In regards to national festivities, even though there were more food groups consumed, the variety of foods were minimal, which is indicative that national festivities are not as greatly celebrated amongst the participants.

4.4 Cultural influences on food consumption

To elaborate on the understanding of eating habits and how it impact on dietary quality, it is important to explore the influences that Pacific culture may have on eating habits and practices. In analysing the qualitative data, several themes became apparent namely cultural / spiritual beliefs, Pacific culture / traditions, and the role of family and of peers.

4.4.1 Cultural-spiritual belief context

- Most of the participants (n=25; 83%) had a current cultural-spiritual belief that influenced the foods that they ate. Some participants (n=17; 57%) reported being affiliated to churches or are Christians. Their cultural-spiritual beliefs have been found to encourage the participants to consume more foods and consume more traditional foods.

  "Uncontrollable [food intake], free to eat anything"
  "Church gathering/function always has variety of traditional foods, e.g. big and rich of fatty food"
  "Normally have traditional foods (feast) regular church functions in relation to food"
  "Chopsuey and taro is a must to have in the house, it's the traditional foods that my father enjoys"

- Cultural-spiritual beliefs have also been found to influence the way some participants perceive their body image (n=9; 30%). These participants perceived themselves to be of a larger body size and the following explains how their perception of being of a larger body size influences their food consumption:

  "It is a belief amongst Pacific culture that being big is recognised to be culturally acceptable and it is indicative of wealth, good health which indicates consumption of large amounts of foods".

  "Being big is associated with eating lots of food which indicates you have wealth and lots of money"
  "Being big is associated with eating lots of food which indicates you have wealth and lots of money"
  "Culturally accepted to be big, if you are skinny then you're not healthy (sick)"
  "Being big is looked at as normal and being skinny is looked at as being sick"

4.4.2 Pacific culture / traditions

- Traditional (cultural) practices also influence food intakes which deviate from the usual intake. In Pacific culture, lunch on Sundays (also known as Toonai) serves a significant purpose where people have a feast after church and therefore food intake is usually more on Sundays. Food has been found to play a special role within the Pacific culture as it brings people together. It has also been found that not eating at social-cultural get-togethers such as Sunday lunches can be considered disrespectful to the families, hence due to this, participants tend to eat more than what they usually do.

  "Food has special roles in our culture coming together"
  "To'onai (Sunday lunch) can influence foods [eaten] as there is always heaps of food.
  "Some families find it disrespectful if you don't to eat/ forced to eat when having massive feeds on Sunday"

- On the contrary some participants have thought that even though it is culturally acceptable to be off a bigger body size, it is however not healthy and that it is important to look after their health. Participants were also found to be aware that their unhealthy diet and lifestyle were the reasons why they perceived themselves to be off a bigger body size. There was also an awareness on what to do to have a healthier diet and lifestyle.

"Too skinny too fat are unhealthy middle size is good"

"Everyone should attempt to maintain a healthy body size, shown through exercise programs and improve in church camp food. More healthy choices at church feast (lukuluku) and avoid fizzy drinks or pork"

"Yes because us Islanders eat and have lots of foods/too much of fatty food- less of vegetables & fruits. We get bigger because we are not scheduled; we eat whenever".

"Yes you have to be healthy. I think you are made in God's image and that's how you value yourself, and that means not over eating".

4.5 Exploring body weight perception

Perceptions regarding weight and subsequent dieting practices are presented in Table 4.13

Table 4.13: Perceptions regarding weight and subsequent dieting practices

Perceptions regarding weight and subsequent dieting practices	Female (n=18) (%)	Male (n=12) (%)	Total (n=30) (%)
Unhappy with current body weight	13 (72)	4 (33)	17 (57)
Wanting to lose weight	13 (72)	3 (25)	16 (53)
Gained weight in the past year	8 (44)	8 (67)	16 (53)
Lost weight in the past year	3 (17%)	3 (25)	6 (20)
Weight is an issue for them	3(17%)	3 (25)	6 (20)
Using a combination of diet, exercise and healthy eating to control weight	9 (50%)	3 (25)	12 (40)

Findings on weight status show in comparison to males, more females are unhappy with their current weight, wanting to lose weight and have used diet and exercise and healthy eating to control weight. Equal numbers of males and females gained weight in the past year and an equal proportion of males and females reported that weight is an issue for them.

Body weight perceptions amongst the participants have also been influenced by family and peers perspectives regarding large body size.

4.5.1 Families perspectives on large body size

- Families of eight of the participants (n=8, 27%) thought that it was acceptable to have a larger body size because they themselves or people they know are of larger body size. Having a larger body size according to participant's families was considered acceptable provided that an individual is happy.

"They do not really say much because they are big themselves"
"Large body size is good [and] acceptable as most of my family members are big size"
"Mum is big women and try to make excuses that big is okay and as long as you are happy".

- All eight participants disagreed with their families' perception due health and psychological consequences entailed with large body size.

"When we were young Dad used to try and feed us heaps coz he thought we were too skinny - I disagree with this because of the effects it has on your insides is more important than a desired bulky frame".
"My parents think it is okay to be big in size- My siblings and I think differently, we think it is disgusting to be big, because we have seen too many family members suffer and die from obesity".
"Do not agree [with families perspective of large body size being acceptable] because it causes more problems like sickness mental health problem, lack of motivation".

- The remaining 22 participants reported that their families did not find it acceptable to be of a larger body size. This was due mainly to health reasons**:**
    - Larger body size is perceived to be associated with adverse health consequences

***"**Large body is unhealthy high risk disease like diabetes, CVD"*
"High risk for diabetes, CVD, Heart Disease"
"Dad [thinks it is] unhealthy -prone to disease"
"Unhealthy, unfit and prone to diabetes etc"
"Large body- unhealthy health risks like diabetes, CVD, unfit"
"Parents and relatives - will always say that large body size people need to eat healthy otherwise you will die".

    - Larger body size does not define beauty and is often a reflection of an unhealthy diet and lifestyle

"Unhealthy not look good in appearance and whole body sickly and too much eating fatty food"
"Large body not healthy, not good look/ugly, embarrassing"
"Being fat is not healthy

"They also thinks its unhealthy, always tell me to watch my food intake
"it is unhealthy to be obese"

- Larger body size was perceived to be a result of a mixture of factors such as low socio-economic status and cultural factors which lead to over-eating and encouraging minimal physical activity.

  "Large body size: over eating, not enough exercise, results of low social, economic and cultural factors"

- A few families who are of large body size do not encourage their children (n=3, 10%) to have larger body size and have shown to encourage them to eat healthier and exercise regularly due to the consequences mentioned above.

  "They don't encourage having large body size; they always make sure we don't eat too much junk food"
  "Parents always tell me to cut down on Island food
  "They definitely care for us - Dad always tells us to watch what we eat; especially takeaways - especially me and my younger brother, because we are young"

The majority of the participants (n=22, 73%) agreed with their families' perception that large body size is not seen as being acceptable due to the same reasons mentioned above.

4.5.2 Peers perspective on large body size

- Peers of 14 participants thought it is unacceptable to have a larger body size since being big is indicative of being lazy, unfit, unappealing and less motivated and having an unhealthy lifestyle.

  "Too unhealthy/disgusting"
  "Large body - unhealthy, unfit, not look good, less motivate, lazy"
  "Being big is not good or appealing"
  "I often heard them wish to be in small size 'fit & active'"
  "All my friends view that smaller size is better and healthier and good"
  "They think its unhealthy; To pursue a good looking body its about being healthy".
  "Friends are very judgemental on big people, think that they are unhealthy, lazy etc., I don't agree"
  "Easily criticise, no patience for understanding cultural reasons as to why"
  "I'm with lots of palagi's who perceive that being big is a disadvantage"

- Larger body size is also perceived to be associated with adverse health consequences.

  "High risk of disease, unhealthy, diabetes, high blood pressure, heart disease"
  "Most of my friends are big; but they are fully aware of the health implications, they are now looking at losing weight and exercising"
  "When we see big people struggling to breath or struggle to walk we would say to each other "I don't want to be like them"
  "If they [people] are obese then that's when I think they need help"
  "I totally agree with them- high risk of disease, unhealthy, diabetes, high blood pressure, heart disease".

- It was apparent that a negative view on self-image existed for those having a larger body size, whilst being of a smaller body size is perceived to be more acceptable, appealing and healthy.

  "Yes I agree with them; because I hate to be big myself, I want to look fit and look healthy".
  "I agree, big is bad and you have to lose weight"
  "I agree, smaller is healthier and you feel good, good self -esteem, lots of energy".
  "Small body is looking good and [is] acceptable".
  "I agree with them - small size is healthier and acceptable- small size has the fashion clothes"

  However some participants (n=6, 20%) disagreed with their peers who perceived large body size to be unacceptable. The main reason participants disagreed was that they felt their peers were being judgemental without having awareness on the impact of Pacific culture and their socio-economic realities

  "No [Disagree] - because I've been exposed to reasons as to why/how Pacific Islanders are generally bigger than non-Pacific Islander. Traditional type food, lack of money/education to provide food that will benefit a child's health in NZ society- easy to buy junk food"
  "I wouldn't agree with my work colleagues, but for my island friends I'm aware of my culture. As long as parents' food will make them full, and their body types don't affect them, don't matter".
  "Don't agree with how they judge big people".

"Do not agree with my friend perspective. I am large but not feeling anything wrong with my body".

- There were mixed views regarding acceptability to have a larger body size:
    - Positive views was based on the cultural acceptability to be big as it signifies beauty and that Pacific people are genetically large:

      "Pacific friends think large body is beautiful"
      "It could be a good thing; sometimes it's an island thing to be curvy or it could be genetics"
      "In Auckland there are pretty big people, they are okay with it"
      "Most of my friends are big (size) and they think are okay, some prefer small body but "average" Not too small-has to be the Island body, has to have some meat".

    - Others find it acceptable to have a large body size since it defines a person for who they are

      "They are not judgmental, not critical, if that's who you are, than that's who you are really"
      "Big can be good, could be genetics and it could be out of their control being big".
      "I agree to an extent, like I'm all for different body size, as long as people are happy".
      "Yes I agree-if that's who you are, then that's who you are really".

4.6 Current perception on lifestyle

Participant's perceptions on their current lifestyle were categorized into healthy and unhealthy lifestyles. The following explores the reasons on how and why the participants thought their lifestyle is healthy and unhealthy. Out of 30 participants five participants (17%) perceived to have a healthy lifestyle, whereas more than half the participants (n=17, 57%) perceived their lifestyle to be unhealthy and the remaining participants reported that their lifestyle is changing from unhealthy to healthy (n=8, 27%).

- Healthy lifestyles

Reasoning behind healthy lifestyles was clearly based around two major themes namely physical activity and dietary aspects:

- Physical activity
    - Incorporating more exercise or recreational activities into their daily life
      “I have a relatively healthy lifestyle due to my level of sports commitment: volleyball, softball, rugby, touch, seven, and basketball”
    - The importance of exercise and staying fit as well as balancing it with a healthy diet to be able to perform better at recreational activities such as sports.
      “Healthy Dieting, is important for keeping fit for sports”
- Dietary practices
    - Implementing a balanced diet
    - Ensuring that no excessive portions of food is consumed
    - Preparing own food at home compared to purchasing convenient takeaway meals
      “*Normal intake balanced meals-portion e.g. veges/meat/carb/mixed veges/beef/taro”*
      “Much healthier than last year more cooked food rather than takeaways”
      “I believe my current dietary lifestyle is good and healthy. I have been piscertarian for 7 years now and eat source of traditional food”

- Unhealthy lifestyles

Reasoning behind unhealthy lifestyles is based around three major themes, namely convenience, overconsumption of food and comfort eating:

- Convenience
    - Convenience was found to be influenced by time and cost. Participants who found they had less time to prepare meals resorted to cheaper convenient foods due to moving to new locations and changes in lifestyle.
      “Current lifestyle is not good; being affected by shifting to wellington, always on the 'go', If I have time I could prepare, if not it's whatever I can have on the 'go' or whatever is cheap”
      “It's easier fast food to go to MacDonald’s - because we don’t have to prepare for it”.
      “Unhealthy I think I can do a lot better, always busy with work no time to cook. Always buying take outs”

"Bad - ever since being away from home, I'm relying a lot on takeaways but I still have fruits and drink lots of waster even though I have no money"

- Over consumption of food
  - Large portion sizes contributed to unhealthy eating and excessive food intake
    "It's not as healthy as I'd want it to be; for me I should be looking at what I get in portion size"
    "Need to cut a lot of my carbohydrates and protein need to watch -serving size, At the moment there is no limitation or strict diet"
    "Unbalanced - not eating right portion/food groups eat more junk food"
  - Over-consumption of calorie dense foods contributes to participant's perceived unhealthy lifestyles
    "Not too healthy - love chocolate"
    "Eat fast food and cheap food e.g. $5.00 meals (burger king, KFC McDonalds, pizza, fish n chips, all $5.00 meals"
    "Not good, eat lots of junk food erratic diet"
    "It's bad hardly eat vegetables/fruits not drinking water lots of unhealthy food like pies, lollies, fizzy drinks"

- Comfort eating
  - Food eaten really late have been reported to contribute to unhealthy lifestyle
    "Not good eat late, no strict diet"
  - Participant also report comfort eating when in the company of peers or when alone
    "A lot of times when I'm with friends we eat crap but only when hungry. But also I do seem to eat when I'm bored"
    "It's very bad, I eat whatever is in front of me".

A few participants (n=5, 17%) report changing their lifestyle from unhealthy to healthier lifestyle due to:

- The awareness of adverse health consequences of unhealthy lifestyles
  "Currently it is changing because the leader/Pastors are aware of the issue that obesity has on health; like diabetes, high Blood pressure, heart disease, because about 50% of our church people have high blood pressure".
  "Must not over eat in order to lessen health risks"

- As an attempt to improve lifestyle some participants have made small changes such as preparing more foods at home instead of resorting to takeaway foods.

  “Current food lifestyle is average involves a lot of home cooked meals and some takeaways balance of vegetables/meat/carb”

  “Good-improving from last year No junk or fatty food in the cupboard”

  “50% on junk food and 50% on the good side reasonably ok, eat variety of food try hard to eat healthy food”

CHAPTER FIVE: DISCUSSION

5.1 Introduction

Prevalence of obesity is high amongst Pacific youth aged 16-24years (Ministry of Health., 2013). Minimal research has been done in understanding why obesity occurs with this age group. This age group proves to be an important age group due to the ability of being independent understanding their own and their families' health realities including obesity and the experiences entailed within it. Therefore this age group can be considered as being a key stakeholder in investigating how the social realities, cultural values and beliefs behind food have an impact on body weight. Therefore an exploration into the social realities, culture, diet quality and food habits is needed in order to understand obesity amongst Pacific youth living in New Zealand.

The aim of this qualitative study was to describe diet quality through exploration of dietary diversity and food variety as well as eating habits of a selected group of Pacific youth. The objectives of this study were to develop a dietary diversity questionnaire that was specific to a Pacific population living in a western setting. This questionnaire was used to assess dietary diversity and food variety and to do an in-depth analysis of the dietary quality of Pacific youth. The third objective was to explore the eating habits amongst Pacific youth in relation to their culture and pathways into obesity.

5.2 Statement of findings

The findings from this study which is set in the two largest cities in New Zealand, show that Pacific youth have high dietary diversity (considering intake of both nutritious and discretionary food groups) and a moderate food variety (considering the various food items consumed within each of the food groups). Interestingly, the food variety was mainly high within the discretionary food groups such as drinks, takeaways, sauces and flavourings and sweet snacks and selected nutritious food groups such as fruits and vegetables high in vitamin A and C as well other vegetables. Pacific youth are aware that overweight and obesity increases risks of adverse health outcomes and knows that positive changes made to their lifestyle (through diet and exercise) could help in minimising risk of obesity related health outcomes, weight management and increasing self-confidence regarding their body image. Due to factors such as time, culture, traditional practices, social and academic/employment obligations, it becomes a challenge prioritising balanced eating for Pacific youth.

5.3 Participant characteristics

With Pacific people carrying the highest burden of obesity in New Zealand, findings from this study adds to the literature that obesity is prevalent amongst Pacific youth aged 16-24 years, increasing their risk of adverse health outcomes. The participants in this small exploratory study, on average had low health risk according to their waist-to-hip ratios cut offs established by The World Health Organisation (2011). However, the participants were at the upper- end of the low risk category which can be concerning for this young age group taking into consideration their weight; if the measurements are not maintained or lowered, Pacific youth could be at risk of moving towards the 'high health risk' category as a consequence of obesity. Even though literature states that obesity increases risk of adverse health outcomes (Reilly and Kelly, 2011; Ng *et al.*, 2014), there are no research that has been published that specifically have addressed overweight and obesity in youth as a predictor of poor health in adulthood for Pacific people . The Ministry of Health (2008) uses international data on evaluating health risks; however it was recognised that not all overweight youth have the same risk of health outcomes such as hypertension, diabetes and CVD. Hence it has been suggested that appropriate risk stratification still needs to be done to give a clearer guide in identifying risk of adverse health outcomes (Ministry of Health., 2008).

5.4 Development of the dietary diversity tool

The tool that was used to measure diet quality was a dietary diversity questionnaire that was developed using the guideline set out by Food and Agriculture Organisation (FAO) (Kennedy *et al.*, 2011). In developing the questionnaire, several considerations were taken into account:

1. Reference period: in this study a reference period of seven days was chosen. The reason behind choosing this time reference period was to gage the habitual intake. It was taken into account that although it may be a bit more challenging for participants to recall intakes, no quantities or exact intake on any particular day were required, but only an indication of whether a particular food was consumed at all over the seven day period.

2. List of foods and food groups to incorporate into the questionnaire: The guidelines to developing the questionnaire were not culture, population or location specific and was suggested that prior to implementing the questionnaire it needed to be adapted to the local context. In order to make it specific to a Pacific population living in a western

setting, the foods were collated through avenues of food data bases and collaborating with Pacific researchers on foods specific to Pacific people and their culture that were consumed in New Zealand.

3. Choosing appropriate food groups: The FAO guidelines stated that the foods consumed over a reference period should be divided into 9 nutritious food groups if analysing individual dietary diversity (Kennedy *et al.*, 2011). However for this study, considering the purpose of this study was to explore intakes of food that would contribute to obesity and due to the abundance of food identified to be consumed in New Zealand, six energy dense (discretionary) food groups were added into the questionnaire (drinks; alcohol; sauces; miscellaneous items (spreads and flavourings); sweets; takeaways) in addition to the nine nutritious food groups. The 15 food groups in the questionnaire were than allocated into a nutritious food group category (foods that are nutrient dense as opposed to energy dense) and discretionary food category (foods that are more energy dense as opposed to nutrient density).

These modifications and addition of extra food groups were not included in the questionnaire, however, because of a large number of food items identified for this particular ethnic group living in a western setting, the modifications made to the guidelines proved valuable as it helped in evaluating clear variances in food consumption across food groups. This approach to dietary diversity analysis have not been done in previous studies, due to the fact most dietary diversity studies were conducted in developing countries where food consumption were monotonous, with limited variety and where household food security or malnutrition was a key focus (Hatloy *et al.*, 1998; Oldewage-Theron and Kruger, 2008; Roche *et al.*, 2008; Oldewage-Theron and Kruger, 2011). The current study explores malnutrition in the context of over-nutrition in a developed country where foods are available in abundance and a more varied diet is generally consumed.

Upon data analysis, the 15 food groups from the dietary diversity questionnaire were disaggregated into 26 food groups where 15 food groups were categorised under the nutritious category and 11 food groups were categorised under the discretionary category. This was an expansion to the guidelines on analysis of dietary diversity where it was stated that foods should be divided into nine nutritious food groups to assess dietary quality (Kennedy *et al.*, 2011). However previous research (Arimond *et al.*, 2010) showed that precision of dietary diversity indicators was improved when greater disaggregation of food groups is used.

5.5 Diet diversity

Dietary diversity is widely recognised as a key indicator of diet quality and the focus according to literature must be based on the variety of foods across and within nutritious food groups (Ruel, 2003). Various studies have illustrated a positive association between diverse diets and optimal nutrient intake. Like other studies (Roche *et al.*, 2008; Labadarios *et al.*, 2011; Oldewage-Theron and Kruger, 2011), this study focused on measuring dietary diversity by the simple counting of food groups and individual food items across and within food groups. The overall findings on dietary diversity from this study indicate that participants have a highly diverse diet. The findings indicated that on average, participants were consuming 23.1 food groups out of a possible 26. In regards to consumption of nutritious food groups it was found that on average 14.3 food groups (out of 15 groups) and in the discretionary category, 8.8 food groups (out of 11 groups) were consumed. The significance of consuming numerous food groups is that it increases the likelihood of meeting nutrient requirements (Kennedy, 2004). Kennedy, (2004) also stated that there is no single food that contains all the required nutrients that would be optimal for health. However this study did not investigate whether the participants met the nutrient requirements but rather explored their food variety (counting the number and types of food items) to gain an understanding of nutrition adequacy and to provide a picture of overall food consumption practices.

A varied diet has been associated with improved health outcomes such as, growth, anthropometric status and reduced nutrient deficiencies (Hoddinott and Yohannes, 2002). The current New Zealand dietary recommendation states that New Zealanders should “eat a variety of foods from the vegetables and fruit, breads and cereals, milk and milk (preferably low fat) products and lean meat, poultry, fish, shellfish, eggs, legumes, nuts and seeds food groups” (Ministry of Health., 2003a). The results from this study confirm that even though the participants were consuming foods from each food group, the mean food variety was only moderate. Ninety one food items were consumed in total (51 (56%; ranging between 17 and 93) of nutritious food items and 39 (i.e. 43%; ranging between 15 and 74) of discretionary food items) over seven days. The number of foods consumed from each category is nearly similar as it is equivalent to the consumption of 12 different food items on average per day of which seven were nutritious and 5.5 were discretionary items; which on daily consumption levels is indicative of poor variety. The findings from this study can be comparable to studies done by Oldewage-Theron & Kruger (2011) who investigated dietary adequacy of women caregivers in a Peri urban settlement in South Africa. The findings from that study showed that the range of nutritious food

items consumed by any individual was between zero to eight food items, which is indicative of a poor variety (Oldewage-Theron and Kruger, 2011). Similarly Jayawardena and co-workers conducted a study investigating dietary diversity, food variety and obesity amongst a Sri Lankan population. They found the variety of foods consumed in the 24 hours reference period was poor amongst those people living in estate sectors (peri-urban) (8.28 food items consumed). In addition, ethnic differences were also found to be associated with poor food variety where those of Indian Tamil ethnicity were found to have the lowest nutritious food variety (8.21 food items) compared to Sinhalese, Muslims and Sri Lankan Tamil (Jayawardena *et al.*, 2013). No comparison could be made with Pacific populations and their ethnic counterparts in New Zealand from this study, however the results are just as comparable to studies done in developing countries and the results are indicative of low intakes of a variety of nutritious foods.

From the nutritious food group category, the food groups identified with the most food variety were the Vitamin A-rich fruit and vegetables, Vitamin C-rich fruit and vegetables, Other vegetables and the Cereals group with 23, 18, 16 and 10 food items respectively. However, the number of food items eaten from those groups on average was less than half compared to the total of food items identified in each group. For example, out 23 food items identified for possible consumption in the Vitamin A-rich fruits and vegetables group, the participants on average consumed only 8 items in the 7 day period. This indicates that even though there is availability of nutritious foods, the participants are consuming only a small amount of these. These results on consumption of nutritious foods can be compared to other dietary diversity studies. For example, a study conducted in rural Mali comparing dietary diversity and food variety in two different areas found that even though food diversity scores of nutritious foods ranged between 4-10, the variety of foods within each was moderate such as only 41% of the fruits group was consumed in the Oussoubidiania area and 69% of the fruits group were consumed in the Ouassala area by majority of the participants (Torheim *et al.*, 2004). Another study conducted in South Africa, recognised 3 food items in the Vitamin-A rich food group, where the majority of the participants consumed between zero and two items, likewise with vegetables foods group, where out of a total four food items identified, the majority of the participants consumed between zero and 2 items from the group (Oldewage Theron and Kruger, 2009). Even though the comparable of numbers from previous published studies are low, it is indicative that even though food groups are consumed, the amount of foods in each group groups is low to moderate.

Furthermore studies investigating the relationship between dietary diversity and obesity found that the risk of obesity was lower amongst those participants who consumed a high variety of fruits and vegetables. Similar results were found in a Boston study where an inverse relationship was established with vegetable consumption and excessive energy intake (McCrory *et al.*, 1999). Likewise, a study by Kennedy and co-workers (2001), found that consumption of fruits and vegetables was associated with lower energy intake, hence a lower BMI (Kennedy *et al.*, 2001).

The least popular food group in the nutritious category was the Legumes food group where more than half of the participants did not consume any food items from that group. Along with fruits, vegetables and nutritious cereals, legumes are also a rich source of dietary fibre which has been found to be beneficial for healthy bowel function. Furthermore consumption of fibre have been found to aid in maintaining a healthy body weight and decreasing obesity by causing a shift in consuming less energy-dense, discretionary foods, increasing satiety as well as decreasing the efficacy of absorption into the small intestine (Slavin, 2008). It has been found that Pacific Islanders have low utilisation of legumes and pulses due to high cultivation and utilisation of root crops such as taro, yams, cassava and high consumption of seafood (Gowda *et al.*, 2006). Considering that many health messages in New Zealand promote consumption of legumes, there is limited information that explains why there is low consumption amongst Pacific people. A dietary diversity study conducted by Labadarios and co-workers (2011) found that the legumes group were the least consumed food group amongst the South African population. Furthermore they elaborated that health promotion messages regarding consumption of legumes may not be well understood by population groups due to lack of access to a variety of foods in low income areas. Therefore unless access is addressed, understanding and knowledge on health promotion messages will have very little effect on intakes (Labadarios *et al.*, 2011).

The Dairy group was also another neglected nutritious food group where the majority of the participants were consuming between one and two food items from the group out of the 8 dairy food items identified for consumption. Dairy foods are a rich source of calcium which is an essential nutrient for building new and healthy bones and teeth. Adequate calcium intake aids in achieving peak bone mass, which is protective against bone loss and osteoporosis as adults age (Greer *et al.*, 2006). Evidence from a systematic review of 19 cohort studies was suggestive (however not convincing) that consumption of dairy foods had protective effects against overweight and obesity (Louie *et al.*, 2011). Evidence states that in New Zealand, the risk of

inadequate calcium intake is highest in young Pacific women and Pacific males (Ministry of Health. and University of Otago., 2011). A study conducted by the Health Sponsorship Council (2007) showed that some Pacific families found it difficult to afford dairy products such as milk and hence would consume sugary drinks as a beverage instead (Health Sponsorship Council. *et al.*, 2007). With Pacific people living in low socio-economic environments, it is evident that the affordability becomes a barrier towards healthy eating.

Consumption of discretionary foods can be considered as a contributing factor towards obesity, since these foods are high in saturated fat, refined carbohydrates (sugar), salt (sodium) and are generally low in vitamins and minerals (Ministry of Health., 2012). These foods do not have many nutrients in them besides providing energy and therefore contribute towards excessive energy intakes – hence add discretionary energy to a person's diet. In regards to the discretionary food groups, those with the most food variety were Drinks, Takeaways, Sauces and Flavourings and Sweet snacks with 14, 13 and 11 food items identified respectively. In contrast to the nutritious food groups, it would be preferred that the food variety in the discretionary food groups were lower, to ensure that more nutritious foods are consumed. However, the number of food items eaten by the majority of participants was between 4-9 items (Table 4.3). One of the outstanding findings from this category was the consumption of items in the drinks food group. From the 14 identified items an average intake amongst the participants was 6.9 with the majority of the participants (24 out of 30) consuming between four and ten items. Likewise for sweet snacks, out of 11 identified items an average of six items was consumed with the majority of the participants (25 out 30) consuming between three and nine takeaways items. This indicates that food items in the discretionary groups are consumed more readily than foods in the nutritious groups, even though the nutritious category had more food groups.

Systematic reviews conducted on consumption on sugary drinks have found significant association with increased weight gain and increased risk of overweight and obesity. Likewise with takeaway consumption, The World Cancer Research fund and American Institute for Cancer Research (2007) stated that there is probable evidence proving that, consumption of takeaway or fast foods more than two times a week was associated with increased risk of obesity (World Cancer Research Fund & American Institute for Cancer Research., 2007).

Previous epidemiological data indicated that young Pacific people consumed high fat, high sugar foods three or more times a week (Ministry of Health., 2012). These foods included takeaway foods (consumed by 48% males and 26% females) and soft drinks (consumed by

77% males and 60% females) (Ministry of Health., 2012). The findings on takeaway consumption from this study suggest that more than half the participants consumed 7 out of 13 takeaway food items in the study period. This study also showed really high intakes of sweetened drinks as 98% of the participants consumed soft drinks (Table 4.4). The New Zealand recommendation states the following: “limit drinks such as fruit juice, cordial, fruit drink, fizzy drinks including diet drinks” (Ministry of Health., 2003). This study found that more than 50% of the participants consumed fruit drinks, flavoured milk, and imitation drinks. In addition, Sweet snacks were also consumed regularly (Table 4.4). Excessive consumptions of sugary drinks according to the literature have been found to occur as a result of low cost and increased availability and access (Vartanian *et al.*, 2007). Furthermore it has also been found that sugary drinks have an inability to induce satiety hence their consumption encourages excessive intake leading to excessive energy consumption as well as displacing nutritious foods in the diet (Bellisle and Drewnowski, 2007; Vartanian *et al.*, 2007; Wolf *et al.*, 2008).

The results show that more than 50% of the participants consumed 8 out of 11 identified sweet food items including chocolates, chewing gum, lollies, biscuits, cakes, sweet bakery items, desserts and puddings. These results were consistent with the New Zealand data where sweet foods are consumed by young people three or more times a week (Ministry of Health, 2012). Discretionary foods are inexpensive, widely available as well as highly marketed. This is particularly true for soft drinks and takeaway foods which create a perception that those foods could be consumed every day (Ministry of Health., 2012). Most discretionary foods are also very convenient, requiring no food preparation or cooking time (Ministry of Health., 2012), which could be appealing to Pacific youth who have busy schedules. Foods high in fat, sugar and salt also have increased palatability and subsequently increasing its preferences over nutritious foods (Drewnowski, 2004; Swinburn *et al.*, 2004).

A review conducted by Kennedy (2004) stated that people may not necessarily have a high variety in their overall diet; however, their food variety may be high in selected food groups (Kennedy, 2004). These food groups may be linked to higher risk of obesity such as those groups with high energy content as opposed to nutrient content. The findings from this study support the evidence stated by Kennedy (2004) since a higher variety of foods were seen amongst the discretionary food groups contributing to higher energy content (Table 4.3 and 4.4). Studies investigating the relationship between obesity and dietary diversity and food variety recommended that changing variety in certain food groups may help in reducing energy and fat intake which could lead to sustainable weight loss and maintenance (Raynor *et al.*, 2004).

Similarly Jayawardena and co-workers (2013) in their study recommended that a reduction on dietary variety of highly palatable and energy rich foods may be a way to lower excessive weight gain. At the same time, in order to avoid nutritional deficiency, foods high in nutrients (such as low fat milk, vegetables, fruits) and low in energy (kilojoules/calories) should be encouraged (Jayawardena *et al.*, 2013).

The least popular food group in the discretionary category of this study was alcohol. Alcohol consumption is not a traditional part of the Pacific islands' culture (Warren *et al.*, 2006). In a survey conducted by the NZ Ministry of Health, it was found that 46% of Pacific people were non-drinkers (Stefanogiannis *et al.*, 2007). Religion, beliefs and commitments were the main reasons discovered in the literature for Pacific people to abstain or limit alcohol intake (Stefanogiannis *et al.*, 2007). This study did not carry out an in-depth analysis on alcohol consumption, however by observing the findings on the number of participants not consuming alcohol, it can be indicative that alcohol consumption is uncommon in this age group and because participants were found to be affiliated to churches, one can connect prior findings that religion and beliefs could be the influencing factors for not consuming alcohol.

5.6 Meal patterns

The general meal patterns for the majority of the participants were two meals (lunch and dinner) per day with snacks in between on both week and weekend days.

5.6.1 Breakfast

The most important finding was that breakfast consumption amongst the participants was low; just half of the participants did so on weekdays (50%) and there was not much difference seen on weekend days (57%). The importance of breakfast consumption has been associated with better nutrient intake and a healthier body weight (de la Hunty et al., 2013; Rampersaud et al., 2005; Szajewska & Ruszczynski, 2010). Skipping breakfast from a young age or during adolescent years predicts an increased BMI during young adulthood, and has been associated with higher BMI (Niemeier *et al.*, 2006; Utter *et al.*, 2007). This finding is confirmed by the 2008/09 NZNNS (Ministry of Health. and University of Otago., 2011) where it was reported that young Pacific people are the most likely to miss breakfast with evidence showing only 42.2% males and 48.1% females were consuming breakfast.(Mackay *et al.*, 2012). Muimuiheata (2009) suggested that the majority of Pacific people do not have a set time to consume meals and would eat according to how hungry

they feel. Furthermore it was stated that for individuals who do not have work would consume breakfast in late hours of the morning i.e. between 9 and 12pm (Muimuiheata, 2009).

Skipping breakfast has also been found to result in increased snacking behaviour or increased consumption of palatable energy-dense foods (Sjoberg *et al.*, 2003; Rampersaud *et al.*, 2005). The current study found similar results where those participants who did not consume breakfast, consumed snacks during the day, particularly snacking on discretionary foods such as potatoes crisps, muesli bars, cookies and crackers, all of which are high in fat and sugar and / or salt. Reasons for breakfast skipping included lack of time due to waking up late and different activities carried out at different times of the week, such as church and sports commitments on weekends and work or school on weekdays. This is similar to the findings of Rampersaud and co-workers (2005) indicating that breakfast skipping is attributable to lack of time in the mornings, especially amongst the younger population. It cannot be determined from this study that breakfast skipping is associated with high BMI levels amongst the participants, however the findings could be taken into consideration that it may contribute to excess weight gain due to the irregularity of meal patterns and frequency of snacking observed.

The most common foods consumed for breakfast in this study were cereals with milk, breads with spreads which is consistent with consumption of the New Zealand population (Ministry of Health., 2012) . In addition dinner leftovers consisting of meat and starchy vegetables or rice and other salad vegetables were also found to be consumed by breakfast consumers. The Ministry of Health suggested that a healthy breakfast should include a variety of foods from the breads and cereals, fruits and vegetables and milk and milk products groups. Consumption of breads and cereals as well as milk was observed amongst the participant. The importance in this case for this particular ethnic group is to encourage breakfast consumption since previous research have indicated that breakfast consumption was positively associated with adequate intake of energy, dietary fibre, vitamins (such as folate, thiamine, riboflavin, vitamin A) and minerals (such as calcium, iron and zinc) (Affenito *et al.*, 2005; Chitra and Reddy, 2007; Ministry of Health., 2012). Furthermore, breakfast consumption is associated with weight maintenance and this is due to the fact that consuming breakfast encourages less snacking and even meal consumption throughout the day (Sjoberg *et al.*, 2003; Rampersaud *et al.*, 2005).

5.6.2 Lunch and Dinner consumption

In this study, lunch and dinner were the main meals consumed by the participants. Lunches were mostly consumed away from home. This finding is consistent with New Zealand data showing that young people do consume foods away from home (Ministry of Health. and University of Otago., 2011). Rockell et al (2011) identified the common foods consumed by young people in New Zealand included sandwiches, fruits, biscuits, muesli bars, crackers, potato crisps as well as sweet drinks (Rockell *et al.*, 2011). The findings from the current study also found similar foods being consumed (Table 4.9), however, in addition there was also a large variety of takeaways consumed at both lunch and at dinner (reflection of a high dietary diversity score amongst the discretionary category) (Table 4.9 and 4.11). Similarly, the National Nutrition Survey (Ministry of Health. and University of Otago., 2011), found that young people aged between 15-30 years are more likely to consume takeaway foods three or more times a week. These findings align with several research studies that have found that eating foods purchased away from home, especially takeaways or fast foods more than two times a week, is associated with increased risk of weight gain and obesity (Block *et al.*, 2004; Niemeier *et al.*, 2006; World Cancer Research Fund & American Institute for Cancer Research., 2007; Rosenheck, 2008).

The participants in this study consumed takeaways frequently, mostly due to the following reasons: lack of time for food preparation, convenience, low cost and taste. These factors concur with the findings identified in a study by Rydell and co-workers (2008) (Rydell *et al.*, 2008). Furthermore Pacific people have been found to choose foods that are based on affordability, availability, palatability and convenience (Ministry of Health., 2012).

However it is worth noting that apart from takeaway foods, packaged snacks and spreads, the characteristics of participants' lunch and dinner meals do contain some nutritional qualities such as breads, meat, fish or poultry as well as fruit, starchy and non-starchy vegetables, confirming their moderate dietary variety indicating medium nutrition quality.

5.7 Food consumption at social occasions

Most of the participants in this study reported increased intakes of foods at social occasions. Cost, convenience, high food availability, variety of food available and the social environment were factors found to influence the increased food consumption. These findings coincide with the findings in the literature which states that the ease and convenience with which foods can

be consumed strongly influences consumption. It has been found that people would consume more food when there is minimal effort put in to obtaining it, which emphasises preference for convenience (Stroebele and De Castro, 2004; Wansink, 2004). In the current study participants were found to eat more where less effort had to be put in to obtain their food such as at social occasions. In contrast, food consumption was found to decrease for some participants at social occasions that occurred outside of the family circle such as gatherings at schools, universities, and work meetings. This was due to the cost of buying food or obtaining foods at such social occasions that resulted in decreased food intake since foods bought were perceived to be expensive. Literature also states the type of foods available and its accessibility also impacts increased food consumption. The sight of food, especially those foods that are visually pleasing enhances the desire to eat more which contribute to increased food intake regardless of an individual's state of hunger. The presence of people such as families and friends also influences what foods are eaten and also how much is eaten (Stroebele and De Castro, 2004; Wansink, 2004). Food intake was reported to increase when eaten with people who are familiar and friendly, since they make the eating experience more relaxed and enjoyable which could hinder an individual's ability to monitor their intakes (Wansink, 2004). The findings from the current study coincides with the literature which helps explain reasons as to why participants ate more due to time spent socialising with friends and families.

Food consumption at social occasions varied greatly from one occasion to another. This study confirms that a large variety of foods were reported to be consumed at weddings, funerals and birthdays and that more discretionary foods were consumed at other social occasions (Table 4.12). Furthermore, more traditional foods were often consumed at these occasions. Traditionally Pacific cultures emphasise their food consumption around starchy foods and animal proteins (Ministry of Health 2012). In this particular study, a variety of meat, seafood, poultry, and starchy vegetables such as taro, yams and kumara were reported to be consumed; these are considered prestigious foods (Ministry of Health., 2008). It is well established that food plays an important part in feasting (which is a significant ritual in many Pacific communities) and celebration, as it signifies wealth and social status and is used to demonstrate kinship and identity (Rush *et al.*, 2009a; Ministry of Health., 2012). Sharing of food carries values such as respect, love as well as appreciation. It also expresses hospitality which brings people together. Therefore the cultural values behind food consumption help explain the significance of consuming a variety of foods at social occasions.

5.8 Findings on weight and lifestyle perceptions

Over half of the participants were found to be unhappy with their current body weight and wanted to lose between five to ten kilograms of body weight, as weight was an issue for them and they reported using dietary changes, healthy eating and exercise as ways to lower their body weight. For the majority of the participants, family encouragement contributed to their attempts in controlling their weight. This finding adds to the research conducted by Teevale (2009) reporting that obese Pacific adolescents who were dissatisfied with their body weight engaged in more weight controlling behaviours than healthy weight subjects (Teevale, 2009).

The participant's knowledge from this study regarding obesity, and its associated health consequences was comprehensive. It also formed the foundation of their perception as to why they thought having a large body size is not ideal and hence could potentially result in their attempt in making lifestyle changes.

According to the participants, they perceived a big body size to be unhealthy as it reflected consumption of large amounts of unhealthy foods such as fatty meats, takeaways, fizzy drinks, sweet and salty snacks. They were also aware that consumption of these types of foods and drinks as well as lack of time to prepare food and do exercise contributed to their current lifestyle which they perceived to be unhealthy. The participants in this study idealised having a smaller body size to what they currently had as they perceived a smaller body size to be acceptable and healthier. There was however no distinct definition of what their perception of small body size was. The response were also mixed where some participants responded on not being too big nor too small but being of a body size that is in-between as ideal, whereas others just thought smaller body size was ideal. Teevale (2009) in his study defined what his participants perceived to be an ideal small body size. It was found that Pacific adolescent girls idealised smaller body size as being able to fit into clothes that were sized between 12-14, whereas Pacific mothers reported that fitting into clothes size between 14-16 is an ideal body image (Teevale, 2009). With this current study it was hard to define what the perception of small body size was amongst the participants, however the common finding that can be derived from this study is that Pacific people do not find being of a bigger body size as desirable and that is mainly due to their awareness of health consequences associated with obesity.

CHAPTER SIX: CONCLUSION

6.1 Introduction

Pacific people have been found to carry the highest burden of obesity compared to the general populations of New Zealand (Ministry of Health., 2008). Pacific youth in particular have been found to have 2.5 times more risk of obesity than any other of their ethnic counterparts (Statistics New Zealand. and Ministry of Pacific Island Affairs., 2011). In many prior interventions, the focus has been on infants, children, adolescent (aged 13-17 years), adults or older adults; however, less has been done in Pacific youth, particularly the 16-24 year old age group. It is well recognised that this age group has the capacity to understand their own social and health realities as well as that of their families. Therefore their contribution in understanding these issues could help address the social-health aspects contributing to obesity and thus aid in attempts to prevent obesity.

Obesity at a younger age tracks into adulthood and has been associated with various chronic health consequences which ultimately reduce quality of life and increase risk of death. Social determinants such as low socio-economic status and food security have been the main focus in the literature to predict obesity amongst Pacific people living in New Zealand. Evidence regarding social and cultural factors pertaining to obesity in Pacific youth is lacking. This limits the understanding of broader factors which drive Pacific people's daily practices which, as a result, may lead to weight gain.

Weight gain is a result of energy imbalance and is influenced by diet quality, food security, eating habits and physical activity (Ministry of Health., 2010). Evidence published by the Ministry of Health (Ministry of Health. and University of Otago., 2011) indicates that Pacific people have inadequate nutrition status and diets high in fat, sugar and salt. Diet quality of Pacific people is therefore a real concern, with limited qualitative evidence available on its impact with other interrelated factors on the development of obesity in this specific group in New Zealand.

Diet quality is indicative of an individual's or a household's dietary diversity (number of food groups consumed) as well as their food variety (number of individual foods consumed across and within food groups (Ruel, 2003).The significance of consuming a variety of foods from numerous food groups is that it increases the likelihood of meeting nutrient requirements which would be beneficial for overall health (Ruel, 2003). The current New Zealand dietary recommendations also recognise the importance of incorporating variety in diet. The

recommendation states that New Zealanders should “eat a variety of foods from the vegetables and fruit, breads and cereals, milk and milk (preferably low fat) products and lean meat, poultry, fish, shellfish, eggs, legumes, nuts and seeds food groups” in order to prevent nutritional deficiencies, obesity as well as diet-related chronic diseases (Ministry of Health., 2003a).

This research study aimed to explore diet quality and eating habits amongst Pacific youth aged 16-24 years and to investigate how cultural norms and values influence their diet practices. These outcomes could contribute to understanding the multiple factors paving the way for obesity. This study is the first study to use dietary diversity and food variety as a way to assess diet quality amongst Pacific youth. Diet quality was explored, not just focusing on consumption of just energy-dense foods, but also nutritious foods that are beneficial for overall health. In addition, eating habits and meal patterns were investigated to allow understanding of the reasons for the various habits and practices that may lead to obesity. Furthermore, because this study has an exploratory design, it provides a knowledge base for future interventions to build upon.

The research tool that was used for this study was a dietary diversity and eating habits questionnaire which was implemented through a one on one interview process. The dietary diversity part of the questionnaire was quantitative in nature (food and food group counts) combined with a qualitative assessment component, whereas the eating habits part was more qualitative (exploratory questions to explain motivations, behaviours and practices). As part of the larger study called “Chewing the facts on fats, what does it say about you”, lifestyle and cultural factors influencing body weight were explored during the interview process, using specific probing questions. This method helped to gain a general understanding on what the participants currently consumed as well as the underlying cultural and social factors that influenced their eating practices. The quantitative findings on dietary diversity and qualitative findings on eating habits, culture and lifestyle complemented each other as it helped in providing an understanding of the research aim and objectives of this study.

6.2 Summary of Findings

The findings of the study will be discussed according to the objectives of this study as set out in chapter 1.

6.2.1 Objective one

The first objective of this study was to develop a dietary diversity and eating habits questionnaire focused on Pacific peoples dietary habits. The dietary diversity questionnaire was developed using the Food and Agriculture Organisation guidelines (Kennedy *et al., 2011)*, adapting it to New Zealand food culture, and even more specific, to that of Pacific youth living in NZ. This process was done through listing foods from National Nutrition Surveys and discussion of general food consumption practices with Pacific groups, and piloting the questionnaire before it was implemented. The questionnaire had 15 food groups which were divided into nutritious (which had 9 food groups based on its high nutrient content) and discretionary categories (which had six food groups based on its high energy content). Upon analysis, the 15 food groups from the questionnaire were disaggregated into 26 groups allocated into two categories; the Nutritious category containing 15 food groups and the Discretionary category containing 11 food groups. By disaggregating the food groups, the variance in consumption became apparent and comparisons were easily made, which proved valuable for this study. The expansion of food groups also helped in identifying the most consumed foods and highlighting the most concerning features of the participant's food intakes that needed to be addressed. Therefore objective one has been met successfully and can also be applied to larger studies exploring diet quality amongst Pacific groups.

6.2.2 Objective two

The second objective of this study was to assess diet quality in terms of food variety and dietary diversity amongst Pacific youth. This group of Pacific youth had a high dietary diversity (mean DDS of 23.1 out of 26 groups) and moderate food variety (mean FVS of 91 out of 227 identified food items). The nutritious category had in total 129 food items from which a mean of 51.7 food items were consumed whereas the discretionary category had in total 98 food items from which a mean of 39.3 food items were consumed. According to established cut offs on food variety (Matla, 2008), consumption of between 30 and 60 nutritious foods is classified as medium variety which is what was established in this study regarding the variety of nutritious foods consumed. In addition, many discretionary food items were also consumed, expanding the energy density of the diet.

The most variety in the nutritious food groups were identified in the Vitamin A and Vitamin C rich fruit and vegetables groups (23 and 18 food items respectively), however a moderate

amount of food items were found to be consumed by the majority of the participants from these groups (between three to eight items from the Vitamin A rich fruit and vegetables group and between two and seven items from the Vitamin C rich fruit and vegetables group).

The least popular food groups from the nutritious category were the legumes and dairy groups. More than half the participants did not consume any food items from the legumes group; the remainder of participants consumed only small variety of three food items from the legumes group. The exact reasons on why legumes consumption is not popular amongst Pacific people is not yet known, however it is known that cultivation and utilisation of legumes in the Pacific Islands is minimal due to higher utilisation of root vegetables and seafood (Gowda *et al.*, 2006). Interestingly, the findings on legume intakes from a dietary diversity study conducted in a developing country also found a similar consumption pattern, and it was suggested that the reasons were lack of understanding of health promotion messages on its use as well as limited access to a variety of products (Labadarios *et al.*, 2011).

The dairy food group was also a neglected food group amongst this group of participants. Although a total of eight different dairy foods were identified as being consumed by this group, more than half the participants consumed only one or two dairy foods. This finding was consistent with findings from the National Nutrition Survey(Ministry of Health. and University of Otago., 2011), indicating that dairy foods are not the most popular group of foods to be consumed amongst this group. Due to high cost of dairy products, affordability becomes an issue for Pacific peoples especially those from low socio-economic backgrounds (Health Sponsorship Council. *et al.*, 2007; Lanumata *et al.*, 2008). The most variety in the discretionary category was found in the Drinks (14 items), Takeaways (13 items), Sauces and Flavourings (11 items), and Sweet snacks groups (11 items), where more than half the food items in each of these food groups, were consumed. For example from the drinks group, although 14 items were identified, more than half the participants were found to consume between four to ten drink items. The types of drink items consumed by more than half the participants included soft drinks, juice (<100% pure fruit), flavoured milk, tea, juice (100% pure fruit) and imitation drinks. Likewise for takeaway items, there were a total of 13 food items identified from which the majority of the participants consumed between one to nine takeaways items. The types of takeaways items consumed included hot chips/ french-fries/ kumara chips, hamburgers, fried chicken, pies, sausage rolls, sandwiches, wraps, pitas and sushi. The results indicate that even though the participants

are consuming foods from the nutritious category, the proportion of foods eaten is lower compared the proportion of foods eaten from the discretionary category. Energy intakes would thus be high due to the fact that discretionary foods are generally energy-dense and rich in fats and sugars or refined carbohydrates. The most neglected food group from the discretionary category was the alcohol group. Abstinence or low alcohol consumption was mainly due to religion, beliefs and commitments (Stefanogiannis *et al.*, 2007). Overall from the findings it can be suggestive that diet quality for this group of participants was moderate; even though the majority of the food groups were consumed, the variety of foods in particular nutritious foods was moderate.

6.2.3 Objective three

The third objective was to explore the eating habits amongst Pacific youth in relation to culture and obesity. Overall a two-meal per day pattern was observed, with more than half of the participants skipping breakfast and instead consuming snacks during the day. The variety of takeaway foods consumed for lunch and dinner on weekdays and weekends were high amongst this group of participants. This finding is indicative of their diet being high in fat, sugar and salt, all of which are characteristic of excess energy intake. Lack of time for meal preparation, convenience, as well as low cost and taste were the reasons established for consuming a high variety of takeaways. This is in line with previous evidence suggesting that Pacific people make food choices based on affordability, availability, palatability and convenience (Ministry of Health., 2012).

Investigating practices around social occasions showed increased food intakes by participants due to the high availability of foods. Participants would eat more if food was provided to them for free, and would eat less if they had to buy food themselves at gatherings. Socialising also contributed to increased intakes since nutrition and portion size control was not a priority for some people at these occasions; they rather wanted to enjoy other peoples company whilst being free to consume any foods they can. On the contrary, only a few participants recognised that social occasions have a lot of discretionary (unhealthy) foods which is why they would eat less. The types of foods available at social occasions varied depending on how traditional an occasion is. Large amounts of foods were consumed at weddings, funerals and birthdays. A mixture of traditional foods (e.g. taro, pork, Sweet and sour luau (fish),Chopsuey, palusami, koko rice) as well as westernised foods (e.g. green salad, coleslaw, potato salads, pasta, chicken nuggets) (both nutritious and discretionary) was consumed at these three occasions whereas on other occasions,

more discretionary foods (e.g. potato crisps, cakes, biscuits, takeaway foods, lollies, soft drinks) were consumed. The findings indicate that with a combination of increased food intake as well as the availability of discretionary foods at social occasions, it can be implied that these two factors could lead to excessive energy intake.

Over half the participants were unhappy with their current body weight and wanted to lose between five to ten kilograms of weight. Dietary changes, healthy eating and exercise were ways participants have tried to lower their body weight. Being overweight or obese was seen as being unhealthy and was reflective of an unhealthy lifestyle.

The conceptual model linking some socio-cultural factors to obesity that was originally developed by Ball and Crawford (2010) has been used to summarise the findings from this study. Overall the model illustrates that the socio-cultural factors identified from this study was the ethnic group i.e. Pacific youth who are at increased risk of overweight and obesity. The mediating pathways into obesity that were identified included values around food and eating, time, environmental influences, taste preference, and values and beliefs about body size/obesity. All of these led to related behavioural outcomes namely food choice (such as increased consumption of discretionary foods and decreased consumption of nutritious foods), specific eating behaviours (which included increased consumption of food at social occasions), unorganised eating patterns (such as skipping breakfast and increased snacking during the day), and diet and weight loss behaviours (where diet and exercise were ways in which participants have tried managing their weight). Excessive energy intake was a result of high food availability, excess and continuous eating which increases the risk of weight gain and obesity (See figure 6.1).

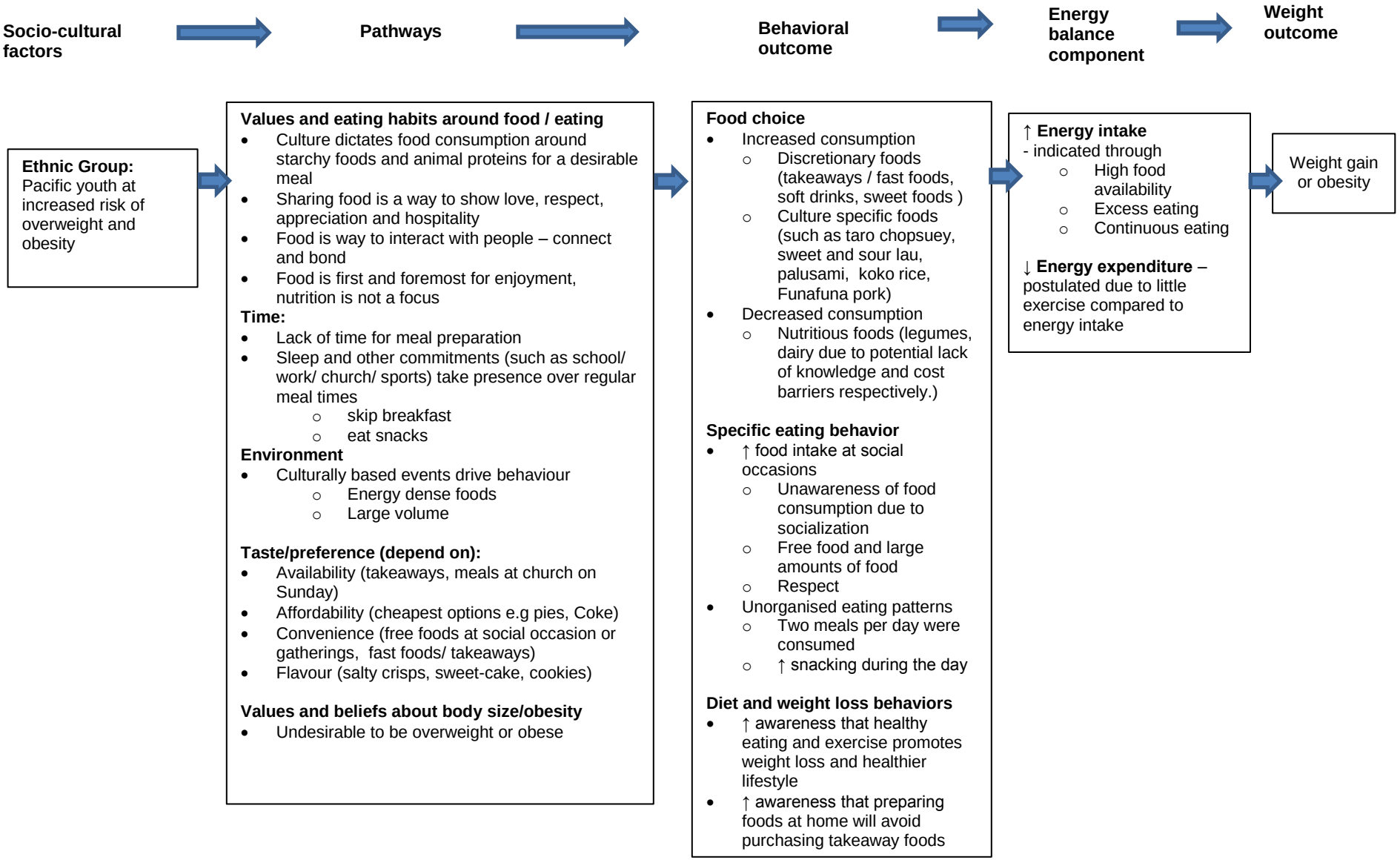


Figure 6.1: Application of findings from this study to the Ball and Crawford's, (2010) Conceptual model of pathways linking selected socio-cultural factors with obesity

6.3 Recommendation for future interventions

Taking into account the level of awareness amongst this group of participants regarding their current weight and the reasons contributing to their current situation, it does pose a question on how ready this group is to make lifestyle changes to control their body weight. Since being aware of the reasons contributing to weight gain and being ready to do something about it, are two different stages of change according to the trans-theoretical model of change (Norcross *et al.*, 2011). Therefore the readiness to make lifestyle changes should be an area of focus for future research due to the fact that this age group is at that stage of life where they are transitioning to take responsibilities regarding their education, employment and living arrangements which will require them to make lifestyle choices.

Consumption of legumes carries many benefits in regards to weight management. According to this study, the reasons for low consumption of legumes amongst Pacific youth living in New Zealand were not established, and should be explored. The participants' perception on what a snack food is needs to be explored since snacking could be an area to look into as another strategy to enhance diet quality and to reduce excessive energy intake. A focus on quick and accessible healthier food options which is appropriate to Pacific youth should also be the focus for future interventions. This could potentially help lower excessive energy intake and enhance diet quality. Strategies to promote meal consumption most importantly breakfast consumption and its importance must be emphasised in order to minimise frequent snacking as another approach for reducing energy intake. Strategies to increase healthier food choices and controlling portion sizes at social occasions should be further investigated. This will add value to future interventions in attempting to reduce excessive energy intake without compromising the cultural values associated with food intakes.

6.4 Strengths of the study

The collaboration between the West Fono Health Trust and Evolve Youth Services and Massey University in both Auckland and Wellington was a strength of this study. Without their input and assistance, these participants would not have been available for the study. Their involvement enabled the valuable process of pilot testing and fine-tuning the newly developed dietary diversity questionnaire to be appropriate for use in Pacific populations living in New Zealand.

Due to the abundance of information available on obesity, the use of a conceptual model was found to be useful in this study as it helped in keeping focused on the topics that was needed to be explored especially regarding the cultural factors influencing food intake.

The qualitative nature of the study enabled gathering extensive data on sensitive topics to gain insight in the diet quality and eating habits of Pacific youth.

The information gathered from this study is focused on and appropriate for Pacific youth due to purposive or judgmental sampling, and adds to the literature regarding obesity amongst Pacific people.

6.5 Study Limitations

There was variance in the level of detail collected on eating habits data. This could potentially be due to the fact that the research assistants in this study did not have a nutrition background. Furthermore, limited involvement from the researcher was possible during data collection due to the logistics of the study and where it was conducted.

Even though it was evident that participants were snacking in between meals, the questions around snacking could have been extended further in the questionnaire regarding the exact timing of snacking as well as the types of foods participants snacked on daily. Since people's perceptions on snack foods are different, a wide range of different responses were received, but not enough to determine trends. The purposive sampling and small sample size in this study was a limitation for the qualitative exploration of some topics, as data saturation was not necessarily reached. A larger study with more participants would have benefited the understanding of some topics.

The length of the questionnaire was also found to be a limitation. The dietary diversity and eating habits questionnaire were completed together with other questionnaires that were used as part of the larger study; hence it was lengthy for both interviewers and for the participants to get through them all at once. Conducting two or more focused topical interviews by specialists in the field could have been a more beneficial approach.

6.6 Future recommendations on what could be done better if this study was to be done again

In regards to data saturation, it would be recommended to continue collecting data until data saturation is reached to validate findings.

In regards to the eating habits data collection, it would be recommended that research assistants with nutrition training should carry out the interviews to ensure a consistent level of detail in data collection.

Future research should perhaps be expanded to also include a focus group discussion by a nutrition specialist with participants to further clarify captured data at the end of the process.

More extensive training of research assistants with a very detailed standardized operating procedure may be beneficial to ensure that the depth of detail is achieved during the research process.

6.7 Conclusions

This study met the aim of exploring diet quality (by establishing dietary diversity and food variety) and eating habits as well as social and cultural factors that influences food intake and eating practices amongst Pacific youth living in New Zealand.

In conclusion, developing a diet diversity questionnaire to be specific for Pacific people and extending foods groups for dietary diversity analysis proved beneficial in getting a clear indication on intakes from both nutritious and discretionary food groups. Even though the dietary diversity of the participants was high, the variety of food eaten overall was moderate, indicating the value of exploring dietary diversity further. The proportion of discretionary foods consumed was slightly higher than nutritious foods consumed. Findings on eating habits showed that lack of time for meal preparation, convenience, low cost and taste were the reasons for established eating habits. A combination of availability of discretionary foods and cultural values around food consumption were found to be reasons contributing to excess food intake at social occasions.

Being overweight or obese was perceived to be unhealthy and a reflection of an unhealthy lifestyle (consisting of consumption of large amounts of unhealthy foods and lack of exercise). Awareness on the importance of healthy diet and exercise in weight management was also present amongst Pacific youth.

The findings from this study confirmed the importance in investigating motivation and readiness to make lifestyle changes with this specific group considering their awareness regarding their current weight and the reasons contributing to their situation. Although some of the findings in this research were similar to studies conducted in New Zealand, especially regarding eating habits, the exploration of diet quality using dietary diversity in a western setting helped to establish specific findings on nutritious and discretionary foods consumed, indicating moderate diet quality. This confirms the need for intervention strategies to increase consumption of nutritious foods and decrease consumption of discretionary foods in an attempt to lower excessive energy intake and enhance health outcomes.

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APPENDIX

APPENDIX 1: Questionnaire Booklet

Chewing the facts on fat!

What does that say about me?

Questionnaire Booklet: Phase I

INSTRUCTIONS

We really appreciate your participation in this study. With your help this interview may take up to 90mins. We can take as much time as you need.

We will work through the booklet together, to ensure that no questions are missed.

All your answers will be treated as <u>COMPLETELY CONFIDENTIAL</u>.

If you have difficulties with any of the questions, feel free to **GET HELP** from your relatives or friends. We will be happy to help with any queries you may have.

ABOUT YOU

In this first section, please tell us a few details about yourself – do not worry if you do not know or cannot find out answers to any questions.

Interviewer writes this in before interview

1) Write in the interview date. ☐ Day ☐ Month ☐ Year

Interviewer writes this in before interview

2) What is their current address?
(include post code)

Interviewer writes this in before interview

3) What sex is the participant? ☐ Male ☐ Female

Interviewer starts interview HERE

4) What is your date of birth? ☐ Day ☐ Month ☐ Year

5) Which ethnic group do you belong to? *Multiple boxes may apply*.

New Zealand European	1	☐
Māori	2	☐
Samoan	3	☐
Cook Island Māori	4	☐
Tongan	5	☐
Niuean	6	☐
Chinese	7	☐
Indian	8	☐
Other (please specify)	9	☐ ……..

PHYSICAL CONDITION

Interviewer measures weight

6) What is your current weight? ☐

Interviewer measures height

7) What is your current height?

Interviewer measures waist

8) What is your waist measurement?

Place the tape measure just below your last rib, but above your hip bone.

Interviewer measures hip

9) What is your **hip measurement**?

Place the tape measure over the widest part of your bottom.

HOME ENVIRONMENT

CULTURAL PERSPECTIVES

10) Do you have current cultural-spiritual beliefs? If No, go to Question 23

☐ Yes ☐ No

20(i) Describe how these beliefs influence the food that you eat? (eg. Church,family traditions)

11) Do the cultural-spiritual beliefs influence body size perceptions?

☐ Yes ☐ No

12) If yes, please describe how the beliefs influence body size?

13) What is <u>your</u> perspective on your current food / dietary lifestyle?

14) Describe what you think your <u>family's</u> perspectives are on large body size types?

15) Explain why you agree or don't agree with their perspectives? (note if their perspectives influence their own perspective)

16)	Describe what you think your peer's perspectives are on large body size types?
17)	Explain why you agree or don't agree with their perspectives? (note if their perspectives influence their own perspective)

FOOD AND EATING HABITS

In this section, we are interested in the 'range' of food that you may be eating. Please consider all the foods that you have eaten over the last seven (7) days (5 week and 2 weekend days). Tick yes or no in the boxes if you have eaten the food listed. You only have to tick the box once even if you have eaten it several times.
If you eat a food regularly that is not on the list, please add under "other".

18) Group 1: Fresh Foods (meat, poultry, fish) diversity	Yes	No
[1]Lamb or mutton (flaps, chops, leg, stewing meat, etc.)	☐	☐
[2]Beef (steak, mince, stewing meat, etc.)	☐	☐
[3]Pork (chops, fillet, leg, etc.)	☐	☐
[4]Goat (meat)	☐	☐
[5]Fish, fresh, white (Hoki, snapper)	☐	☐
[6]Fish, fresh, brown or pink (salmon, trout)	☐	☐
[7]Tinned fish (tuna or salmon)	☐	☐
[8]Tinned fish (sardines)	☐	☐
[9] Tinned meat (corn-beef)	☐	☐
[10]Chicken (whole, thighs, drumsticks)	☐	☐
[11]Chicken breast, no skin	☐	☐
[12]Chicken livers	☐	☐
[13]Sausages	☐	☐
[14]Fresh seafood (mussels, paua, shellfish, fish, etc)	☐	☐
[15]Chicken nibbles or chicken wings	☐	☐
[16]Other	☐	☐
19) Group 2: Eggs diversity	Yes	No
Eggs	☐	☐
20) Group 3: Dairy products diversity	Yes	No
[1]Milk, unpasteurised (cow)	☐	☐

[2]Full cream milk (pasteurised) (dark blue top)		
[3]Low-fat milk (pasteurised)(light blue top)		
[4]Skim milk (pasteurized)(green or yellow top)		
[5]Evaporated milk, tinned, (unsweetened)		
[6]Powdered milk		
[7] Cheese, hard, yellow		
[8] Custard		
[9] Ice cream		
[10] Yoghurt		
[11] Dairyfood		
[12]Buttermilk		
[13]Cream		
[14] Other		
21) Group 4: Breads, cereals, roots, & tubers diversity	Yes	No
[1]Rice		
[2]Bread (white or brown)(toast or sandwich)		
[3]Bread rolls, any type (white or brown)		
[4]Rice vermicelli		
[5]Whole wheat bread		
[6]Dumpling		
[7]Muffins		
[8]Scones		
[9]Biscuits		
[10]Oats porridge		
[11]Cereal flakes (lower fibre eg cornflakes)		
[12]Bran flakes (high fibre)		

[13]Weet-bix		
[14]Taro		
[14]Cassava		
[14]Green banana		
[15]Potatoes		
[16]Sweet potatoes		
[17]Corn		
[18]Turnip		
[19]Other		

22) Group 5: Legumes and nuts	Yes	No
[1]Dried beans (kidney, sugar, red, butter, garbanzo etc.)		
[2]Dried peas (green)		
[4]Chick peas or hummus		
[5]Peanut butter		
[6]Nuts (e.g. pecan, walnut, almond, cashew)		
[7]Peanuts		
[8]Seeds (e.g. sunflower, sesame, poppy etc)		
[9]Other		

23) Group 6: Vitamin A rich fruits & vegetables diversity	Yes	No
[1]Pumpkin		
[2]Carrots		
[3]Wild leafy vegetables, fresh and dried		
[4]Spinach		
[5]Taro leaves		
[6]Apricots		

[7]Peach, yellow	☐	☐
[8]Mango	☐	☐
[9]Other	☐	☐

24) Group 7: Other fruits (and juices) diversity	Yes	No
[1]Apple	☐	☐
[2]Peaches, white	☐	☐
[3]Pears	☐	☐
[4]Grapes (black/green)	☐	☐
[5]Plum	☐	☐
[6]Lemon	☐	☐
[7]Orange	☐	☐
[8]Mandarin	☐	☐
[9]Banana	☐	☐
[10]Pineapple	☐	☐
[11]Avocado	☐	☐
[12]Blue berry	☐	☐
[13]Cherry	☐	☐
[14]Kiwifruit	☐	☐
[15]Raspberry	☐	☐
[16]Watermelon	☐	☐
[17]Melon, green or yellow	☐	☐
[18]Guava	☐	☐
[19]Feijoa	☐	☐
[20]Other	☐	☐

25) Juices	Yes	No
[1]Juice (100% pure juice e.g. Ceres / Liquifruit)	☐	☐
[2]Other	☐	☐

26) Group 8: Other vegetables diversity	Yes	No
[1]Onions	☐	☐
[2]Cabbage	☐	☐
[3]Rhuharb	☐	☐
[4]Parsnips	☐	☐
[5]Tomatoes	☐	☐
[6]Green beans (fresh)	☐	☐
[7]Peas (fresh-green)	☐	☐
[8]Cauliflower	☐	☐
[9]Chili	☐	☐
[10]Lettuce	☐	☐
[11]Mushroom	☐	☐
[12]Broccoli	☐	☐
[13]Capsicum (green, red, yellow, orange, black)	☐	☐
[14]Sweet-corn (baby, yellow)	☐	☐
[15] Corn-on-the-cob (white)	☐	☐
[16]Garlic	☐	☐
[17]Beetroot	☐	☐
[17]Other	☐	☐

27) Group 9: Oils and fats diversity (*discretionary foods)*	Yes	No
[1]Butter	☐	☐

[2]Sunflower / canola / rice bran oil	☐	☐
[3]Margarine	☐	☐
[4]Margarine, low fat or lite	☐	☐
[5]Lard (e.g. animal fat)	☐	☐
[6]Olive oil	☐	☐
[7]Coconut cream	☐	☐
[8]Coconut milk	☐	☐
[9]Other	☐	☐

28) Group 10: Drinks diversity	Yes	No
[1]Juice (<100% pure / imitation juice)	☐	☐
[2]Imitation drinks (raro)	☐	☐
[3]Soft drinks (Coke, Fanta etc.)	☐	☐
[4]Milo / hot chocolate	☐	☐
[5]Tea (Dilma, Twinings, etc)	☐	☐
[6]Coffee (instant e.g. Nescafe)	☐	☐
[7]Brewed coffees (e.g. espresso, cappuchino, latte, moccachino, etc.)	☐	☐
[8]KoKo	☐	☐
[9]Instant soups	☐	☐
[10]Other	☐	☐

29) Group 11: Alcohol diversity	Yes	No
[1]Beer	☐	☐
[2]Wine (red or white)	☐	☐
[3]Spirits (rum, brandy, whiskey, etc)	☐	☐
[4]Home brewed beer	☐	☐
[5]Kava	☐	☐

[6]Ready to drink mixers (e.g. Vodka cruiser, Jim Beam etc.)	☐	☐
[7]Other	☐	☐

30) Group 12: Sauce diversity	Yes	No
[1]Tomato sauce, mustard sauce, BBQ sauce	☐	☐
[2]Mayonnaise	☐	☐
[3]Soy sauce	☐	☐
[4]Aioli	☐	☐
[5]Sweet chilli sauce or chilli sauce	☐	☐
[6]Salad dressing	☐	☐
[7]Other	☐	☐

31) Group 13: Miscellaneous diversity	Yes	No
[1]Sugar (brown or white)	☐	☐
[2]Jam (any type)	☐	☐
[3]Syrup or Honey	☐	☐
[4]Salt	☐	☐
[5]Jelly	☐	☐
[6]Marmite / vegemite	☐	☐
[7]Fish paste	☐	☐
[8]Other	☐	☐

32) Group 14: Sweets diversity	Yes	No
[1]Chewing gum	☐	☐
[2]Chocolates	☐	☐
[3]Lollies	☐	☐
[4]Chips	☐	☐

[5]Cheezels, Twisties, Rashuns	☐	☐
[6]Cake	☐	☐
[7]Sweet bakery items (e.g. pastries)	☐	☐
[8]Other	☐	☐

33) Group 15: Take away food diversity	Yes	No
[1]Pizza	☐	☐
[2]Hamburgers	☐	☐
[3]Hot chips	☐	☐
[4]Fish and Chips	☐	☐
[5]Pies	☐	☐
[6]Subway (breads or wraps)	☐	☐
[7]Sushi	☐	☐
[8]Hot dogs	☐	☐
[9]Kentucky Fried Chicken	☐	☐
[10]Noodle canteen	☐	☐
[11]Indian dishes	☐	☐
[12]Thai dishes	☐	☐
[13]Other	☐	☐

Eating Habits

34) How would you describe your appetite? *Tick one option*

Good: Being able to eat and enjoy moderate sized meals without difficulty and being able to snack in-between meals	☐
Fair: Being able to eat moderate sized meals, but finding it hard to complete meals, and seldom snacking in-between meals	☐

Poor:
Never feeling like eating OR being hungry but don't feel like eating food at all AND generally not enjoying eating at all.

35) Are you happy with your current weight? *Tick one option*

If Yes continue with Question 57

i) What would you like your weight to be? *Tick one option*

+ 1 kg

+ 2 kg

+ 2 to 5 kg

+ 5 to 10 kg or more

- 1 kg

- 2 kg

- 2 to 5 kg

- 5 to 10 kg or more

ii) Please give a reason for your choice

36) Has your weight changed in the past year?

No (same)

Gained

Lost by how much

i) Please indicate why you lost/ gained weight:

37) Is weight an issue for you? *Tick one option* Yes No

If Yes answer Question 59 (i)

i) How are you trying to control your weight?

Dieting ☐

Exercising ☐

Healthy eating regime ☐

Combination of diets, exercise, & health eating ☐

Don't know how to do it ☐

Other methods (please explain) ☐

38) When do you usually eat meals and snacks on **week days?**
(Monday to Friday)

Tick ONE time period that will be mostly appropriate for your usual behaviour.

i) What time do you usually eat breakfast?

- Before 6am ☐
- 6-8am ☐
- 8-10am ☐
- Don't eat breakfast at all ☐

ii) Do you usually eat breakfast? Yes ☐ No ☐

iii) What time do you usually eat breakfast?

- Before 6am ☐
- 6-8am ☐
- 8-10am ☐
- Don't eat breakfast at all ☐

iv) What do you usually eat for breakfast on week days?

v) Do you usually eat lunch? Yes ☐ No ☐

vi) What time do you usually eat lunch?

- Before 12pm ☐
- 12-2pm ☐
- After 2pm ☐
- Don't eat lunch at all ☐

vii) What do you usually eat for lunch on weekdays?

viii) Do you usually eat dinner? Yes ☐ No ☐

ix) What time do you eat dinner?

- Before 6pm ☐
- 6-8pm ☐
- 8-10pm ☐
- Don't eat dinner at all ☐

x) What do you usually eat for dinner on week days?

SNACKS

xi) Do you usually eat snacks (any food or drink eaten between meal times)? Yes ☐ No ☐

xii) What time do you usually eat snacks? *Multiple ticks may apply*

- During the morning ☐
- During the afternoon ☐
- During the evening ☐
- Late at night ☐
- Don't eat snacks at all ☐

xiii) Do these times change on weekends? Yes ☐ No ☐

39) When do you usually eat meals and snacks on **week-end days**

Tick ONE time period that will be mostly appropriate for your usual behaviour.

i) Do you usually eat breakfast? Yes ☐ No ☐

ii) What time do you usually eat breakfast?

- Before 6am ☐
- 6-8am ☐
- 8-10am ☐
- Don't eat breakfast at all ☐

What do you usually eat for breakfast on a weekend?

iii) Do you usually eat lunch? Yes ☐ No ☐

iv) What time do you usually eat lunch?

- Before 12pm ☐
- 12-2pm ☐
- After 2pm ☐
- Don't eat lunch at all ☐

What do you usually eat for lunch on a weekend?

v) Do you usually eat dinner? Yes ☐ No ☐

vi) What time do you eat dinner?

- Before 6pm ☐
- 6-8pm ☐
- 8-10pm ☐
- Don't eat dinner at all ☐

What do you usually eat for dinner on a weekend?

vii) Do you usually eat snacks (any food or drink eaten between meal times)? Yes ☐ No ☐

viii) What time do you usually eat snacks?
Multiple ticks may apply

- During the morning ☐
- During the afternoon ☐
- During the evening ☐
- Don't eat

snacks at all

xi) Do these times change on weekends? Yes ☐ No ☐

40) Please describe a typical weekday's meal

Typical meals	Week	Weekend
Breakfast		
Lunch		
Dinner		

41) Do you eat differently when attending social occasions? Yes ☐ No ☐

i) If Yes, describe which social occasions:

ii) How does your food intake change when you participate in these occasions?

iii) Typical foods consumed

Social occasion	Foods consumed
a.	
b.	
c.	
d.	
e.	