SOCIOECONOMIC DIFFERENCES IN TAKEAWAY FOOD CONSUMPTION AMONG ADULTS

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ABSTRACT

Background

In Australia and other developed countries, there are consistent and marked socioeconomic inequalities in health. Diet is a major contributing factor to the poorer health of lower socioeconomic groups: the dietary patterns of disadvantaged groups are least consistent with dietary recommendations for the prevention of diet-related chronic diseases compared with their more advantaged counterparts.

Part of the reason that lower socioeconomic groups have poorer diets may be their consumption of takeaway foods. These foods typically have nutrient contents that fail to comply with the dietary recommendations for the prevention of chronic disease and associated risk factors. A high level of takeaway food consumption, therefore, may negatively influence overall dietary intakes and, consequently, lead to adverse health outcomes. Despite this, little attention has focused on the association between socioeconomic position (SEP) and takeaway food consumption, with the limited number of studies showing mixed results. Additionally, studies have been limited by only considering a narrow range of takeaway foods and not examining how different socioeconomic groups make choices that are more (or less) consistent with dietary recommendations. While a large number of earlier studies have consistently reported socioeconomically disadvantaged groups consume a lesser amount of fruit and vegetables, there is limited knowledge about the role of takeaway food in socioeconomic variations in fruit and vegetable intake. Furthermore, no known studies have investigated why there are socioeconomic differences in takeaway food consumption.

The aims of this study are to: examine takeaway food consumption and the types of takeaway food consumed (healthy and less healthy) by different socioeconomic groups, to determine whether takeaway food consumption patterns explain socioeconomic variations in fruit and vegetable intake, and investigate the role of a range of psychosocial factors in explaining the association between SEP and takeaway food consumption and the choice of takeaway food.

Methods

This study used two cross-sectional population-based datasets: 1) the 1995 Australian National Nutrition Survey (NNS) which was conducted among a nationally representative sample of adults aged between 25–64 years (N = 7319, 61% response rate); and 2) the Food and Lifestyle Survey (FLS) which was conducted by the candidate and was undertaken among randomly selected adults aged between 25–64 years residing in Brisbane, Australia in 2009 (N = 903, 64% response rate). The FLS extended the NNS in several ways by describing current socioeconomic differences in takeaway food consumption patterns, formally assessing the mediated effect of takeaway food consumption to socioeconomic inequalities in fruit and vegetable intake, and also investigating whether (and which) psychosocial factors contributed to the observed socioeconomic variations in takeaway food consumption patterns.

Results

Approximately 32% of the NNS participants consumed takeaway food in the previous 24 hours and 38% of the FLS participants reported consuming takeaway food once a week or more. The results from analyses of the NNS and the FLS were somewhat mixed; however, disadvantaged groups were likely to consume a high level of "less healthy" takeaway food compared with their more advantaged counterparts. The lower fruit and vegetable intake among lower socioeconomic groups was partly mediated by their high consumption of "less healthy" takeaway food. Lower socioeconomic groups were more likely to have negative meal preparation behaviours and attitudes, and weaker health and nutrition-related beliefs and knowledge. Socioeconomic differences in takeaway food consumption were partly explained by meal preparation behaviours and attitudes, and these factors along with health and nutrition-related beliefs and knowledge appeared to contribute to the socioeconomic variations in choice of takeaway foods.

Conclusion

This thesis enhances our understanding of socioeconomic differences in dietary behaviours and the potential pathways by describing takeaway food consumption patterns by SEP, explaining the role of takeaway food consumption in socioeconomic inequalities in fruit and vegetable intake, and identifying the potential impact of psychosocial factors on socioeconomic differences in takeaway food consumption and the choice of takeaway food. Some important evidence is also provided for developing policies and effective intervention programs to improve the diet quality of the population, especially among lower socioeconomic groups. This thesis concludes with a discussion of a number of recommendations about future research and strategies to improve the dietary intake of the whole population, and especially among disadvantaged groups.

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LIST OF ABBREVIATIONS

AGHE	The Australian Guide to Healthy Eating
ANHS	Australian National Health Survey
ANZFA	Australian and New Zealand Food Authority
BMI	Body mass index
CD	Collector's District
CI	Confidence interval
CVD	Cardiovascular disease
EVT	Expectancy-Value Theory
FLS	Food and Lifestyle Survey
FFQ	Food frequency questionnaire
GI	Glycemic index
HDL	High-density lipoprotein
ICC	Intra-class correlation
KAB	Knowledge-Attitude-Behaviour Model
LDL	Low-density lipoprotein
LOA	Limits of agreement
NNS	National Nutrition Survey
PR	Prevalence ratio
QUT	Queensland University of Technology
SEP	Socioeconomic position
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action

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Miura K, Giskes K. (2010) Household food expenditure and its contribution to socioeconomic inequalities in purchasing foods consistent with Australian dietary guideline recommendations. *Australasian Epidemiologist*. 17, 26–31.

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CONFERENCE PRESENTATIONS ON MATTERS RELEVANT TO THE THESIS

Oral presentations

2011 **Miura K**, Giskes K, Turrell G. *Role of nutrition knowledge in the association between socioeconomic position and takeaway food consumption*. The Joint Annual Scientific Meeting of the Nutrition Society of New Zealand and the Nutrition Society of Australia. Queenstown, New Zealand.

Miura K, Giskes K, Turrell G. *Does nutritional knowledge explain socioeconomic differences in takeaway food consumption?* Institute of Health and Biomedical Innovation Inspire Conference. Queensland University of Technology, Brisbane, Australia.

2010 **Miura K**, Giskes K, Turrell G. *Takeaway food consumption among Australian adults: do socioeconomic groups differ in their takeaway food consumption behaviour?* The 11th International Congress of Behavioural Medicine, Washington D.C., USA.

2009 **Miura K**, Giskes K, Turrell G. *How to achieve a high response rate from a postal survey? A population-based health study*. Institute of Health and Biomedical Innovation Inspire Conference. Queensland University of Technology, Brisbane, Australia.

Miura K, Giskes K, Turrell G. *Socioeconomic differences in takeaway consumption and the contribution of takeaway foods to inequalities in dietary intakes*. Heart Foundation Conference, Brisbane, Australia.

Miura K, Giskes K, Turrell G. *Socioeconomic differences in takeaway food consumption and their contribution to inequalities in dietary intakes*. The Public Health Association of Australia, Queensland State Conference, Brisbane, Australia.

2008 **Miura K**, Giskes K, Turrell G. *Socioeconomic differences in household food expenditure and the purchase of healthy food*. The Public Health Association of Australia Queensland State Conference, Brisbane, Australia.

National symposia

2010 Giskes K, **Miura K**, Ramsey R, Siu J. *Socioeconomic disadvantage, overweight/obesity & dietary behaviors*. Australian Society for Behavioural Health and Medicine 7th Annual Scientific Conference, Brisbane, Australia.

Poster presentation

2011 **Miura K**, Giskes K, Turrell G. *Contribution of takeaway food consumption to socioeconomic differences in fruit and vegetable intake: a mediation analysis*. Annual Meeting of the International Society for Behavioral Nutrition and Physical Activity, Melbourne, Australia.

Miura K, Giskes K, Turrell G. *Socioeconomic differences in takeaway food consumption among Australian adults*. Annual Meeting of the International Society for Behavioral Nutrition and Physical Activity, Melbourne, Australia.

2008 **Miura K**, Giskes K, Turrell G. *Household food expenditure does not mediate income inequalities in food purchasing behaviour*. The Population Health Congress 2008, Brisbane, Australia.

ITEMS FOR CONSIDERATION PRIOR TO READING TO THIS THESIS

The papers presented in this thesis are reformatted to suit this thesis. This thesis uses the author's version of a work that was accepted for publication by each journal.

The paper presented in Chapter 6 was published in a North American journal; therefore, takeaway food is referred to as take-out food to suit their American audience.

STATEMENT OF ORIGINAL AUTHORSHIP

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: _________________________

Date: _________________________

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Chapter 1: Introduction

1.1 SOCIOECONOMIC POSITION AND HEALTH

Socioeconomic inequalities in health have been reported in numerous developed countries including Australia. Socioeconomically disadvantaged groups, such as people who are unemployed or employed in a unskilled job and have low income, have higher rates of mortality from all causes (Draper, Turrell, & Oldenburg, 2004), and morbidity from chronic disease such as cardiovascular disease (CVD) and type 2 diabetes (Australian Institute of Health and Welfare [AIHW], 2010). For example, in Australia life-expectancy at birth among the most disadvantaged groups is two years less for males and four years less among females compared with the most advantaged groups (Draper et al., 2004). Mortality from CVD is also approximately 20% higher among the most disadvantaged groups compared with the most advantaged (AIHW, Moon, & Waters, 2006), and this difference has widened between the mid 1980s and 2000 (Draper et al., 2004). Similarly, disadvantaged groups are more likely to have a higher prevalence of type 2 diabetes (Williams et al., 2010), CVD (AIHW, 2010), and risk factors including overweight/obesity (AIHW, 2010; Turrell, Stanley, de Looper, & Oldenburg, 2006), and hypertension (Kavanagh et al., 2010; Turrell et al., 2006).

Some of these socioeconomic differences in health conditions can be explained by health behaviours. The key health behaviours that contribute to the development of chronic disease are smoking and physical inactivity. For example, smoking is the single most important contributing factor to a number of diseases (e.g. type 2 diabetes) (AIHW, 2010; Williams et al., 2010) and is more prevalent among disadvantaged groups (Turrell, et al., 2006). Likewise, insufficient physical activity can increase the risk of developing a range of health conditions, diseases, and some forms of cancer (World Health Organization [WHO], 2010). Insufficient physical activity or not participating in any form of physical activity are prevalent among lower socioeconomic groups (Cerin & Leslie, 2008; Mäkinen, Borodulin, Laatikainen, Fogelholm, & Prättälä, 2009; Turrell et al., 2006). Another important health behaviour that affects health is diet. An unhealthy diet can increase the risk of developing numerous chronic diseases, and some types of cancer (WHO, 2003).

1.2 DIET AND HEALTH

Diet plays an important role in the development of a number of chronic diseases (WHO, 2003) and these diseases are now a major health burden in Australia (AIHW, 2010) and worldwide (WHO, 2003). There are a number of health conditions that are categorised as “chronic disease” and among them CVD is the leading cause of death in Australia, accounting for 34% of all deaths (AIHW, 2011a). In contrast, a small number of biomedical risk factors account for most of the chronic diseases and these risk factors are overweight and obesity, hypertension, dyslipidemia (high blood cholesterol and triglycerides), and impaired glucose regulation (WHO, 2003). These biomedical risk factors can all be modified by a change in dietary behaviours. Consequently, dietary guidelines are developed in many countries to reduce diet-related chronic disease and promote the health of populations. These guidelines consistently recommend consuming: a wide variety of nutritious food, plenty of fruit and vegetables, a limited amount of total fat especially saturated fat, a moderate amount of sugars, and a lower amount of sodium to reduce diet-related chronic diseases and promote health and well-being (Food Standard Agency, 2005; National Health and Medical Research Council [NHMRC], 2003a; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010). Fruit and vegetables, in particular, are key foods that provide good sources of essential nutrients and other bioactive components. Although the mechanisms are not fully understood, high fruit and vegetable intake has an important role in prevention of diet-related chronic diseases and some types of cancer.

A large body of research has reported that there are socioeconomic variations in diet with disadvantaged groups being more likely to have a diet less consistent with dietary recommendations compared with advantaged groups (Beydoun & Wang, 2008a; Lallukka, Laaksonen, Rahkonen, Roos, & Lahelma, 2007; Malon et al., 2010; McNaughton, Ball, Crawford & Mishra, 2008; Turrell, Hewitt, Patterson, Oldenburg, & Gould, 2002). For example, when fruit and vegetable intake was examined in Australia and other countries, lower socioeconomic groups were consuming less fruit and vegetables compared with their higher status counterparts (Ball, Crawford, & Mishra, 2006; Giskes, Turrell, Patterson, & Newman, 2002a, 2002b). Less healthy dietary patterns observed among disadvantaged groups, therefore, may be one contributing factor to their higher prevalence of diet-related health conditions.

While eating a healthy diet has been encouraged for the whole population, the prevalence of diet-related health conditions, especially type 2 diabetes, overweight and obesity, has increased rapidly in the last three decades (AIHW, 2010). At the same time, eating food prepared outside of the home, especially takeaway and fast-food, has become increasingly more common in Australia (BIS Shrapnel, 2008) and other countries (ACNielsen, 2005; Jekanowski, 1999). Additionally, money spent on takeaway and fast-food has increased significantly compared with the amount spent on meals at restaurants from 1993 to 2003 (Australian Bureau of Statistics [ABS], 1996, 2000, 2006, 2011). The Australian Guide to Healthy Eating (AGHE) categorises typical takeaway and fast-food items into foods that should be consumed occasionally, in small amounts or not consumed at all as these foods do not provide essential nutrients but are likely contribute to a high energy intake (The Commonwealth Department of Health and Family Services, 1998). Additionally, takeaway and fast-foods are often served and promoted using large serving sizes (Matthiessen, Fagt, Biltoft-Jensen, Beck, & Ovesen, 2003) which can contribute to excess energy intake and subsequent weight gain. Furthermore, takeaway and fast-food consumption are also associated with lower fruit and vegetable intake (Bowman & Vinyard, 2004; Schröder, Fïto, & Covas, 2007). This suggests that increased consumption of takeaway and fast-food may be displacing fruit and vegetable intake. Therefore, it is plausible that socioeconomic inequalities in diet and subsequent diet-related health conditions (e.g. overweight/obesity) may be partly due to the large portion sizes and/or frequent consumption of takeaway and fast-foods by socioeconomically disadvantaged groups.

1.3 CONCEPTUAL FRAMEWORK

This thesis is based on the conceptual framework presented in Figures 1.1 and 1.2. These frameworks are constructed based on previous research, theories and models. Figure 1.1 shows the pathways from socioeconomic position (SEP) to health status through dietary behaviours. Socioeconomic differences in dietary behaviours such as food choice and intake are influenced by a number of factors. The main components of these determinants are categorised into intra-personal, societal/inter-personal, and physical environmental levels.

Intra-personal factors that influence food choice and dietary behaviours are individual constructs that are often within individuals' control which include knowledge, beliefs, attitudes, skills (e.g. culinary-related), values, perceived barriers (e.g. cost) and culture. Societal/inter-personal factors that influence food choice and dietary behaviours are within social contexts such as work and family, as eating situations usually occur in such environments. This level includes social support or pressure, eating style of family members, co-workers or friends, and societal norms. Individuals' physical environment has an impact on dietary behaviours as this determines spatial access or proximity to and availability of foods or food shops and restaurants.

Intra-personal, societal/inter-personal, and physical environmental factors determine food choice and consumption of food which affect nutrients, other food components, and total energy intakes. These nutrients and non-nutrients interact with each other and also physiological and genetic mechanisms. These responses may result in increased biological risk factors and consequently, the development of diet-related diseases.

Figure 1.2 shows the conceptual socioeconomic pathway to diet, specifically fruit and vegetable intake, and the possible contribution of takeaway food consumption patterns to socioeconomic differences in fruit and vegetable intake.

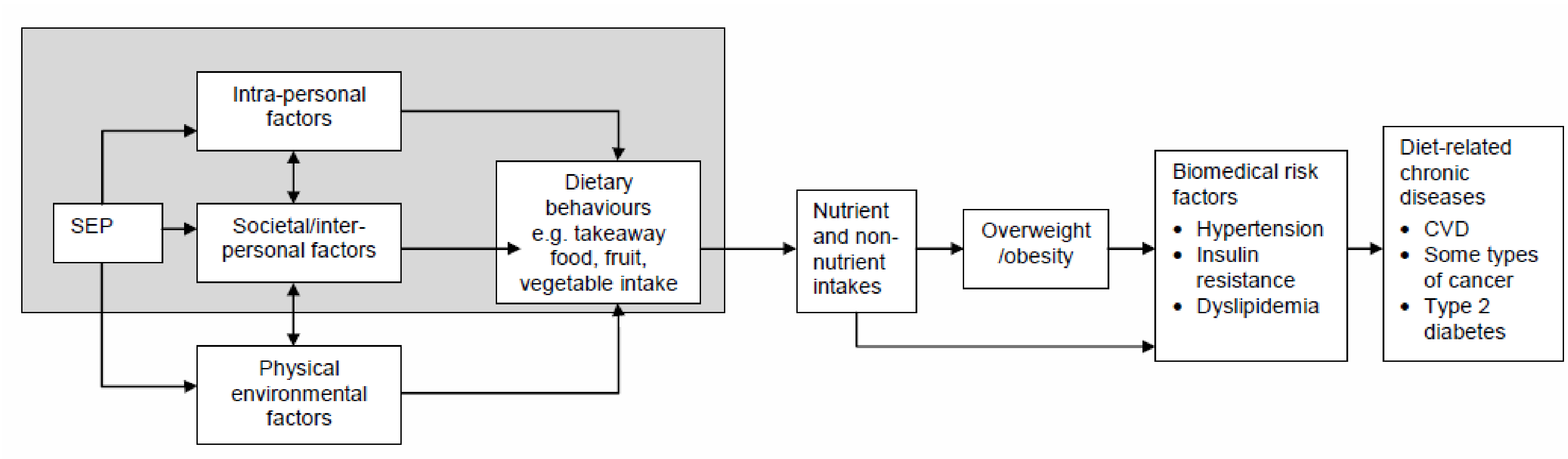

Figure 1.1: Socioeconomic pathways to diet-related diseases and health conditions
This thesis has examined the scope highlighted by the grey shading area.

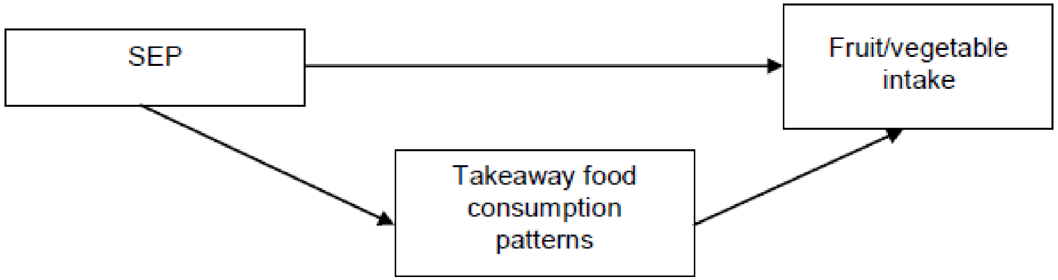

Figure 1.2: Influence of takeaway food consumption patterns to socioeconomic inequalities in fruit and vegetable intake

Figure 1.1 and Figure 1.2 served as a framework for the development of research questions and choice of statistical methods used for this thesis. First, it was important to determine whether there were socioeconomic differences in takeaway food consumption patterns. Takeaway food consumption is one characteristic of dietary intake. As the figure indicates, food intakes determine nutrients, non-nutrients and energy intakes. Frequency, amount, and choice of takeaway food consumption can be important contributors to socioeconomic differences in total dietary intakes which may lead to the development of biological risk factors and consequently, the development of diet-related disease. Second, fruit and vegetable intake is recognised as a key indicator of diet quality since the consumption of an adequate amount of fruit and vegetables may prevent a number of chronic diseases and promote health and well-being. Socioeconomic differences in takeaway food consumption may be one contributing factor to inequalities in fruit and vegetable intake. Third, while choice and frequency of takeaway food consumption are likely to be influenced by a number of psychosocial factors, it is unknown whether these psychosocial factors contribute to socioeconomic differences in takeaway food consumption and choice of takeaway food. Examining these associations will provide further understanding of the socioeconomic differences in diet and possible reasons why these differences are observed.

The aims of the research are to:

1. Determine the direction, magnitude, and nature of socioeconomic differences in takeaway food consumption patterns.
2. Ascertain whether takeaway food consumption patterns mediate socioeconomic inequalities in fruit and vegetable intake
3. Investigate the contribution of psychosocial factors to socioeconomic inequalities in takeaway food consumption patterns.

The basic hypotheses addressed are that socioeconomic inequalities in diet-related chronic diseases are partly attributable to differences in dietary behaviours. Additionally, differences in psychosocial factors are contributing factors to dietary inequalities.

In order to achieve the aims of the research, four quantitative analyses were conducted based on two data sources. A secondary data analysis of the 1995 Australian National Nutrition Survey (NNS) was undertaken to achieve aims 1 and 2. The NNS is the most recent national dietary survey in Australia, and provides quantitative dietary intake estimates using a 24-hour dietary recall for a large nationally representative sample. It provides national prevalence of takeaway food consumption patterns by SEP, and estimates of the contribution of takeaway food consumption to socioeconomic differences in fruit and vegetable intake. The results of these secondary analyses provided the basis of the Food and Lifestyle Survey (FLS), a cross-sectional study that was conducted among adult residents of Brisbane, Australia by the candidate. As the NNS was conducted more than 10 years ago, the types and availability of takeaway food have changed in Australia since 1995. The FLS provided current takeaway food consumption patterns by SEP, and also collected a range of psychosocial factors that are likely to influence takeaway food consumption. The FLS, therefore, addressed all of the aims of this research.

1.4 TAKEAWAY FOOD

In the literature, there is no standard definition of takeaway foods. In this thesis, takeaway foods are defined as foods or meals that are pre-prepared commercially and require no further preparation by the consumer, and can be consumed immediately after purchase. Takeaway foods are available from: fast-food outlets (e.g. McDonald's®), takeaway restaurants (e.g. Chinese restaurants), canteens (e.g. at school food services), cafeterias (e.g. at work/office food services), convenience stores (e.g. NightOwl®), and stores at petrol stations (e.g. Coles Express). On the other hand, fast-food is defined as food that can be consumed immediately after purchase and is bought from an outlet without table service (Stewart, Blisard, Bhuyan, & Nayga, 2004). Therefore, fast-food is conceptualised as one area of takeaway food, and the term "takeaway food" rather than "fast-food" is used in this study. Takeaway food outlets are distinguished from restaurants in that they do not have wait staff, and that payment for the food occurs before consumption.

1.5 FRUIT AND VEGETABLE INTAKE

Currently the dietary recommendations in Australia are being revised to become based on total diet rather than nutrient-based to ensure individuals make healthy food choices (NHMRC, 2011). Dietary recommendations encourage the consumption of a variety of foods from each of the five core food groups (cereal, vegetables, fruit, dairy, and meat/meat alternatives) to decrease the risk of developing diet-related chronic disease (NHMRC, 2003a; The Commonwealth Department of Health and Family Services, 1998). Current dietary recommendations emphasise the consumption of fruit, vegetables, and whole grains as these foods are high in vitamins and minerals. Consumption of lean meats or meat alternatives (e.g. legumes) is also emphasised to avoid excess fat intake in one's diet (The Commonwealth Department of Health and Family Services, 1998). Among these food groups, this thesis focused on fruit and vegetable intake. Epidemiologic research strongly supports the association between increased fruit and vegetable intake and decreased risk of diet-related chronic disease, such as cardiovascular disease and some types of cancer (NHMRC, 2003a; World Cancer Research Fund & American Institute for Cancer Research, 2007). There are many hypothesised pathways through which fruit and vegetable consumption may confer health benefits. Firstly, there are a number of nutrient (e.g. antioxidents, minerals) and non-nutrient compounds (e.g. fibre, phytochemicals) found within fruits and vegetables that may directly reduce the risk of developing these diseases (NHMRC, 2003a; World Cancer Research Fund & American Institute for Cancer Research, 2007). Secondly, indirect factors may contribute to this association: fruit and vegetables increase dietary bulk, leading to reduced energy intakes and, consequently, lower prevalence of overweight/obesity and risks of weight-related chronic diseases (World Cancer Research Fund & American Institute for Cancer Research, 2007).

1.6 SIGNIFICANCE OF THE THESIS

The outcome of this research makes the following theoretical and practical contributions.

1.6.1 Theoretical contributions

Increased knowledge and understanding of the impact of SEP on dietary behaviours

Socioeconomically disadvantaged groups have lower health status compared with the rest of the population and therefore, are recognised as priority population groups in Australia (AIHW, 2011b). As stated previously, one contributing factor to their lower health status is diet (Davey Smith & Brunner, 1997). Understanding socioeconomic differences in dietary behaviour is crucial in order to reduce health inequalities. While a number of studies have described the association between SEP and dietary behaviours, examining the nature and extent of differences in takeaway food consumption by socioeconomic groups is understudied. As takeaway foods, in general, have nutritional characteristics that are inconsistent with dietary recommendations and these foods have become an important part of the Australian diet, takeaway food may be a significant contributing factor to socioeconomic inequalities in dietary intakes.

Furthermore, this thesis provides some insights into why socioeconomic differences in takeaway food consumption are observed. The findings add to the limited knowledge of determinants of food choice and consumption across different socioeconomic groups which provides important information that can be used to implement health promotion messages targeted specifically at socioeconomically disadvantaged groups. This may lead to the improvement of dietary intakes among disadvantaged groups and subsequently may reduce socioeconomic differences in health status.

1.6.2 Practical contributions

Provide important evidence for future nutrition intervention programs and policies

Improving diet quality is recognised as having a significant role in the prevention of diet-related chronic disease such as CVD, some types of cancer, diabetes, and risk factors such as obesity. These diet-related chronic diseases and conditions are the major cause of morbidity and mortality in Australia and other countries (WHO, 2003), and are identified as health priority areas in Australia (AIHW, 2011c). A number of nutrition policies and intervention programs have been implemented to promote healthy eating and prevent diet-related chronic disease and related risk factors. Despite these efforts, a large proportion of Australian adults, particularly among lower socioeconomic groups, have diets inconsistent with dietary recommendations. A lack of understanding of the determinants of dietary behaviours across different socioeconomic groups may be limiting the effectiveness of current efforts. Therefore, outcomes of this research have practical applications by providing important evidence for developing:

- effective intervention programs to improve dietary intakes for whole populations, especially among socioeconomically disadvantaged groups
- policies to ensure healthy foods are available for the whole population and to promote dietary intakes consistent with long-term health outcomes.

1.7 DELIMITING THIS RESEARCH

This thesis focuses on the consumption of takeaway food, and fruit and vegetable intake among adults and is not concerned with children, adolescents or the elderly. Additionally, specific sub-population groups such as Indigenous populations or institutionalised groups were excluded as this research takes a population-wide approach. Furthermore, this research examines factors that may influence takeaway food consumption on an individual level but not on a physical environmental level (e.g. accessibility).

1.8 THESIS STRUCTURE

This thesis is presented in the Publication style and it contains three papers, each designed to stand on its own. Chapter 2 reviews the literature relating to socioeconomic differences in takeaway food consumption, fruit and vegetable intake, and other dietary behaviours. Additionally, factors that may influence dietary behaviours and socioeconomic differences in these factors are reviewed.

Chapter 3 gives an overview of the methods that are not dealt with or only discussed in minimum detail in the Methods sections of the papers. Chapters 4 through to 7 provide the findings from the studies and their discussions.

The first paper (Chapter 4), which has been published in *Journal of the Epidemiology and Community Health*, examined socioeconomic differences in takeaway food consumption and their contribution to fruit and vegetable intake, using the 1995 Australian National Nutrition Survey.

Chapters 5 to 7 were written based on the survey data collected from adult populations in Brisbane, Australia. Chapter 5 (the second paper) examined socioeconomic differences in takeaway food consumption and has been published in *Public Health Nutrition*. Chapter 6 (the third paper), which has been published in *Journal of the American Dietetic Association*, investigated whether socioeconomic inequalities in fruit and vegetable intake are explained by differences in takeaway food consumption patterns. Chapter 7 looked at psychosocial determinants of takeaway food consumption and their contributions to socioeconomic differences in takeaway food consumption.

Chapter 8 presents a synthesis of the study findings across Chapters 4 to 7, and discusses the study strengths and limitations, recommendations for future research, health promotion and policies, and the public health significance of the research.

Chapter 2: Literature review

2.1 INTRODUCTION

This chapter provides a review of the Australian and international literature relating to potential socioeconomic pathways to biomedical risk factors (e.g. overweight and obesity) via dietary behaviours indicated in the conceptual model (Figure 1.1). The chapter is divided into four sections. The first section describes dietary intake, specifically takeaway food consumption, fruit and vegetable intake, and resulting health conditions. The second section discusses SEP and dietary intakes: diet quality/patterns, takeaway or fast-food consumption, fruit and vegetable intake, and nutrient/non-nutrient intake. The third section briefly describes models and theories of health behaviour and food choice, and the last section provides a review of factors that may contribute to socioeconomic differences in dietary behaviours.

2.2 DIET AND HEALTH

2.2.1 Takeaway food consumption and its effect on diet and health

Over the last three decades, the proportion of household food expenditure spent on takeaway and fast-food has been increasing in Australia (ABS, 1996, 2000, 2006, 2011) and the consumption of typical takeaway or fast-food items doubled between 1983 and 1995 (Burns, Jackson, Gibbons, & Stoney, 2002). Similar effects have been observed in other countries (Paeratakul, Ferdinand, Champagne, Ryan, & Bray, 2003; van der Horst, Brunner, & Siegrist, 2011a).

Studies have consistently reported that nutrient intakes were different between participants who consumed fast-food on the survey days and those who did not: participants who consumed fast-food had significantly higher intakes of energy, energy density (kcal/100 g of total food consumed), total fat, saturated fat (Bowman & Vinyard, 2004), sodium (Guthrie, Lin, & Frazao, 2002; Paeratakul et al., 2003), and lower intakes of vitamin A and C, (Bowman & Vinyard, 2004; Paeratakul et al., 2003) calcium (Bowman & Vinyard, 2004; Guthrie et al., 2002; Paeratakul et al., 2003), fibre, and iron (Bowman & Vinyard, 2004; Guthrie et al., 2002) compared with those who did not. These associations tend to be linear: as frequency of takeaway or fast-food consumption increase, energy and fat intakes increase, conversely, intakes of micronutrients and fibre decrease (Bowman & Vinyard, 2004; Schröder, Fïto, & Covas, 2007). These nutritional characteristics are inconsistent with dietary recommendations for good health and increase the risk of developing overweight/obesity and diet-related chronic disease (NHMRC, 2003a).

When the nutritional effect is assessed in terms of food, rather than nutrients, similar negative patterns are observed. Takeaway or fast-food consumption was inversely associated with fruit and vegetable intake (Bowman & Vinyard, 2004; Inglis, Ball, & Crawford, 2008; Paeratakul et al., 2003; Schröder, et al., 2007; Smith et al., 2009), and both frequency and amount of fruit and vegetable intake was linearly associated with frequency of fast-food consumption (Schröder et al., 2007). In addition, fast-food consumers have higher consumption of non-diet carbonated drinks and added sugar, (Bowman & Vinyard, 2004; Pereira et al., 2005) and a reduced intake of milk compared with those who do not consume fast-food (Bowman & Vinyard, 2004; Paeratakul et al., 2003). These food intake patterns may reduce overall diet quality and may also influence the level of nutrient intake which can lead to the development of diet-related health problems.

Studies have reported an association between takeaway and fast-food consumption and development of health conditions: insulin resistance (Duffey, Gordon-Larsen, Steffen, Jacobs, & Popkin, 2009; Pereira et al., 2005), dyslipidemia (Duffey et al., 2009), and overweight and obesity (Binkley, Eales, & Jekanowski, 2000; Bowman & Vinyard, 2004; Duffey, Gordon-Larsen, Jacobs, Williams, & Popkin, 2007; Pereira et al., 2005; Rosenheck, 2008; Schröder et al., 2007). In addition, nutritional profiles of takeaway and fast-foods may increase the development of hypertension. All of these risk factors increase the likelihood of chronic disease. The following sections provide brief reviews of the evidence for the relationships between consumption of takeaway or fast-food and the development of these risk factors.

Insulin resistance

Insulin resistance is "a state resulting from impairment in the responsiveness of muscle, liver and adipose tissue to insulin, which, as a result, causes a rise in the levels of blood glucose and triglycerides with a lowering in high-density lipoprotein (HDL) cholesterol" (Huxley, Omari, & Caterson, 2008). Insulin resistance can significantly increase the risk of developing type 2 diabetes (Willett, Manson & Liu, 2002) and may result from a diet high in saturated fat. High saturated fat intake exacerbates stimulation of insulin secretion which leads to raised insulin levels (hyperinsulinemia). Hyperinsulinemia, in turn, can induce insulin resistance (Shanik et al., 2008). The level of insulin secretion is dependent on the types of fat (fatty acid chain lengths): saturated fat stimulates insulin secretion more so than unsaturated fat (Isganaitis & Lustig, 2005). As fast-foods, in general, contain higher saturated fat than food cooked at home (Guthrie et al., 2002), frequent fast-food consumption may lead to insulin resistance. Another explanation of the link between takeaway and fast-food consumption and insulin resistance is that some of these foods (e.g. donuts) are highly processed carbohydrate which has a high glycemic index (GI) (Atkinson, Foster-Powell, & Brand-Miller, 2008). High consumption of foods that have a high GI and glycemic loads raise blood glucose levels and also stimulate insulin secretion significantly (Isganaitis & Lustig, 2005; Ludwig, 2002). Regular consumption of such a diet may result in hyperglycemia (raised blood glucose level) and hyperinsulinemia (Ludwig, 2002). Hyperglycemia can also lead to insulin resistance as it stimulates more insulin secretion (Ludwig, 2002). Lastly, the lower dietary fibre, fruit and vegetable contents of typical takeaway and fast-food may also explain the increased risk of insulin resistance. Most fruit, vegetables and high fibre foods have low GI. Foods that have low GI and high fibre have a slow response on blood glucose level and therefore, low in insulin demand (Isganaitis & Lustig, 2005; Salmerón et al., 1997).

Dyslipidemia

Dyslipidemia is also a risk factor for cardiovascular disease (CVD) and is characterised by raised triglycerides, total and LDL-cholesterol, and low level of HDL-cholesterol (Pereira et al., 2002; Wilson et al., 1998). An association between frequent fast-food consumption and dislipidemia has been reported from one US cohort study (Duffey et al., 2009). There are several mechanisms by which dyslipidemia may develop from consumption of takeaway and fast-food. First, these foods are high in total and saturated fat which may lead to raised serum LDL-cholesterol (Frayn & Stanner, 2005; Lichtenstein et al., 1998). Second, takeaway and fast-food consumption is associated with higher intake of non-diet soft drinks and added sugar (Bowman & Vinyard, 2004; Pereira et al., 2005) and these are a major source of sucrose and fructose (Park & Yetley, 1993). High consumption of sucrose and/or fructose may lead to dyslipidemia by disturbing glucose metabolism which will lead to elevated blood triglycerides and cholesterol (Basciano, Federico, & Adeli, 2005; Rutledge & Adeli, 2007).

Hypertension

Hypertension is a major cause of CVD and stroke (Coppack, Mohamed-Ali, & Karpe, 2005) and a number of dietary factors influence the development of hypertension (Buttriss, 2005). One dietary factor that influences the development of hypertension is sodium intake. High sodium intake increases the risk of developing hypertension (Houston & Harper, 2001; Scientific Advisory Committee on Nutrition, 2003). Fast-foods have higher sodium density compared with food prepared at home (Guthrie et al., 2002), and participants who consumed fast-food in the previous 24-hours had approximately 250 mg per day higher sodium intake ($p<0.001$) (Paeratakul et al., 2003). Therefore, frequent takeaway and fast-food consumption can contribute to high overall sodium intake, and may increase the risk of developing hypertension.

Overweight and obesity

Overweight and obesity are major risk factors for a number of chronic diseases (e.g. CVD) and related conditions (e.g. hypertension) (National Preventative Health Taskforce, 2008a). Cross-sectional (Binkley et al., 2000; Bowman & Vinyard, 2004; Rosenheck, 2008; Schröder et al., 2007; Smith et al., 2009) and cohort (Duffey et al., 2007; Pereira et al., 2005) studies show that frequent takeaway and fast-food consumption is associated with weight gain, higher body mass index (BMI), and abdominal obesity among adults. One possible explanation for these observed trends is that takeaway and fast-foods are typically energy dense (kJ or kcal per 100 g) compared with the average diet, and this may alter appetite control (Isganaitis & Lustig, 2005; Prentice & Jebb, 2003). The energy density of fast-food meals is around 1054–1167 kJ per 100 g which means the weight of daily food consumed needs to be restricted to about 700–800 g (Prentice & Jebb, 2003). On the other hand, the average British adult woman consumes 670 kJ per 100 g per day, approximately 60% lower than the average energy density of fast-food items. To meet the average woman's energy requirement, she would need to eat about 1300 g of food (Prentice & Jebb, 2003). Humans tend to eat a similar amount of food (volume and weight) every day regardless of the energy density of the food and they do not reduce the amount of food consumed after they eat energy-dense foods (de Castro, 2006; Rolls et al., 1999). Consumption of energy dense food, therefore, can lead to over-consumption of energy and this energy imbalance may result in weight gain (James, 2008).

Typical takeaway and fast-foods are low in fibre, fruit and vegetables, and a low intake of fibre is found to be associated with an increased risk of overweight and obesity (Pereira & Ludwig, 2001; Vioque, Weinbrenner, Castello, Asensio, & de la Hera, 2008). Fruit and vegetables are a good source of fibre, and foods high in fibre have greater satiating effect than low fibre foods (Pereira & Ludwig, 2001; Swinburn, Caterson, Seidell, & James, 2004). In addition, high fibre foods may reduce gastric emptying time (Burton-Freeman, 2000; Pereira & Ludwig, 2001). Food intake, therefore, can be regulated by consumption of high fibre meals (Burton-Freeman, 2000). However, reduced fibre intake by consuming a high level of takeaway and fast-food is likely to increase overweight and obesity.

Another link between the nutritional characteristics of takeaway and fast-food and overweight and obesity is the lower calcium and milk contents of these foods. A longitudinal study reported that lower levels of total dairy intake were significantly associated with the development of obesity among young American adults (Pereira, et al., 2002). The mechanisms through which dairy products may reduce the risk of obesity are not well understood; however, it may be due to the low GI or the constituents of dairy, such as protein and lactose that may promote satiety and thereby regulate food intake (Pereira, et al., 2002).

Obesity or high body mass is a factor in the aetiology of type 2 diabetes, CVD, dyslipidemia, and hypertension (Pi-Sunyer, 2002). In Australia, high body mass accounts for 19.5% of CVD, 54.7% of diabetes mellitus (Begg, Vos, Barker, Stanley, & Lopez, 2008), 23.8% of type 2 diabetes, 24.5% of osteoarthritis, 20.5% of colorectal, breast, uterine and kidney cancers (Access Economics, 2008). Obesity is also responsible for other health conditions such as asthma, sleep apnoea, reproductive and mental health problems (Pi-Sunyer, 2002). Takeaway and fast-food consumption, therefore, may be contributing to these health problems.

In summary, takeaway and fast-food consumption has increased over the last three decades in Australia. Consumption of these foods has had a negative impact on diet. Takeaway and fast-foods tend to be high in energy, energy density, total fat, saturated fat, sodium, added sugar, and low in micronutrients (vitamins and minerals), fibre, fruit and vegetables. Takeaway and fast-food consumption is also associated with a number of health conditions: insulin resistance, dyslipidemia, and overweight and obesity. These health conditions are risk factors for the development of chronic disease such as CVD and type 2 diabetes. Overweight and obesity, especially, have been associated with the development of numerous chronic conditions, and these may be partly the result of the adverse impact of takeaway and fast-food consumption on dietary intakes.

2.2.2 Fruit and vegetable intake and health

Chronic disease and associated risk factors impose significant health and social burdens in developed countries, such as Australia. A number of epidemiologic studies have shown an association between increased fruit and vegetable intake and a decreased risk of CVD (Hung et al., 2004; van't Veer, Jansen, Klerk & Kok, 2000; Van Duyn & Pivonka, 2000), stroke (Johnsen et al., 2003; Van Duyn & Pivonka, 2000), hypertension (John, Ziebland, Yudkin, Roe, & Neil, 2002; Van Duyn & Pivonka, 2000; Van Horn et al., 2008), some types of cancer (Key et al., 2004; Key, Allen, Spencer, & Travis, 2002; Riboli & Norat, 2003; van't Veer et al., 2000; Van Duyn & Pivonka, 2000), overweight, obesity (Bes-Rastrollo, Martínez-González, Sánchez-Villegas, de la Fuente Arrillaga, & Martínez, 2006; Vioque et al., 2008) and possibly diabetes (Carter, Gray, Troughton, Khunti, & Davies, 2010). Inadequate fruit and vegetable intake is the major dietary risk factor for poor health, accounting for 2.0% of cancer, 9.6% of CVD, and 2.1% of all causes of disease and health conditions (Begg et al., 2008). This evidence highlights the health benefits of fruit and vegetables and has underpinned the development of Dietary Guidelines and recommendations in Australia (NHMRC, 2003a) and other countries (Food Standard Agency, 2005; National Health and Medical Research Council, 2003; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010).

Dietary guidelines for Australia (NHMRC, 2003a) and other countries (Food Standard Agency, 2005; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010) have been developed to reduce diet-related chronic disease and their risk factors, and they consistently recommend people eat an adequate amount of fruit and vegetables regularly. Fruit and vegetables contain many nutritional and non-nutritional components, and some of these are thought to have beneficial effects on health: vitamins (vitamins C, E, folate), minerals (potassium, selenium), carotenoids, flavonoids (phenolic compounds), sulphides, and fibre (Van Duyn & Pivonka, 2000; World Cancer Research Fund & American Institute for Cancer Research, 2007). For example, β-carotene (a carotenoid) is found in yellow, orange, and green-coloured fruit and vegetables. Vitamin C is found in citrus fruit, capsicum, berries, and a rich source of folate is green leafy vegetables. Flavonoids are found in apples, onions, green leafy vegetables, and citrus fruit, and sulfides are present in cruciferous vegetables (e.g. broccoli). Most fruit and vegetables are good or rich sources of fibre (World Cancer Research Fund & American Institute for Cancer Research, 2007). Some of these compounds are called phytochemicals and are biologically active compounds that are naturally occurring in small quantities in plant products (World Cancer Research Fund & American Institute for Cancer Research, 2007). Intakes of a wide variety of fruit and vegetables will ensure that a range of beneficial vitamins, minerals, phytochemicals and fibre are included in one's diet (Van Duyn & Pivonka, 2000). Although the mechanisms of the protective effects of fruit and vegetables for these chronic diseases are not exactly known, the phytochemicals in fruit and vegetable are thought to have protective roles for CVD, hypertension, cancer, and overweight and obesity (Kris-Etherton et al., 2002). The following sections present brief discussions of the evidence for the association between fruit and vegetable intake and development of CVD, hypertension, cancer, overweight and obesity.

Cardiovascular disease (CVD)

Cardiovascular disease is the most costly disease in Australia (AIHW, 2011). Atherosclerosis and thrombosis (platelet aggregation) have an important role in the development of CVD (Frayn & Stanner, 2005). The reduction of cardiovascular disease risk resulting from the consumption of fruit and vegetables is thought to occur as a consequence of several mechanisms. First, constituents of fruit and vegetables have antioxidative properties which may prevent the oxidation of the low-density lipoprotein (LDL) (Diaz, Frei, Vita, & Keaney, 1997). Oxidation of LDL is thought to be the first step in arterial wall cholesterol accumulation which leads to atherosclerosis. High intakes of fruit and vegetables can increase the plasma concentration of antioxidants (John et al., 2002), and thereby may reduce the risk of developing CVD by decreasing the oxidation of LDL.

Second, a high level of fruit and vegetable intake may reduce plasma total cholesterol and LDL cholesterol level. Raised total and LDL cholesterol is a risk factor for CVD (Frayn & Stanner, 2005) and dietary fibre in fruit and vegetables, especially soluble fibre, has been shown to decrease total and LDL cholesterol levels (Brown, Rosner, Willett, & Sacks, 1999; Kris-Etherton et al., 2002; Van Duyn & Pivonka, 2000). The mechanisms of how fibre lowers blood cholesterol are not well understood; however, soluble fibre is thought to bind with bile acids or cholesterol in the small intestine, thereby interfering with cholesterol absorption. This in turn increases faecal bile acid and the excretion of LDL (Brown et al., 1999). Another possible mechanism of decreasing total and LDL cholesterol by fibre is that products from fermented fibre in the intestine inhibit synthesis of cholesterol in the liver (Brown et al., 1999).

Thirdly, phenolic compounds (e.g. flavonoids), which are one type of phytochemical, have been reported to decrease platelet aggregation (Kris-Etherton et al., 2002). Changes in blood platelet aggregation resulting from phenolic compounds are thought to prevent the formation of thromboses (Hubbard, Wolffram, Lovegrove, & Gibbins, 2003). Likewise, phenolic compounds may also have antithrombotic effects by altering the nitric oxide production which leads to vasodilation (widening blood vessels by relaxation) (Freedman et al., 2001; Hubbard et al., 2003). Although evidence of the protective role of vascular function has been increasing, the effectiveness of phenolic compounds as antithrombotic agents is inconclusive.

Hypertension

High blood pressure, or hypertension, is a risk factor for stroke, CVD and kidney disease (Lampe, 1999). High fruit and vegetable intake have been reported to reduce blood pressure independent of any changes in sodium intake (John et al., 2002). Fruit and vegetables are rich sources of potassium and a high consumption of these foods has been shown to reduce blood pressure in cohort and experimental studies (He & MacGregor, 2008; He, Nowson, & MacGregor, 2006; Lampe, 1999). The mechanisms of the blood pressure lowering effect of potassium are not well understood; however, the increased serum potassium level resulting from high fruit and vegetable intake is thought to lead to endothelial-dependent vasodilation (Haddy, Vanhoutte, & Feletou, 2006; Houston & Harper, 2008).

Cancer

A high level of fruit and vegetable intake is associated with a reduced risk of developing some types of cancer, such as cancer of the oral cavity, pharynx, larynx, oesophagus, lung, stomach, colorectum, pancreas, and prostate (Key et al., 2004; van't Veer et al., 2000; World Cancer Research Fund & American Institute for Cancer Research, 2007). The antioxidant properties of fruit and vegetables are thought to act through protecting against oxidative damage to cell membranes and DNA (Lampe 1999; Van Duyn & Pivonka, 2000; World Cancer Research Fund & American Institute for Cancer Research, 2007). Other potential mechanisms of cancer prevention of the phytochemicals in fruit and vegetables are: increases in the activity of detoxifying enzymes (Lampe, 1999), helping carcinogen excretions (Van Duyn & Pivonka, 2000), increasing immune system function (Lampe, 1999), altering hormone metabolism (Kris-Etherton et al., 2002; Lampe, 1999), and inhibiting tumour cell growth (Kris-Etherton et al., 2002).

Overweight and obesity

The reduced risk of weight gain (Bes-Rastrollo et al., 2006; Vioque et al., 2008), obesity (Burton-Freeman, 2000) and a lower BMI (Greenwood et al., 2000) are also associated with a high level of fruit and vegetable intake. These associations can be explained in several ways. First, most fruit and vegetables are low in energy-density, and foods that have low energy density or are high bulk food with low energy content may help to reduce the high consumption of energy-dense foods (World Cancer Research Fund & American Institute for Cancer Research, 2007). Since humans tend to eat the same amount (volume and weight) of food every day, consuming a high amount of foods with low energy-density may reduce the amount of high energy-dense foods consumed (Prentice & Jebb, 2003; World Cancer Research Fund & American Institute for Cancer Research, 2007). Second, fruit and vegetables typically contain high fibre which has an influence on satiety. High fibre intake can increase the bulk and viscosity of food which promotes satiety by slowing gastric emptying (Burton-Freeman, 2000; Pereira & Ludwig, 2001; World Cancer Research Fund & American Institute for Cancer Research, 2007). While there is some evidence to suggest that higher fruit and vegetable intake lead to better weight management (weight loss and the prevention of weight gain), the effect is inconclusive as only a small number of studies have investigated the direct relationship between the two due to the difficulties in isolating the independent effects of determining the weight management effect purely from consumption of fruit and vegetables (World Cancer Research Fund & American Institute for Cancer Research, 2007).

In summary, there is substantial evidence to suggest that a high consumption of fruit and vegetables reduces the risk of developing a number of biological risk factors that may lead to chronic disease. This protective effect of fruit and vegetables is thought to be partly due to the components of these foods such as phytochemicals, vitamin C and carotenoids. Rich sources of these constituents are found in yellow, orange, and green-coloured fruit and vegetables, green leafy vegetables and cruciferous vegetables; however, there are numerous types of phytochemicals found in fruit and vegetables. Therefore, to ensure that a variety of beneficial compounds are consumed, it is recommended to consume a wide variety of fruit and vegetables and also to consume at least two serves of fruit and five serves of vegetables every day (The Commonwealth Department of Health and Family Services, 1998).

2.3 DEFINITION OF SOCIOECONOMIC POSITION

According to Lynch and Kaplan (2000, p.14), SEP is defined as "Social and economic factors that influence what position(s) individuals and groups hold within the structure of society". Although a range of terms have been used to describe socioeconomic conditions such as socioeconomic status and social class, each term is based on a different theory and concept (Dutton, Turrell & Oldenburg, 2005; Galobardes, Lynch & Davey Smith, 2007; Krieger, Williams & Moss, 1997; Lynch & Kaplan, 2000). SEP represents a number of overlapping concepts that are comprised by diverse socioeconomic factors, such as economic resources, social relationships, and prestige (Krieger et al., 1997). The term SEP is used throughout this thesis to reflect a diverse concept that incorporates both aspects of resources and status (Dutton et al., 2005; Krieger et al., 1997). There are widely acknowledged disparities and inequalities in health and health-related behaviours between social groups (i.e. gender, ethnicity, geographical location). A significant proportion of these inequalities may be due to socioeconomic differences between these groups (through either a direct or reverse causation). The research undertaken in this thesis seeks to better understand how socioeconomic factors are related to dietary behaviours. While these may differ between social groups (i.e. gender, ethnic, rural/remote), the primary focus of this thesis is on socioeconomic factors rather than social group differences.

2.4 SEP AND DIET

This section provides a review of the literature relating to the association between SEP and dietary intake that is thought to influence the development of diet-related chronic disease and their risk factors among adults. Lower socioeconomic groups have higher rates of diet-related chronic diseases: type 2 diabetes (Geyer, Hemstrom, Peter, & Vagero, 2006; Williams, et al., 2010), cardiovascular diseases (Davey Smith et al., 1998; Geyer et al., 2006; Ramsay, Morris, Lennon, Wannamethee, & Whincup, 2008; Stewart et al., 2008; White, van Galan & Chow, 2003) and some forms of cancer (White et al., 2003), and greater risk for the development of such illness through their higher prevalence of overweight, obesity and hypertension (Davey Smith et al., 1998; Stewart et al., 2008; Turrell et al., 2006).

Developing these diseases and conditions can be directly influenced by diet. In Australia, dietary guidelines have been developed in an effort to reduce dietary-related chronic diseases and their risk factors (NHMRC, 2003a). Australia and other countries consistently recommend the regular consumption of plenty of fruit and vegetables and a limited total and saturated fat intake (Food Standard Agency, 2005; NHMRC, 2003a; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010). Dietary factors, therefore, are thought to be contributing to socioeconomic differences in health status. Dietary behaviours examined are: dietary patterns/diet quality, takeaway and fast-food consumption, fruit and vegetable intake, and intake of nutrients/non-nutrients (energy, total and saturated fat, dietary fibre, vitamin C, and folate). These include studies where the age of the participants are 18 years or older (or part thereof). Studies comprised exclusively of young or elderly participants (those 15 years or younger, or 65 years or older, respectively) were not included in this review as they fall outside of the scope research conducted for this thesis.

2.4.1 SEP and dietary patterns/diet quality

Dietary patterns and diet quality characterise whether an individual’s overall food intake is consistent with dietary recommendations rather than focussed on specific nutrients or narrowly defined food groups. Overall diet quality provides a summary of measures to assess whether one’s dietary components are consistent with dietary recommendations. For example, the Australian-Healthy Eating Index assesses: variety, whether recommended options are chosen, the amount of fruit and vegetables consumed, the amount and types of milk, frequencies and cooking method of meat, and the consumption of foods that are high in saturated fat and low in nutrient density (AIHW, 2007). These indices are considered to be better measures than using a single-food items or specific dietary component to assess diet inequalities as they may decrease misclassification and bias (Roos, Lahelmab, Virtanena, Prättäläc & Pietinena, 1998). In addition, diet quality may predict health outcomes: diet quality measures are associated with biomarkers of CVD and diabetes risk (Fung et al., 2005), major chronic diseases, CVD (McCullough et al., 2002) and mortality (Kant, Schatzkin, Graubard, & Schairer, 2000). A number of Australian and international studies examining the association between SEP and dietary patterns/diet quality were found in the literature and these are summarised in Tables 2.1 to 2.3.

The results of studies that have examined the association between SEP and diet consistently show that there are socioeconomic differences in dietary patterns and diet quality. Although the findings of these studies are difficult to compare due to the different measurements for dietary patterns, the evidence consistently indicates that lower socioeconomic groups are more likely to have a dietary pattern characterised as “less healthy” or low quality comprising of low fruit, vegetable, and wholegrain consumption compared with higher socioeconomic groups (Beydoun & Wang, 2008a; Lallukka et al., 2007; Malon et al., 2010; Martikainen, Brunner, & Marmot, 2003; Roos et al., 1998).

Table 2.1: Dietary patterns/diet quality by socioeconomic position in Australia

Author & year	Sample	SEP measure	Dietary intake/purchase measure	Main findings
Turrell et al. (2002)	N=1003 (66.4% RR), mean age 45.2 years	Highest education completed, total household income (quintile), occupation.	Healthiness of food choice: Grocery food purchasing index (recommended or regular choices on 16 different food-types. higher score indicate greater compliance for the dietary recommendations). Low compliance (bottom quintile of the index)	Compared with the advantaged group, disadvantaged groups were more likely to be classified as low compliers for grocery purchasing • Education: least educated OR 2.02 (95% CI 1.3, 3.1) • Income: lowest income OR 3.15 (95% CI 2.0, 5.1) • Occupation: Blue collar OR 2.44 (95% CI 1.3, 4.6) compared with managers & professionals
McNaughton et al. (2008)	N=8220, ≥19 years, 24-hr recall, dietary guideline index	Equivalent household income, area level SEP categorised into quintile.	24-hr recall, dietary guideline index (higher score indicates greater compliance with the dietary guidelines)	Lower socioeconomic groups had mean lower dietary guideline index Men: • Lowest income groups: mean index –3.76 (95% CI –5.73, –1.79) • Most disadvantaged area: mean index –2.63 (95% CI –4.58, –0.68) Women: • Lowest income groups: mean index –4.00 (95% CI –5.87, –2.13) • Most disadvantaged area: mean index –2.69 (–4.55, –0.82)

RR=response rate.

Table 2.2: Dietary patterns/diet quality by socioeconomic position in European countries

Author & year	Country and sample	SEP measure	Dietary intake/purchase measure	Main findings
Roos et al. (1998)	Finland, N=6051 (76.5% RR), 25–64 years.	Education, employment status	Food record, diet quality index (dichotomised into highly complied with diet guideline or not)	Compared with disadvantaged groups, advantaged groups have a better quality of diet (complied with dietary guideline) Men • Education: the highest OR 1.89 (95% CI 1.44, 2.47) compared with the least educated • Employment status: unemployed OR 0.42 (95% CI 0.22, 0.82) compared with employed Women • Education: the highest educated OR 1.62 (95% CI 1.35, 3.56) compared with least educated • Employment status: unemployed OR 0.52 (95% CI 0.31, 0.86) compared with employed
Martikainen et al. (2003)	UK, N=8004, 39–63 years	Occupation	Semi-quantitative FFQ, dietary patterns (cluster analysis) categorised into six groups: very healthy, moderately healthy, French, sweet unhealthy, unhealthy, and very unhealthy.	Lower socioeconomic groups were more likely to have unhealthy dietary patterns Compared with the highest occupational grade: Men: • Lowest grade: very unhealthy diet OR 3.34 ($p<0.05$), moderately healthy diet OR 0.64 ($p<0.05$) Women: • Lowest grade: very unhealthy diet OR 6.19 ($p<0.05$), moderately healthy diet OR 1.90 ($p<0.05$).
Giskes, Turrell, van Lenthe, Brug & Mackenbach (2006)	The Netherlands, N=1339, 25–79 years (80.9% RR)	Education, household income, area level SEP	Healthiness of food choice measured by grocery purchasing index (recommended or regular choices on 16 different food-types. higher score indicate greater compliance for the dietary recommendations). Categorised into quartile	Lower socioeconomic groups were less likely to have chosen grocery that was consistent with dietary recommendations. • Education: unhealthy grocery food choice least educated OR 1.54 (95% CI 1.00, 2.37) • Household income: unhealthy grocery food choice lowest income OR 1.54 (95% CI 1.02, 2.32) • Area level SEP: NS

Table 2.2: Dietary patterns/diet quality by socioeconomic position in European countries (continued)

Author & year	Country and sample	SEP measure	Dietary intake/purchase measure	Main findings
Lallukka et al. (2007)	Finland, N=8960, 40–60 years (67% RR)	Childhood socioeconomic circum stance (parental education and childhood economic difficulties), education, occupation, household income, home ownership, current economic difficulties	FFQ, having healthy food habit measured by healthy food habit index ranged 0 to 6. Dichotomised into having healthy food habits(≥5 scores) or less healthy food habits (< 5 scores)	Own education, occupational class, household income, home ownership and current economic difficulties were associated with healthy food habits. • Childhood socioeconomic circumstance: NS • Education: OR 1.60 (95% CI 1.39 1.84) • Occupation: managers & professionals OR 1.81 (95% CI 1.47, 2.23) compared with manual occupation • Household income: highest income group OR 1.59 (95% CI 1.35, 1.88) compared with lowest income group • Home ownership: Yes OR 1.34 (95% CI 1.18, 1.51) • Current economic difficulties: no difficulties OR 1.47 (95% CI 1.27, 1.71) compared with frequent difficulties
Malon et al. (2010)	France, N=2577, 18–74 years	Occupation, education	24-hr dietary recall, Programme National Nutrition Santé guideline score (PNNSGS) (adherence of French nutrition recommendations) categorised into quartile being low quartile: being low adherence (bottom quartile) or not.	Lower occupational men and women are more likely to having diets that are inconsistent with dietary recommendations. Education was not associated with diet quality. Men • Manual worker OR 1.98 (95% CI 1.22, 3.22); Homemaker/disabled person/other OR 3.43 (95% CI 1.51-7.83) compared with management/intermediate profession • Education NS Women • Manual worker OR 1.52 (95% CI1.02, 2.26); homemaker/disabled person/other OR 1.90 (95% CI 1.17-3.07) compared with management/intermediate profession • Education NS

RR=response rate, FFQ=food frequency questionnaire, NS=not significant

Table 2.3: Dietary patterns/diet quality by socioeconomic position in the USA

Author & year	Sample	SEP measure	Dietary intake/purchase measure	Main findings
Kant & Graubard (2007)	USA, N=5874 (76% RR), 25–74 years	Education, poverty income ratio (PIR) (PIR <1 below the poverty level, 1.0–1.99, 2.0–2.99, 3.0–3.99 and ≥4.0)	24-hr dietary recall, dietary diversity score (DDS) (whether or not a food from each of the five major food groups was mentioned in the recall; score ranged from 0–5) Having DDS score = 5	Highly educated group was more likely to consume all five major groups (DDS = 5). • Least educated 31%±0.7 vs highest educated 47%± 0.8; p<0.001.
Beydoun & Wang (2008b)	USA, N=4356, 20–65 years	SES index (combined education and household income)	24-hr dietary recall, diet quality measured by healthy eating index (HEI) and alternate Mediterranean diet score (aMED)	Higher socioeconomic groups had a higher diet quality HEI: B=5.75±3.85, p<0.05, aMED: B=0.35±0.03, p<0.05.

RR: response rate; FFQ: food frequency questionnaire.

2.4.2 SEP and takeaway or fast-food consumption/purchasing

There are a small number of studies that have examined associations between SEP and takeaway or fast-food consumption in Australia, USA and European countries. A summary of these studies is presented in Table 2.4 to Table 2.6. The Australian studies that have examined the association between SEP and takeaway and fast-food consumption or purchasing showed inconsistent results regardless of the socioeconomic indicators used. In terms of education, one study showed evidence of frequent fast-food purchasing among less educated groups (Thornton, Bentley, & Kavanagh, 2011) while another study found the opposite result (Turrell & Giskes, 2008). However, three studies have found no association (Inglis et al., 2008; Mohr, Wilson, Dunn, Brindal, & Wittert, 2007; Smith et al., 2009). Associations between income and takeaway or fast-food have also been found to be inconsistent: three studies reported higher income consume/purchase takeaway or fast-food frequently (Inglis et al., 2008; Mohr et al., 2007; Turrell & Giskes, 2008); however, one study has found lower income groups consuming more frequently compared with their counter parts (Thornton et al., 2011). Only one study used occupation and they reported blue collar occupations consuming fast-food more frequently compared with people in professional occupations (Thornton et al., 2011). Young employed women were more likely to consume takeaway food twice per week or more compared with unemployed; however, there was no association among young adult men (Smith et al., 2009).

Studies conducted in the US, Spain and Switzerland have also shown mixed results. Two studies found that lower education was associated with a higher level of fast-food consumption (Paeratakul et al., 2003; Pereira et al., 2005), one reported the opposite result (Schröder et al., 2007) and yet another study reported no association (Anderson, Rafferty, Lyon-Callo, Fussman, & Imes, 2011; Binkley, 2006; Dave, An, Jeffery & Ahluwalia, 2009; French, Harnack & Jeffery, 2000; Stewart, Blisard, Jolliffe & Bhuyan, 2005; van der Horst, Brunner, & Siegrist, 2011a). In terms of income, two studies reported that lower income groups consume takeaway or fast-food more frequently (French et al., 2000; Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Stewart et al., 2005; van der Horst et al., 2011a) whereas four studies reported that higher income groups were more likely to consume fast-food (Beydoun, Powell, & Wang, 2008a; Fanning, Marsh, & Stiegert, 2010; French et al., 2000;

Paeratakul et al., 2003). Non-significant associations between income and fast-food consumption have also been reported (Binkley, 2006; van der Horst et al., 2011a).

These inconsistent results may be the result of a number of factors. First, the studies conceptualised takeaway/fast-food differently. Most studies measured fast-food, which is defined as any food from fast-food outlets whereas others examined meals from fast-food outlets (excluding snacks). Another study only examined four typical fast-food items: hamburger, cheese burger, BicMac™, and French fries (Schröder et al., 2007). Nevertheless, the majority of studies examined fast-food consumption rather than the more inclusive category of takeaway food which include fast-food. Examining takeaway food with wider food types would provide a better understanding of the socioeconomic differences in dietary behaviours.

Second, the methods used to assess takeaway or fast-food consumption varied among the studies: FFQs, 24-hour dietary recalls, or one question assessing takeaway or fast-food consumption in a survey (e.g. How often do you usually eat fast-food?). Although all of the above methods relied on participants' memory and are prone to bias, each method has different strengths and limitations. While 24-hour dietary recalls can provide detailed information on all food and beverage consumed from which the estimated mean intake among a population can be obtained, this method does not provide the usual intake of individuals (Thompson & Byers, 1994). FFQs on the other hand, can provide the usual intake of food and beverages among individuals (Thompson & Byers, 1994); however, the lack of detail of food consumed and the amount of misreporting tend to be larger in FFQs than in the 24-hour recall method (Tooze et al., 2004). The method of assessing takeaway or fast-food consumption/purchasing by one question in a survey is more feasible as it allows information to be collected from large population group. However, it is limited by the amount of detail that can be collected: types of food, portion size or number of items consumed/purchased.

Third, when studies examined the frequency of consumption or purchasing, the definition of frequent takeaway or fast-food consumers is different from study to study. While one study defined once per month or more as frequent, another study defined frequent consumers as twice per week or more. Depending on the cut-off used to define frequent consumers, the direction and magnitude of any associations may change. In addition to these issues, different measures can produce associations in the opposite direction. For example, Beydoun et al. (2008a) examined income differences in the proportion of participants who consumed fast-food in two 24-hour recalls and in the number of fast-food items consumed in the same period, and reported conflicting results: a higher proportion of the highest income group consumed fast-food compared with the lowest income group (47.2% vs 40.2%; $p<0.05$); however, when the number of fast-food items consumed was compared, the lowest income group consumed more items compared with the highest income group (2.59 items vs 2.48 items, $p<0.05$).

Lastly, the results from some studies were not adjusted for potential confounders (e.g. age and sex). Age and sex have been reported as confounders in the association between SEP and dietary behaviours (Turrell, 1996) including fast-food consumption (Binkley, 2006; Dave et al., 2009). In addition, other factors such as household composition and country of birth are also identified as potential confounders (Thornton, Bentley, & Kavanagh, 2009). Since takeaway and fast-food consumption are likely to be confounded by number of factors such as age and sex (Turrell, 1996), unadjusted results are likely to be unreliable. The reason for the studies presenting unadjusted results is that their focus was not on examining the association between SEP and takeaway or fast-food consumption but collected socioeconomic information as covariates. Despite increased interest in and the resultant increased number of published literature on the area of SEP and diet, only a few studies have focussed on socioeconomic differences in takeaway or fast-food consumption (Inglis et al., 2008; Thornton et al., 2011; Turrell & Giskes, 2008) which limits our understanding of the association between SEP and takeaway and fast-food consumption.

In summary, the available literature has to date reported mixed results and these inconsistencies may be due to a number of reasons: differences in conceptualising takeaway food, dietary intake methods and measurements used, and the reporting of unadjusted results. Due to the limited amount of literature available, it is difficult to know with any certainty whether SEP is associated with takeaway or fast-food consumption, or the direction of any association between them.

Table 2.4: Takeaway/fast-food consumption or purchasing by socioeconomic position in Australia

Author & year	Sample	SEP measure	Takeaway or fast-food consumption/purchase measure	Main findings
Mohr et al. (2007)	N=20527 (60.4% RR), ≥14 years	Education, household occupational status, household income	Frequency of FF consumption (eat-in, takeaway), eight scales (never to several times/week). FF = food from FF place	Household income was positively associated with both eat-in and takeaway fast-food consumption Eat-in • Household: B=0.28 (p<0.001) • Education: NS • Occupation: NS Takeaway • Household income: B=0.21 (p<0.001) • Education: NS • Occupation: NS
Inglis et al. (2008)	N=1580, 18–65 years women only	Education, (own) income	Frequency of weekly FF consumption: never to 6–7 times/week (six categories), dichotomised into frequent (≥one meals/week or infrequent (< one meal/week). FF = meals from FF restaurants e.g. McDonald's, pizza eat-in and at home, work, or study	Low income women were frequent FF meal consumers. Education was not associated with FF meal consumption. • Income: highest income OR 0.51 (95% CI 0.33 to 0.80) • Education: NS
Turrell & Giskes (2008)	N=1001, mean 45.6 years primary responsible for food shopping	Education, household income	Frequency of takeaway food purchasing (never/rarely to ≥five times/months) dichotomised into ≥once/month or less.	Least educated and high income groups purchased takeaway food more regularly. • Household income: OR 0.51 (95% CI 0.34, 0.76) • Education: OR 0.63 (95% CI 0.47, 0.84)
(Smith et al. (2009)	N=2881, 26–36 years	Education, employment status (working or not in the workforce)	Frequency of takeaway food consumption (never to 6–7 times/week) dichotomised into ≥twice/week or less. Takeaway food = hot takeaway meals (e.g. pizza, burgers, fried or roast chicken, Chinese/Indian/Thai takeaway)	Education and employment status were not associated with takeaway food consumption
Thornton et al. (2011)	N=2547 (64% RR), ≥ 18years	Education, occupation, household income	Frequency of purchasing FF dichotomised into ≥once/week FF = food from major five FF outlets	Lower socioeconomic groups were more likely to purchase FF ≥one/week • Education: least OR 2.13 (95% CI 1.44, 3.14) • Occupation: blue collar OR 3.88 (2.27, 6.62) • Income: lowest OR 1.94 (95% CI 1.20, 3.14)

RR=response rate; FF=fast-food.

Table 2.5: Takeaway/fast-food consumption or purchasing by socioeconomic position in USA

Author & year	Sample	SEP measure	Dietary intake/purchase measure	Main findings
Glanz et al., (1998)	National sample N=2967 (average 74% RR)	Income	Frequency of FF consumption (food from FF outlets) index was created FF= breakfast, lunch, dinner, or snack from McDonalds' Burger King, Pizza Hut, Hardee's Wendy's, Taco Bell and other FF restaurants.	Household income was positively associated with fast-food consumption • Income: F=5.4 ($p<0.05$)
French et al. (2000)	N=891, 20-45 years, women only, Pound Prevention study	Education, employment status, household income	Frequent FF meal consumption/week: low (0), med (1/week), high 3.3/week) at FF restaurants.	At the bivariate level low income and employed were more likely to consume FF frequently • Education: NS • Low household income: low consumption 32.7% vs high consumption 43.1% ($p=0.04$) • Employed: low consumption 81.2% vs high consumption 85.4% ($p=0.04$)
Paeratakul et al. (2003)	N=17370, the 1994-1996, 1998 Continuing Survey of Food Intakes by Individuals	Education, income (% of poverty)	FF consumption from 24-hour recall, dichotomised into consumed or did not consume. FF = food from FF place and pizza place.	highly educated and higher income groups were more likely to be consumed FF • Education: Less than high school 36.6% vs Four or more years of college 41.7% ($p<0.001$) • Income: low 32.1% vs high 45.5% ($p<0.001$)
Pereira et al., (2005)	N=3031, 18–30 years	Education	Frequency of FF consumption: < once/week, 1–2 times/week, ≥ twice/week. FF = food from FF outlets such as McDonald's, Burger King, Wendy's, Arby's, Pizza Hut, or Kentucky Fried Chicken.	At the bivariate level, there was an association between increased education and less frequent FF consumption among white participants: FF consumption < once/week = 16.0 years of education whereas ≥ twice/week = 15.5 years of education ($p=0.001$).
Stewart et al. (2005)	N=989 (RR 41%)	Education, household income	Whether regularly patronise FF restaurants (yes/no) by short question. FF = Mexican food, sandwiches, burgers, and food from chicken-type facilities	• Household income was negatively associated with FF (B= –0018, $p<0.001$) • Education NS

Table 2.5: Takeaway/fast-food consumption or purchasing by socioeconomic position in USA (continued)

Author & year	Sample	SEP measure	Dietary intake/purchase measure	Main findings
Binkley (2006)	N=4361, ≥20 years, the 1994–96 Continuing Survey of Food Intakes and the participants of Diet and Health Knowledge Survey	Education, household income	Two 24-hr dietary recall, whether ate meals from fast-food outlet (≥ two items/24 hours) (snacks excluded)	Education and household income were not associated with FF consumption.
Fanning et al. (2010)	N=21662, the 1994–96 Continuing Survey of Food Intakes by Individuals	Income	The likelihood of daily FF consumption estimated from 24-hr dietary recall	Income was an important determinant for FF consumption. The likelihood of FF consumption increases until the $50,000-70,000 range and then decreases.
Beydoun et al., (2008a)	N=7331, 20–65 years, the 1994–96 Continuing Survey of Food Intakes by Individuals	Family income [poverty income ratio: 0–130 (poor: food stamp eligible), 131–299 (near poor), and 300 or more (not poor)]	Number of fast-food items consumed (include beverages); whether consumed any fast-food over the two 24-hr recall periods.	At the bivariate level, higher proportion of non-poor consumed fast-food; however, the poorest consumed more number of items over the period of 48 hours. Poor 40.17% ±1.83 non-poor 47.19% ±1.53, $p<0.05$. Poor 2.59 items ±0.44 vs non-poor 2.48 ±0.11, $p<0.05$.
Dave et al. (2009)	N=530, 18–76 years, participants who consumed FF at least once in the previous week	Education	Frequency of FF consumption, dichotomised into: <once/week or ≥ once/week. FF = food from FF outlets Burger King, Hardee's, Kentucky Fried Chicken, Pizza Hut, and similar	Education was not associated with FF consumption.
Anderson et al. (2011)	N=3279 (51% RR), the 2005 Michigan Behavioral Risk Factor Survey, 18–64 years	Education, household income	Frequency of usual FF consumption, dichotomised into: <twice/week or ≥twice/week.	Education and household income were not associated with frequent FF consumption.

RR=response rate, FF=fast-food.

Table 2.6: Takeaway/fast-food consumption or purchasing by socioeconomic position in European countries

Author & year	Country and sample	SEP measure	Dietary intake/purchase measure	Main findings
Schröder et al. (2007)	Spain, N=3054, 25–74 years	Education	FFQ, frequency of FF consumption dichotomised into consumed or not consumed. FF = hamburger, cheese burger, BicMac, and French fries from McDonalds or similar.	At the bivariate level, education was positively associated with FF consumption. Collage level of education 11% (95% CI 10.5, 13.0) did not consumed; 15.9% (95% CI 11.7, 20.1) consumed (p=0.036).
van der Horst et al. (2011a)	Switzerland, N=1017 (44% RR), 17–93 years	Education, income	Frequency of FF and takeaway food consumption for lunch and dinner using short questions: seven-point scale (never to daily) and create scores for each food type. Dichotomised into consumed FF or takeaway food ≥ one/month or less. FF = products from a fast-food company (takeaway and eating at the table). Takeaway food = all foods consumed as takeaway, excluding FF.	Higher income consumed takeaway foods more frequently. Middle level of education consumed takeaway foods less frequently. No association between education/income and FF consumption. FF • Education: NS • Income: NS Takeaway food • Education: middle OR 0.65 (95% CI 0.45 0.93); high NS (ref: least educated) • Income: OR 1.11 (95% CI 1.03, 1.19)

RR=response rate, FF=fast-food.

2.4.3 SEP and fruit and vegetable intake

A number of Australian and international studies have investigated SEP and fruit and vegetable intake/purchase. A summary of these study results is shown Tables 2.7 to 2.9. In Australia, the majority of studies have reported that lower socioeconomic groups consume less fruit and vegetables. Giskes et al. (2002b) estimated differences between the lowest and highest household income groups in fruit intake were 77 g per day for men and 73 g per day for women whereas the differences in vegetable intake were 18 g per day for men and 16 g per day for women (Giskes et al., 2002b). Additionally, socioeconomically advantaged groups were more likely to consume or purchase a wider variety of fruit and vegetables (Ball, Crawford, & Mishra, 2006; Brennan, Henry, Nicholson, Kotowicz, & Pasco, 2009; Giskes et al., 2002a; Inglis et al., 2008; Turrell et al., 2002).

Most studies conducted in other countries have also consistently reported that socioeconomically disadvantaged groups were more likely to consume a lesser amount of fruit and vegetables (Beydoun & Wang, 2008a; Boukouvalas, Shankar, & Traill, 2009; Galobardes, Morabia, & Bernstein, 2001; Shohaimi et al., 2004) and less likely to have an adequate daily fruit and vegetable intake (Beydoun & Wang, 2008a; Friel, Newell, & Kelleher, 2005) compared with their more advantaged counterparts. A systematic review from seven European countries estimated that differences between the lowest and highest level of education in fruit consumption were 24 g per day among men, and 34 g per day among women; and for vegetable consumption, 17 g per day for both men and women (Irala-Estevez et al., 2000). Socioeconomic differences in fruit and vegetable intake in European countries seem to be smaller than those observed in Australia.

Although the direction of associations between SEP and fruit and vegetable intake/purchasing was generally consistent, there are some difficulties in comparing these results. First, items included for fruit and vegetable intake were differed across studies which may have influenced the direction and magnitude of the association. For example, some studies included fruit juice in the measure of fruit intake, whereas others did not. Likewise, while some studies excluded potato in vegetable intake, others included or did not specify. Since fruit juice (Lindström, Hanson, Wirfait & Ostergren, 2001) and potatoes (Galobardes et al., 2001; Hulshof, Brussaard, Kruizinga, Telman, & Löwik, 2003) tend to be consumed more by lower socioeconomic groups, inclusion/exclusion of such an item (or items) may affect the direction and magnitude of associations. Second, similar to the SEP and nutrient intakes, the methods of collecting information on fruit and vegetable intake were varied: most studies used 24-hour dietary recalls, FFQs or one (or two) questions assessing fruit and vegetable intake in a survey (e.g. How many serves of fruit and vegetables do you usually eat each day?). Similarly, measures of fruit and vegetable intake were different: measuring the amount consumed (grams or servings), the proportion or likelihood of consuming the recommended amount, or single dichotomised measures (consumed or not consumed). These different methods and measures make it difficult to compare each study and may also have influenced the direction and magnitude of associations reported.

Table 2.7: Australian studies of socioeconomic differences in fruit and vegetable intake

Author & year	Sample	SEP measure	Fruit/vegetable measure	Main findings
Giskes et al. (2002b)	N=8883 (61% RR), aged 18–64 years	Household income (quintile)	Fruit and vegetables: amount consumed (g/day), 24-hour recall	Lower income groups consumed lower amount of fruit and vegetables Fruit: men –77g; women –73g Vegetables: men –18g; women –16g
Turrell et al. (2002)	N=1003 (66%), mean aged 45.2 years	Education, total household income, occupation	Fruit and vegetable purchasing indices: frequency (4-point scale: never to always) and variety purchased. Higher score indicates wider variety and greater regularity of purchasing. The (likelihood of being bottom 20% score)	Compared with the most disadvantaged groups, the most disadvantaged purchase fewer types of fruit and vegetables less regularly. Fruit: • education OR 2.3 (95% CI 1.5, 3.5) • occupation OR 2.2 (95% CI 1.2, 2.8) • income OR 4.5 (95% CI 2.3, 7.4). vegetables: • education OR 1.6 (95% CI 1.1, 2.4); occupation OR 1.9 (95% CI 1.1, 3.5) • income OR 1.4 (95% CI 0.9, 2.1)
Ball et al. (2006)	N=1347 woman, aged 18–64 years (mean 42),	Education	Usual fruit and vegetable intake (servings/day), FFQ	Compared with the least educated, the most educated group consumed more fruit and vegetables (fruit 0.36 servings/day; vegetables 0.33 servings/day).
Inglis et al. (2008)	N=1580 women, aged 18–65 years	Education, own gross income	Usual fruit and vegetable intake (servings/day). Categorised into: high fruit consumers (≥2serves/d), high vegetable consumers (≥3 serves/d)	Compared with the least educated, the most educated consumed more likely to be high fruit and vegetable consumers (fruit OR 1.7 95% CI 1.3, 2.2). No income differences in fruit and vegetable observed.
Brennan et al. (2009)	N=1100 women, aged 20–92 years (mean 49)	ABS index of area advantage, bottom and top quintiles of SEIFA values	Average fruit and vegetable intake (pieces/d)	At the bivariate level, residents of the lowest SES area consumed lower fruit intake (3 pieces vs 4 pieces/day). Vegetable intake NS.

RR=response rate, FFQ=food frequency questionnaire, NS=not significant.

Table 2.8: Fruit and vegetable intake by socioeconomic position in European countries

Author & year	Country and sample	SEP measure	Fruit/vegetable intake measure	Main findings
Irala-Estevez et al. (2000)	15 European countries (review), N=337 to N=12308, aged ≥15years,	Education and occupation	Amount consumed (g/day), 24-hour recall, FFQ, dietary record, diet history	Compared with the low SES, high SES consumed more fruit and vegetables. Fruit • Education: men –24.3 g, women –33.6g • Occupation: men –16.6 g, women –11.4g Vegetables • Education: men –17.0g, women –13.4g • Occupation: men –20.1g, women –9.6g
Giskes, Avendano, Brug & Kunst (2010)	European countries (EU), ≥ 18 years	Education, occupation, income	A range of measures	Majority of studies reported lower socioeconomic groups consuming lower fruit and vegetable intake (amount, portion, or frequencies)
Prättälä et al. (2009)	9 European countries (Denmark, Germany, Estonia, Latvia, Lithuania, France, Italy and Spain), N ranged from 5888 to 167 618 (RR 60–87%)	Education, occupation	Vegetable consumption categorised into consume daily or not.	Highly educated and non-manual workers consumed vegetables daily than lower educated and manual workers. • Education: OR ranged from 2.0 to 2.4 (except France, Spain, Italy). • Occupation: OR range from 1.2 to 2.0.
Friel et al. (2005)	Ireland, N=6599 (62% RR), ≥ 18 years	Education level, employment status	Recommended servings (≥ four) of fruit & vegetables, FFQ	Higher socioeconomic groups consumed recommended servings of fruit and vegetables. • Social class: high 63.7%, low 44.9% ($p<0.01$); • Education: high 61.3%, low 44.9% ($p<0.01$) • Employment status: NS.
Wardle & Steptoe (2003)	UK, N=1691 (62% RR), ≥ 16 years	SES: occupational social class	Eating fruit/vegetables <one portion/day	Higher social class less likely consumed < one portion fruit/vegetable daily. Compared with the high SES, • Fruit: low SES consumed < one portion/day OR 2.2 (95% CI 1.6, 3.0) • Vegetables: low SES consumed < one portion/day OR 2.9 (95% CI 2.1, 4.0)

Table 2.8: Fruit and vegetable intake by socioeconomic position in European countries (continued)

Author & year	Country and sample	SEP measure	Fruit/vegetable intake measure	Main findings
Shohaimi et al. (2004)	UK, N=22536, 39–79 years	Occupation (men: own occupation, women: partner's occupation), education, residential area-based deprivation (Townsend deprivation score)	Fruit and vegetable combined amount consumed (g/day), FFQ	Higher socioeconomic groups consumed higher amount of mean fruit and vegetables daily Men: • Occupation: manual worker –20.0g (95% CI –28.3 to –11.6) compared with non-manual worker (p<0.001) • Education: least –13.2g (95% CI –22.3, –24.0)(p=0.005) • Area: most deprived –26.5g (95% CI –37.5, 15.6)(p<0.001) Women: • Occupation: manual worker –13.2g (95% CI–22.0, –4.5) (p=0.003) • Education: least – 30.0g (95% CI –38.8, –21.2) (p<0.001) • Area: most deprived –16.0g (–7.2, –4.9) (p=0.005).
Boukouvalas et al. (2009)	UK, N=11044 (66% RR)	Education, equivalised household income, SES (occupation)	Fruit and vegetable intake (portion/day), 24-hour recall (80 = 1 portion)	Higher socioeconomic groups consumed higher portion of fruit and vegetables • Education: highest B=1.2 portion (p<0.001) • household income: B=0.01 (p<0.001); • SES: manager B=0.40 (p<0.001) compared with routine/manual.
Hulshof et al. (2003)	The Netherlands, N=12965 (80% RR), ≥19 years	SES: education occupation combined (high, medium, low, and very low)	2 day dietary records, amount consumed (g/day)	Higher SES consumed higher amount of vegetables but no association with fruit intake. • Fruit: men NS, women NS • Vegetables: men –2.8g/day (p<0.01), Women –11g/day (p<0.01).
Giskes et al. (2006)	The Netherland, N=1339 (81%), 25–79 years	Education, household income, area-level deprivation	Usual fruit intake (portion/day) dichotomised into low fruit intake (< one portion daily) or not, short questionnaire	Lower (individual level) socioeconomic groups consumed fewer portion of fruit daily. • Education: least educated OR 2.2 (95% CI 1.4, 3.5) • Income: OR 1.5 (95% CI 1.0, 2.3) • Area-level deprivation: NS.

Table 2.8: Fruit and vegetable intake by socioeconomic position in European countries (continued)

Author & year	Country and sample	SEP measure	Fruit/vegetable intake measure	Main findings
Galobardes et al. (2001)	Geneva, N=5696 (63% RR), 35–74 years, aged 45–64 years	Education, occupation	Amount of fruit and vegetables consumed (g/week) (exclude potatoes), semi-quantitative FFQ	Low SES consumed lower amount of vegetables: Education • Vegetables: men –75.3g, women –109.6 g/week • Fruit: men NS; women NS
Lindström et al. (2001)	Sweden, N=11837 (38.9% RR), 45–64	Occupation	Lowest quartile of intake (g) Fruit juice: consumed or not, diet history	compared with high non-manual workers, unskilled manual workers were more likely to be in the lowest quartile of intake • Fruit: men NS, women OR 1.5 (95% CI 1.2, 2.1) • Vegetables: men OR 1.8 (95% CI 1.3, 2.4), women OR 2.3 (95% CI 1.7, 3.1) • Fruit juice: men OR 2.1 (95% CI 1.7, 2.7), women 1.5 (95% CI 1.2, 2.0)

RR=response rate; SES = socioeconomic status, FFQ=food frequency questionnaire; NS=not significant.

Table 2.9: Fruit and vegetable intake by socioeconomic position in the USA and Canada

Author & year	Country and sample	SEP measure	Fruit/vegetable intake measure	Main findings
Forshee & Storey (2006)	USA, Data from the Continuing Survey of Food Intake by Individuals 1994–96, 1998	Family income (% of the poverty line based on family size)	Amount of fruit (include juice) and vegetable (except potatoes) consumed (g/day), 24-hour recall	High income is associated with higher vegetable intake among women, and higher fruit intake among men and women. Vegetables: Men: NS; women: B=0.24 (95% CI 0.14, 0.34; p<0.05); Fruit: Men: B=0.10 (95% CI 0.06, 0.15; p<0.05); women B=0.19 (95% CI 0.13, 0.25; p<0.05).
Deshmukh-Taskar, Nicklas, Yang & Berenson (2007)	USA, N=1336, 20–38yr the Bogalusa Heart Study	income, education	Amount fruit (include juices) and vegetables (exclude French fries) consumed (servings/day)	Highly educated group consumed higher quantity of fruit and vegetables. Fruit: • Education: –0.23 servings (p<0.001) • income NS Vegetables: • Education: –0.29 servings (p<0.001) • Income NS.
Beydoun & Wang (2008a)	USA, N=4356, aged 20–65 years, US Department of Agriculture continuing survey of food intakes (CSFII) 1994–96	education, poverty income ratio (PIR)	adequate daily fruit intake ≥2serves, vegetable daily intake ≥ 3 servings, fruit and vegetable intake ≥5 servings, 24 hour recall	Higher socioeconomic groups had higher odds for adequate daily fruit and vegetable intake. Fruit: • Education: OR 2.6 (95% CI 1.3, 5.3) • PIR: OR 2.1 (95% CI 1.4, 3.0). Vegetables • Education NS; • PIR: OR 1.5 (95% CI 1.2, 2.0) Fruit and vegetables (combined) • Education: OR 1.7 (95% CI 1.2, 2.4) • PIR: OR 1.7 (95% CI 1.2, 2.4).
Beydoun & Wang (2008b)	USA, N=4356, 20–64 years, US Department of Agriculture continuing survey of food intakes (CSFII) 1994–96	SES index score (derived from education and household income)	fruit and vegetable intake (combined) (g/day), 24-hour recall	Higher SES consumed higher quantity of fruit and vegetable B=45.60±4.78 (p<0.05).

Table 2.9: Fruit and vegetable intake by socioeconomic position in the USA and Canada (Continued)

Author & year	Country and sample	SEP measure	Fruit/vegetable intake measure	Main findings
Dubowitz et al. (2008)	USA, N=13310, ≥ 20 years, Third National Health and Nutrition Examination Survey (NHANES III)	Education, family income, employment status	fruit and vegetable intake (servings/day), 24-hour recall	Higher education and income were associated with higher fruit and vegetable intake. No employment status differences observed. Fruit: • Education: –0.70 servings (p<0.001); • Income: –0.26 servings (p=0.036); • Employment: NS. Vegetables: • Education: –0.51, p<0.001; • Income: –0.35, p=0.007; • Employment: NS. Fruit and vegetables: • Education: –1.19 (p<0.001) • Income: –0.62 (p<0.001) • Employment: NS.
Ricciuto, Tarasuk & Yatchew (2006)	Canada, Family Food Expenditure (FOODEX) survey, N= 9969 households	Education, household income	Average weekly expenditure for fruit and vegetables (Can$), and quantity of fruit and vegetable purchased (kg/week)	Higher educated and lower income spent greater share of their income on fruit and vegetables. Higher educated and higher income purchased more amounts of fruit and vegetables. Expenditure: • Higher education spent greater amount of money on fruit and vegetables: compared with < 9 years education, university degree B=0.82, p<0.001; • Income B= –1.91, p<0.001. Quantity purchased: • Higher education and income groups purchased greater quantity of fruit and vegetables: compared with < 9 years education, university degree B= 0.14 (SE 0.03) p<0.001. • Income B=0.16 (SE 0.01) p<0.001.

SES=socioeconomic status. NS=not significant.

2.4.4 SEP and nutrient/non-nutrient intakes

A number of Australian and international studies have examined the relationship between SEP and nutrient/non-nutrient intakes. A summary of these findings are shown in Tables 2.10 to 2.14. For intakes of energy, studies from Australia and other countries have found inconsistent results. One study found the lowest educated group consumed lower total energy compared with the highest educated group (2037 kcal vs 2091 kcal per day, p=0.02) (Kant & Graubard, 2007). However, when energy intake was assessed by energy density, the lowest educated group consumed higher energy density (1.71 kcal per g vs 1.59 kcal per g, p<0.001) and the association was stronger when the energy density measure was used compared with using the total energy intake measure (Kant & Graubard, 2007).

Similarly, studies examining total fat intake by SEP have reported inconsistent results. Among men, lower socioeconomic groups may consume a diet high in fat (Beydoun & Wang, 2008b; Evans, Booth, & Cashel, 2000; Friel, Kelleher, Nolan, & Harrington, 2003; Hulshof et al., 2003) especially saturated fat (Friel et al., 2003; Groth, Fagt, & Brøndsted, 2001). However, among women most studies have reported no associations between low and high socioeconomic groups, and where significant associations were observed, the magnitude of these differences were small. Socioeconomic differences in fat intake may be dependent on the types of socioeconomic indicator used: education tended to show significant negative associations with fat intake (Dubois & Girard, 2001; Groth et al., 2001). Similarly, studies conducted in US and Ireland have found that lower socioeconomic groups consume higher fat intakes compared with their counterparts (Beydoun & Wang, 2008b; Friel et al., 2003).

For dietary fibre intake, the majority of studies have reported that lower socioeconomic groups have lower intakes of fibre, especially among men. The higher fibre intakes among higher socioeconomic groups is likely to reflect their higher intakes of fruit, vegetables (Galobardes et al., 2001) and whole-grains compared with lower socioeconomic groups (Lang, Thane, Bolton-Smith, & Jebb, 2003; Worsley, Blaschea, Ball, & Crawford, 2004). A smaller number of studies have examined vitamin C and folate intake, and the majority of these studies report that lower socioeconomic groups have lower intakes of vitamin C and folate. These results can also be explained by low fruit and vegetable intake among lower socioeconomic groups.

The available evidence suggests that there is no or little socioeconomic difference in energy, total fat and saturated fat intake although these nutrients are strong predictors of weight gain (Sherwood, Jeffery, French, Hannan, & Murray, 2000) and are associated with the development of diet-related chronic diseases and health conditions (NHMRC, 2003a). The observed inconsistencies may be the result of differential under-reporting of food intake by SEP. It has been observed that lower educated groups are more likely to under-report their energy intake (Johansson, Solvoll, Bjørneboe, & Drevon, 1998), and under-reporters are less likely to report daily consumption of some foods that are high in energy and fat such as muffins and biscuits (Millen et al., 2009). Additionally, the method used to collect dietary information may have contributed to the mixed results, as the degree of misreporting is larger using FFQ compared with 24-hour recall (Subar et al., 2003). Furthermore, some studies reported crude fat intakes (g per day), whereas others estimated as a percentage of energy consumed. These differences may have contributed to these inconsistent findings.

Studies that have examined intakes of fibre, vitamin C and folate have shown some evidence of higher socioeconomic groups consuming higher intakes of these nutrients. However, in some studies, nutrient intakes were not adjusted for energy, making comparisons of their findings difficult, and may have affected the direction and magnitude of associations.

Table 2.10: Energy intakes by socioeconomic position

Author & year	Country and sample	SEP measure	Energy intake measure	Main findings
Evans et al. (2000)	Australia, N=6255 (75.3% RR), 25–64 year, 1983 National Dietary Survey of Adults (NDSA),	Education, occupation	24-hr recall, mean total fat intake (kJ/day)	Highly educated men and women had a higher energy intake, and unemployed men and women had a lowest energy intake. • Education: men primary 10054 vs tertiary 11091 ($p<0.05$); women primary 6561 vs tertiary 7780 ($p<0.05$); • Occupation: men blue collar 11603 vs upper white collar 10968 vs unemployed 9990 ($p<0.05$); women blue collar 7301 vs upper white collar 7595 vs unemployed 7102 ($p<0.05$)
Mishra et al. (2004)	Australia, N=10561 (82% RR), 50–55 years women participating the Australian Longitudinal Study on Women's Health	Occupation	FFQ, total energy intake (kJ/day)	Labourer consumed higher energy than professional occupation (7166 vs 6892, $p \leq 0.01$).

Table 2.10: Energy intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Energy intake measure	Main findings
Dubois & Girard (2001)	Canada & USA n=2103, USA n=14877, 18–74 years	Relative education, working class, relative income, global socioeconomic scale (derived from education, modified Pineo's prestige score, and last year household income)	24-hr recall, total energy intake (kcal/day), and not meeting 75% of the recommended dietary allowances (RDAs)	No clear associations between SEP and energy intake in Canada & USA Canada • Education: men Total: –, RDA: NS; women Total: NS, RDA: – • Working class: men Total: –, RDA: NS, women Total: NS, RDA: NS • Income: men Total: NS, RDA: NS; women Total: NS, RDA: NS • Global SES: men Total: NS, RDA: NS; women Total: +, RDA: – USA • Education: men Total: NS, RDA: –; women Total: –, RDA: NS • Working class: men Total: –, RDA: NS; women Total: NS, RDA: NS • Income: men Total: NS, RDA: –; women Total: NS, RDA: – • Global SES: men Total: +, RDA: –; women Total: +, RDA: –
Kant & Graubard (2007)	USA N=5874 (average 75% RR), 25–74 years	Education, poverty income ratio (PIR) [<1.0 (income below the poverty level), 1.0–1.99, 2.0–2.99, 3.0–3.99 and ≥4.0]	the National Health and Nutrition Examination Surveys 1971–75, 1976–80, 1988–94, and 1999–2002. 24-hr dietary recall, total energy intake (kcal/day), energy density (kcal/g)	Total energy • Education: least educated had lower energy intake: <12 years 2037 vs > 12 2091, p=0.02. • PIR: higher income had higher energy intake. poorest 2010 vs highest income 2106 (p-trend <0.001) Energy density • Education: least educated consumed higher energy density: < 12 years 1.71 vs > 12 years 1.59 ,p<0.001 • PIR: poorest consumed higher energy density. Poorest 1.65 vs highest income 1.62 (p-trend =0.003)

Table 2.10: Energy intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Energy intake measure	Main findings
Beydoun & Wang (2008b)	USA N=4356, ≥20 years	SES index (based on combined education & household income)	Two 24-hr recalls, total energy intake (kcal/day)	No SES differences in energy intake Men: NS Women: NS
Stallone, Brunner, Bingham & Marmot, (1997)	England N=865 (73% RR), 39–61year	Employment grade	MJ/day (low energy reporters excluded), 7-day diary	Higher employment grade consumed greater energy intake. Men: NS; Women: p-trend=0.007
Galobardes et al. (2001)	Geneva N = 5696 (63% RR), 35–74 years	Education, occupation	quantitative FFQ, total energy intake (kcal/day)	No association between SEP and energy intake. Education: men NS, women NS Occupation: men NS, women NS
Friel et al. (2003)	Ireland N=6539 (62% RR), ≥18 years	Education, social class (based on occupation of the principal wage earner in the household)	semi-quantitative FFQ, total energy intake (MJ/day)	Education: men NS, women NS Social class: men NS, women NS
Hulshof et al. (2003)	The Netherlands N=12965 (80% RR), ≥19 years	SES (based on education and occupation: high, medium, low, or very low)	the Dutch National Food Consumption Survey 1987–88, 1992 and 1997–98, a 2-days dietary record, average total energy intake (MJ/day)	Average intake Men: high 10.9 vs low 11.3 ($p<0.01$) (high vs very low NS) Women: NS
Ovaskainen, Paturi, Tapanainen & Harald (2010)	Finland N=1576 (60% RR), 25–64 years	Education	The FINDIET survey, 48-hr recall, energy intake (MJ/day)	At the bivariate level, lower educated women consumed lower daily energy but no association among men. Men NS; women –0.5MJ (p-trend = 0.001)

RR = response rate, SES = socioeconomic status, FFQ = food frequency questionnaire, NS = not significant.
The sign “+” (without any number) refers to positive association; “–” refers to negative association.

Table 2.11: Fat intakes by socioeconomic position

Author & year	Country and sample	SEP measure	Fat intake measure	Main findings
Evans et al. (2000)	Australia N=6255 (75.3% RR), 25–64 year, 1983 National Dietary Survey of Adults (NDSA)	Education, occupation	24-hour recall, mean total fat intake (g/day)	Men: NS Women: NS
Mishra et al. (2004)	Australia N=10561 (82% RR), 50–55 years women participating the Australian Longitudinal Study on Women's Health	Occupation	FFQ, energy adjusted total & saturated fat intake, and % energy	Lower occupational class consumed higher total and saturated fat (all $p<0.001$) • Total fat: Energy adjusted: manager/administrator 59.2 vs labourer 60.6 % energy from total fat: manager/administrator 33.5% vs labourer 34.5% • Saturated fat: Energy adjusted: manager/administrator 23.8 vs labourer 24.4 % energy from total fat: manager/administrator 13.5% vs labourer 13.9%
Metcalf, Scragg & Davis (2006)	New Zealand N=5677, 40–78 years,	Education, household income, occupation (highest in the participant/spouse)	FFQ, total fat & saturated fat intake (g/day)	Total fat • Education: NS • Income: high 93g vs low 100g ($p<0.01$) • Occupation: NS Saturated fat • Education: NS • Income: high 38g vs low 42g ($p<0.001$) • Occupation: NS

Table 2.11: Fat intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Fat intake measure	Main findings
Dubois & Girard (2001)	Canada n=2103, USA=14877, 18–74 years,	Relative education, working class, relative income, global socioeconomic scale (derived from education, modified Pineo's prestige score, and last year household income)	24-hr recall, total fat intake (g/day), ≥30% of energy from total fat	**Total fat** Canada • Education: men Total: NS, ≥30%: –; women Total: NS, ≥30%: – • Working class: men Total: NS, ≥30%: NS, women Total: NS, ≥30%: NS • Income: men Total: –, ≥30%: NS; women Total: –, ≥30%: NS • SES: men Total: +, ≥30%: NS; women Total: +, ≥30%: + USA • Education: men Total: –, ≥30%: NS; women Total: –, ≥30%: NS • Working class: men Total: NS, ≥30%: NS; women Total: NS, ≥30%: NS • Income: men Total: NS, ≥30%: NS; women Total: NS, ≥30%: NS • SES: men Total: NS, ≥30%: NS; women Total: NS, ≥30%: NS

Table 2.11: Fat intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Fat intake measure	Main findings
Dubois & Girard (2001)	Canada n=2103, USA=14877, 18–74 years,	Relative education, working class, relative income, global socioeconomic scale (derived from education, modified Pineo's prestige score, and last year household income)	24-hr recall, saturated fat (SF) intake (g/day), ≥ 10% of energy from SF	**Saturated fat** Canada • Education: men Total: NS, ≥10%: NS; women Total: NS, ≥10%: NS • Working class: men Total: NS, ≥10%: NS, women Total: NS, ≥10%: NS • Income: men Total: + ≥10%: NS; women Total: NS, ≥10%: NS • SES: men Total: NS, ≥10%: NS; women Total: NS, ≥10%: NS USA • Education: men Total: –, ≥10%: –; women Total: +, ≥10%: + • Working class: men Total: –, ≥10%: –, women Total: NS, ≥10%: NS • Income: men Total: –, ≥10%: NS; women Total: NS, ≥10%: NS • SES: men Total: –, ≥10%: +; women Total: NS, ≥10%: NS
Kant & Graubard (2007)	USA, N=5874 (average 75% RR), 25–74 years	Education, poverty income ratio [<1.0 (income below the poverty level), 1.0–1.99, 2.0–2.99, 3.0–3.99 and ≥4.0]	the National Health and Nutrition Examination Surveys 1971–75, 1976–80, 1988–94, and 1999–2002. 24-hr dietary recall, total fat and saturated fat intake (g/day)	Education was not associated with total and saturated fat intake.
Beydoun & Wang (2008b)	USA, N=4356, ≥20 years	SES index (based on combined education & household income)	Two 24-hr recalls, % energy intake of total fat & saturated fat (% kcal)	Higher SES consumed lower total and saturated fat (all $p<0.05$) Total fat: men β = –0.63; women β = –0.49 Saturated fat: men β = –0.34; women β = –0.31

Table 2.11: Fat intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Fat intake measure	Main findings
Stallone et al. (1997)	England, N=865 (73% RR), 39–61year	Employment grade	7-day diary, energy adjusted fat intake (g/day)	Men: NS Women: NS
Friel et al. (2003)	Ireland N=6539 (62% RR), ≥18 years	Education, social class (based on occupation of the principal wage earner in the household)	≥ 18 years, semi-quantitative FFQ, % energy intake of total & saturated fat	Lower socioeconomic groups consumed higher total fat and saturated fat intake (all p<0.01) Total fat • Education: men +3%; women +2.3% • SES: men +1.6%; women +3% Saturated fat • Education: men +1.9%, women +1.9% • SES: men 1.3%, women +1.3%
Johansson, Thelle, Solvoll, Bjørneboe & Drevon (1999)	Norway, N=3144 (63% RR), 16–79 year	Education	quantitative FFQ, % energy from fat	Longer years of education was associated with lower fat intake among women but not men Men: NS Women: B = –0.24 (p<0.001)
Lindström et al. (2000)	Sweden, N=11837, 45–64 years	SES (based on job title, tasks, and position at work)	diet history, high fat intake (% energy intake ≥ 35.9% for men, 34.8% for women)	Men: NS Women: NS
Galobardes et al. (2001)	Geneva, N=5696 (63% RR), 35–74 years	Education, occupation	quantitative FFQ, total and saturated fat intake (g/day)	Lower educated men and women consumed lower saturated fat but not total fat. Occupation was not associated with both total and saturated fat. Total fat • Education: men NS, women NS • Occupation: men NS, women NS Saturated fat • Education: men lower –2.0g (p≤0.05), women –1.1g (p≤0.05) • Occupation: men NS, women NS

Table 2.11: Fat intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Fat intake measure	Main findings
Groth et al. (2001)	Denmark, N=1722 (58% RR), 20–67 year	Education	7-day dietary record, % energy intake from fat; % energy intake from SF	Lower educated men and women consumed higher % energy from fat and saturated fat Total fat Compared with the highest educated, Men: 3.3% ($p<0.001$); women: 1.2% ($p<0.001$) Saturated fat: Men: 2.2% ($p<0.001$); women: 0.9% ($p=0.002$)
Hulshof et al. (2003)	The Netherlands N=12965 (80% RR), ≥19 years	SES (based on education and occupation: high, medium, low, or very low)	the Dutch National Food Consumption Survey 1987–88, 1992 and 1997–98, a 2-days dietary record, % energy intake of total fat, saturated fat	Lower SES consumed higher total fat and saturated fat (all $p<0.01$) except saturated fat among women. Total fat: men +2.3%; women +2.3% Saturated fat: men NS; women NS
Giskes et al. (2006)	The Netherlands N=1339, 25–79 years	Education, household income, area deprivation	FFQ, % energy intake for total fat and saturated fat, dichotomised into the highest quartile intake or not	All measures of SEP were not associated with total and saturated fat intake
Ovaskainen et al. (2010)	Finland N=1576 (60% RR), 25–64 years	Education	The FINDIET survey, 48-hr recall, % energy of total fat & saturated fat	Lower educated men consumed higher total and saturated fat but no association among women at the bivariate level. Total fat Men +3.0% (p-trend =0.001); women NS Saturated fat Men +1.7% (p-trend = 0.001); women NS

RR = response rate, SES = socioeconomic status, FFQ = food frequency questionnaire, NS = not significant.
The sign “+” (without any number) refers to positive association; “–” refers to negative association.

Table 2.12: Fibre intakes by socioeconomic position

Author & year	Country and sample	SEP measure	Fibre intake measure	Main findings
Evans et al. (2000)	Australia, N=6255 (75.3% RR), 25–64 year, 1983 National Dietary Survey of Adults (NDSA)	Education, occupation	24-hour recall, mean total fibre intake (g/day)	Lower education and occupational class consumed lower fibre. • Education: men primary 21.4g vs tertiary 36.4g; women primary 17.4g vs 21.9g • Occupation: men blue collar 23.9g vs upper white collar 25.1g; blue collar 18.4g vs white collar 20.6g
Mishra et al. (2004)	Australia, N=10561 (82% RR), 50–55 years women participating the Australian Longitudinal Study on Women's Health	Occupation	FFQ, energy adjusted fibre intake (g/day)	Lower occupational class consumed lower fibre (all p<0.001) Labourer 18.8g vs professional 20.4g
Metcalf et al. (2006)	New Zealand, N=5677, 40–78 years,	Education, household income, occupation (highest in the participant/spouse)	FFQ, total fibre intake (g/day)	Higher SEP had significantly higher daily fibre intake (all p<0.001) • Education: –2g • Income: –2g • Occupation: –2g
Beydoun & Wang (2008b)	USA, N=4356, ≥20 years	SES index (based on combined education & household income)	Two 24-hr recalls, % energy intake of total fat & saturated fat (% kcal)	Higher SES consumed higher fibre both men and women (all p<0.05) Men β = 0.72; women β = 0.95
Stallone et al. (1997)	England, N=865 (73% RR), 39–61 year	Employment grade	7-day diary, energy adjusted fibre intake (g/day)	Employment grade was not associated with fibre intake both men and women
Johansson et al. (1999)	Norway, N = 3144 (63% RR), 16–79 year	Education	quantitative FFQ, daily fibre intake (g/MJ)	Longer years of education was associated with higher fibre intake among men and women Men: β= 0.17g (p=0.01) Women: β= 0.43g (p<0.001)
Galobardes et al. (2001)	Geneva, N=5696 (63% RR), 35–74 years	Education, occupation	quantitative FFQ, total fibre intake (g/day)	Blue collar occupation (both men and women) had lower fibre intake. No education differences in fibre intake. • Education: men NS, women NS • Occupation blue collar: men –0.5g (p≤0.01), women –0.7g (p≤0.05)

Table 2.12: Fibre intakes by socioeconomic position (continued)

Author & year	Country and sample	SEP measure	Fibre intake measure	Main findings
Groth et al. (2001)	Denmark, N=1722 (58% RR), 20–67 year	Education	7-day dietary record, energy adjusted daily fibre intake (g/10MJ)	Highly educated men and women consumed higher fibre compared with lower educated. Men: least 19.2g vs highest 22.6 ($p<0.001$); women: least 22g vs highest 22.3g ($p<0.001$)
Friel et al. (2003)	Ireland N=6539 (62% RR), ≥18 years	Education, social class (based on occupation of the principal wage earner in the household)	≥ 18 years, semi-quantitative FFQ, total daily fibre intake (g/day)	Lower educated groups consumed lower daily fibre (all $p<0.01$). No significant SES differences observed. • Education: men –2.5g; women –2.9g • SES: men NS; women NS
Hulshof et al. (2003)	The Netherlands N=12965 (80% RR), ≥19 years	SES (based on education and occupation: high, medium, low, or very low)	the Dutch National Food Consumption Survey 1987–88, 1992 and 1997–98, a 2-days dietary record, energy adjusted daily fibre intake (g/10MJ)	Lower SES consumed lower daily fibre both men and women (all $p<0.01$). Men –0.11g; women –0.10g
Ovaskainen et al. (2010)	Finland N=1576 (60% RR), 25–64 years	Education	The FINDIET survey, 48-hr recall, energy adjusted daily fibre intake (g/MJ)	No education differences in fibre intake both men and women at the bivariate level.

Differences reported are (highest) – (lowest).
RR=response rate; SES = socioeconomic status, FFQ=food frequency questionnaire; NS=not significant.

Table 2.13: Vitamin C intakes by socioeconomic position

Author & year	Country and sample	SEP measure	Vitamin C intake measure	Main findings
Stallone et al. (1997)	England N=865 (73% RR), 39–61 year	Employment grade	7-day diary, energy adjusted vitamin C intake (mg/day)	Higher employment grade was associated with higher vitamin C intake both men ($p<0.001$) and women ($p=0.01$)
Giskes et al. (2002b)	Australia N = 8883 (61% RR), 18–64 years,	Household income	24-hr recall, vitamin C intake (mg/day)	Higher income (men and women) were associated with higher vitamin C intake (all $p<0.01$) Men –23mg; Women –20mg
Mishra et al. (2004)	Australia N=10561 (82% RR), 50–55 years women participating the Australian Longitudinal Study on Women's Health	Occupation	FFQ, vitamin C intake (mg/day)	Lower occupational class consumed lower vitamin C Labourer 110mg vs professional 120mg ($p<0.001$)
Kant & Graubard (2007)	USA N=5874 (average 75% RR), 25–74 years	Education, poverty income ratio [<1.0 (income below the poverty level), 1.0–1.99, 2.0–2.99, 3.0–3.99 and ≥4.0]	the National Health and Nutrition Examination Surveys 1971–75, 1976–80, 1988–94, and 1999–2002. 24-hr dietary recall, energy adjusted vitamin C intake (mg/day)	Lower educated group consumed lower daily vitamin C (–23mg, $p<0.001$).
Beydoun & Wang (2008b)	USA N=4356, ≥20 years	SES index (based on combined education & household income)	Two 24-hr recalls, % energy intake of total fat & saturated fat (% kcal)	Higher SES consumed higher fibre both men and women (all $p<0.05$) Men β = 0.72; women β = 0.95
Friel et al. (2003)	Ireland N=6539 (62% RR), ≥18 years	Education, social class (based on occupation of the principal wage earner in the household)	≥ 18 years, semi-quantitative FFQ, daily vitamin C intake (mg/day)	Lower socioeconomic groups (men and women) consumed lower vitamin C (all $p<0.01$). • Education: men –30.2mg; women –37.9mg • SES: men –19.4mg; women –20.7mg
Hulshof et al. (2003)	The Netherlands N=12965 (80% RR), ≥19 years	SES (based on education and occupation: high, medium, low, or very low)	the Dutch National Food Consumption Survey 1987–88, 1992 and 1997–98, a 2-days dietary record, median vitamin C intake (mg/day)	No association between SES and vitamin C intake
Ovaskainen et al. (2010)	Finland N=1576 (60% RR), 25–64 years	Education	The FINDIET survey, 48-hr recall, energy adjusted daily vitamin C intake (mg/MJ)	Lower educated women consumed lower daily vitamin C but no association among men at the bivariate level. Men NS; women –3.0mg (p-trend =0.001)

Differences reported are (highest) – (lowest).
RR=response rate; SES = socioeconomic status, FFQ=food frequency questionnaire; NS=not significant.

Table 2.14: Folate intakes by socioeconomic position

Author & year	Country and sample	SEP measure	Vitamin C intake measure	Main findings
Giskes et al. (2002b)	Australia N = 8883 (61% RR), 18–64 years,	Household income	24-hr recall, folate intake (µg/day)	Higher income (men and women) were associated with higher daily folate intake (all p≤0.05) Men –21 µg; Women –18mg
Mishra et al. (2004)	Australia N=10561 (82% RR), 50–55 years women participating the Australian Longitudinal Study on Women's Health	Occupation	FFQ, folate intake (µg/day)	Lower occupational class consumed lower daily folate Labourer 243 µg vs professional 252 µg (p<0.001)
Friel et al. (2003)	Ireland N=6539 (62% RR), ≥18 years	Education, social class (based on occupation of the principal wage earner in the household)	≥ 18 years, semi-quantitative FFQ, folate intake (µg/day)	Lower educated men and women, and lower SES men consumed lower daily folate (all p<0.01). • Education: men –32.8µg; women –34.9 µg • SES: men –23.2 µg; women NS
Ovaskainen et al. (2010)	Finland N=1576 (60% RR), 25–64 years	Education	The FINDIET survey, 48-hr recall, energy adjusted daily folate intake (µg/MJ)	Lower educated men and women consumed lower daily folate at the bivariate level. Men –4.1 µg (p-trend = 0.001); women –1.6 µg (p-trend =0.05)

Differences reported are (highest) – (lowest).
RR=response rate; SES = socioeconomic status, FFQ=food frequency questionnaire; NS=not significant.

2.4.5 Socioeconomic measures and dietary behaviours

A number of socioeconomic indictors are used to describe socioeconomic differences in food or nutrient intakes in the literature. The majority of the literature reviewed in this chapter used education, income, occupation, or a combination of these measures to characterise the respondents' socioeconomic circumstances. These indicators are conceptually different, and each measure reflects distinct pathways to dietary behaviours. Education reflects the knowledge of an individual and it may influence dietary behaviours as it can make people more receptive to nutrition education information and increase their ability to understand nutrition education messages (Galobardes et al., 2007). The main strengths of education based measures are that information on education is easy to collect and it can be collected from any individuals regardless of age or work circumstances. However, education is often stable over adulthood (Dutton et al., 2005; Krieger et al., 1997) which means that using an education based measure cannot capture how changes in SEP influence dietary behaviours.

Income reflects the material circumstances of an individual. Income level influences their ability to purchase commodities including food, and also facilitates access to health-enhancing services (Galobardes et al., 2007) such as consulting with a dietitian. Household rather than personal income may be a more appropriate way to assess the disposable income of the individuals in that household as food purchasing or consumption behaviours of the household are likely to be shared between the individuals in a household (Galobardes et al., 2007). Personal and household income is strongly associated with health outcomes (Krieger et al., 1997) and food choice (Turrell, Hewitt, Patterson, & Oldenburg, 2003). However, income is a sensitive issue which often limits participants' willingness to disclose their income accurately (Dutton et al., 2005; Galobardes et al., 2007).

Occupation-based measures are also widely used for dietary research (Giskes, Kamphuis, van Lenthe, Kremers, Droomers, & Brug, 2007; Lindström et al., 2001; Turrell, et al., 2003). Occupation influences food choice or consumption via work conditions (e.g. shift working), pressure (e.g. time), and social networks (Galobardes et al., 2001). One major limitation of an occupation-based measure is that it is not able to be used for individuals outside of the paid labour force (Arber 1989; Pugh & Moser, 1990). Some examples of these subgroups are the unemployed, retired individuals, homemakers (mainly affecting women), students and people working in unpaid, informal or illegal jobs (Dutton et al., 2005; Galobardes et al., 2007; Krieger et al., 1997).

Some studies used composite socioeconomic measures (e.g. based on combined education and occupation into one index); however, this approach cannot assess how a particular socioeconomic measure affects dietary behaviours.

In this review, there was no one socioeconomic indicator that strongly and consistently predicted dietary intakes, even within the same country or areas. This may be attributed to three factors. First, the meanings of each indicator may differ by gender or birth cohorts (Galobardes et al., 2001; Mishra, Ball, Dobson, Byles, & Warner-Smith, 2001). For example, use of the (own) occupation often excluded women as they are more likely to be outside of the labour market rather than in paid work, and the use of their partner's occupation may inadequately allocate their SEP (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006). Second, socioeconomic measures may interact with other socioeconomic characteristics such as ethnicity, and specific dietary behaviours examined (e.g. fruit and vegetable intake). Different ethnic groups have a varied food culture; for example, Mediterranean diet characteristics include a high consumption of plant foods (e.g. vegetables, cereals, and nuts), olive oil as principal source of dietary lipids, low frequency and amounts of red meat and processed meat consumption (Serra-Majem et al., 2004). This means that observed results may be under- or overestimated depending on the characteristics of participants, the specific dietary behaviours examined, and which socioeconomic measures were used. Lastly, how SEP was measured and defined varied across the studies. One example is that occupation was categorised as "manual worker" or "non-manual worker" (Shohaimi et al., 2004), or classified based on the prestige standing of each occupation in society (Wardle & Steptoe, 2003). As a result, the findings of studies are difficult to compare.

Conclusions

The findings of the reviewed literature suggest that lower socioeconomic groups consume a diet less consistent with dietary recommendations (low diet quality), and have a lower intake of fruit, vegetables, fibre, vitamin C, and folate.

These dietary patterns appear to be consistent with the socioeconomic inequalities in diet-related chronic disease and risk factors.

To date, only a small number of studies examining the association between SEP and takeaway food consumption although there are numerous studies that have investigated associations with other dietary factors as shown in this review. Takeaway or fast-food consumption is potentially an important contributing factor to socioeconomic inequalities in health due to their nutritional profiles and the potential adverse health effects that may develop from regular or large consumption of these foods. Therefore, socioeconomic differences in takeaway food consumption need to be examined using more inclusive food types. This will assist in better understanding whether these foods also need to be targeted in health promotion initiatives to decrease socioeconomic inequalities in dietary intakes or diet-related chronic disease.

2.5 FACTORS THAT MAY CONTRIBUTE SOCIOECONOMIC DIFFERENCES IN DIETARY BEHAVIOURS

This section provides a selective overview of theories and models of health behaviour that are applied to dietary behaviour, as well as psychosocial factors that may influence dietary behaviours. The first section briefly reviews some of the most widely used theories applied to dietary behaviour, and a conceptual model that holistically identifies factors that influence food choice. The subsequent section reviews the literature related to factors that may influence dietary behaviours. In order to identify those possible influential factors, combinations of literature that used theories and those that did not use them are reviewed since there are substantial limitations to these theories and models. The factors reviewed here are: nutritional knowledge, attitude, taste, belief in diet-health relationship, convenience, time, cooking skills and cooking-related behaviours, value, cost and price of food, and inter-personal influences.

These selected factors are likely to influence dietary behaviours especially fruit and vegetable intake and the consumption of takeaway or fast-food. The socioeconomic differences in these factors are also provided where evidence is available. The focus of the literature reviewed is limited to adults; studies among other populations such as children, adolescents, and elderly are excluded.

Additionally, literature that focussed on specific sub-population groups such as nurses or individuals with diseases were also excluded from the review.

2.5.1 Theories of health behaviour and a food choice process model

A number of behavioural theories that may explain dietary differences have been proposed, and models have also been developed to identify and understand the factors that influence dietary behaviour. This thesis will give a brief overview of some of the most widely used theories applied to dietary behaviour: Knowledge-Attitude-Behaviour Model (KAB), Expectancy-Value Theory (EVT), the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) (Brinberg & Durand, 1983; Conner & Armitage, 2006). In addition to these, a conceptual model of food choice, referred to as a Food choice process model (Furst, Connors, Bisogni, Sobal, & Falk, 1996; Sobal, Bisogni, Devine, & Margaret, 2006), will be briefly outlined to encompass the broader aspects that affect food choice. These theories and models informed the selection of the psychosocial factors that may influence dietary behaviours reviewed in this chapter.

Knowledge-Attitude-Behaviour (KAB) model

The KAB is a basic model which asserts a way of explaining the role of knowledge in behaviour change (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003). According to this model, as individuals acquire and accumulate knowledge in health behaviour domains, changes in attitude are initiated and as attitudes accumulate over a period of time, behaviour subsequently changes (Brien & Davies, 2007). For this reason, knowledge is assumed to be an important factor for dietary behaviour. However, it has been reported that the relationships among the knowledge, attitude, and behaviour continuum are often weak (Bettinghaus, 1986). Brien and Davies (2007) identified a limitation to the KAB model because the provision of knowledge failed to influence behavioural change. Another criticism of this model was that attitude was not well defined which lead to a contamination of measurements and subsequent unreliable results (Bettinghaus, 1986). More importantly, a fundamental criticism of the KAB model is that it is too simple to explain or understand human behaviour, as our behaviour is influenced by a multitude of factors, many of which are ignored by this model (Goodstadt, 1978).

The Expectancy-value theory (EVT)

The EVT is a model that aims to understand the motivation underlying decision making and has been widely used to understand dietary behaviour (Conner & Armitage, 2006). This theory focuses on "behavioural intention" which is a mediator between "attitude" and "behaviour" (Figure 2.1). An attitude represents an individual's general feeling of favourableness or unfavourableness towards an object (Fishbein & Ajzen, 1975). According to this theory, individuals have a number of beliefs about a given object and evaluations of those beliefs (Fishbein & Ajzen, 1975), and attitude to a given behaviour is determined by the salient outcome associated with that behaviour (Conner & Armitage, 2006). That is, individuals are motivated by the most favourable outcomes and have values in line with those expected outcomes; therefore, they are more likely to engage in that behaviour (Fishbein & Ajzen, 1975).

Figure 2.1: The Expectancy-Value Theory

In the EVT, attitude toward behaviour (A_B) is:

$$\text{Attitude} = \sum_{i=1}^{n} b_i e_i$$

Where "b" refers to the outcome belief and "e" is the multiplied subjective evaluation of that belief's attribute, "i" refers to a particular attribute, and "n" is the number of beliefs (Fishbein & Ajzen, 1975). A limitation of using this theory is attitude to predict (dietary) behaviour is weak (Conner & Armitage, 2006). Another limitation of this theory is that attitude is neither explicitly defined nor structured (Ajzen, 1991; Fishbein & Ajzen, 1975). These limitations affect the measurement of attitude and also analyses of the attitude-behaviour relationship (Fishbein & Ajzen, 1975).

The theory of reasoned action (TRA) and theory of planned behaviour (TPB)

The TRA builds on the EVT as it also explains the relationship of attitudes and behaviour and asserts that an individual's behaviour is determined by the person's intention to perform the behaviour (Baranowski et al., 2003). In addition to the elements in the EVT, TRA introduces the second determinant of intention, *subjective norm* (Conner & Armitage, 2006), which refers to the perceived social pressure to engage or not to engage in a given behaviour (Ajzen, 1991) (Figure 2.2). The limitation of the TRA is that it assumes people have "volitional control over the behaviour of interest" (Ajzen, 2002). To overcome this limitation, TPB was proposed and it includes *perceived behavioural control* as a determinant of both intentions and behaviour (Ajzen, 2002) (Figure 2.3). *Perceived behavioural control* refers to an individual's perceptions of their ability to perform a given behaviour and it is assumed to reflect past experience (Ajzen, 1991, 2002). TPB is one of the most frequently employed psychological theories to explain dietary behaviours and the components of the model significantly predict dietary behaviour (Conner & Armitage, 2006). For example, Bogars et al. (2004) reported that attitude, subjective norm and perceived behavioural control explained 44% of the variance in the intention to eat at least two pieces of fruit and 51% of variance in the intention to eat at least 200g of vegetables. Additionally, the total model explained 46% of the variation in self-rated fruit intake and 33% of the variation for vegetables which is much higher than other theories (Baranowski et al., 2003; Conner & Armitage, 2006). In spite of the higher prediction of this theory compared with the theories discussed previously, as well as some not discussed here, the TPB does not sufficiently predict variations in actual dietary behaviour (Baranowski et al., 2003). Furthermore, theories explaining variations in dietary behaviour are dependent on how the diet behaviours are measured: for example, when self-reported measures were used, the TPB explained an 11% higher variance in behaviour compared with using objective measures (Christopher & Mark, 2001). More importantly, the TPB along with other theories introduced previously, are all considered cognitions: socio-demographic or environmental factors are not included in these models (Baranowski et al., 2003). Dietary behaviours that differ by socio-demographic groups will also be influenced by environmental factors such as the availability and cost of food. The ability to predict the dietary behaviour may be increased if these factors are taken into account.

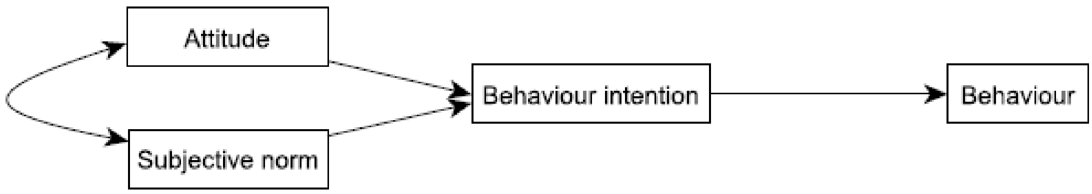

Figure 2.2: The Theory of Reasoned Action

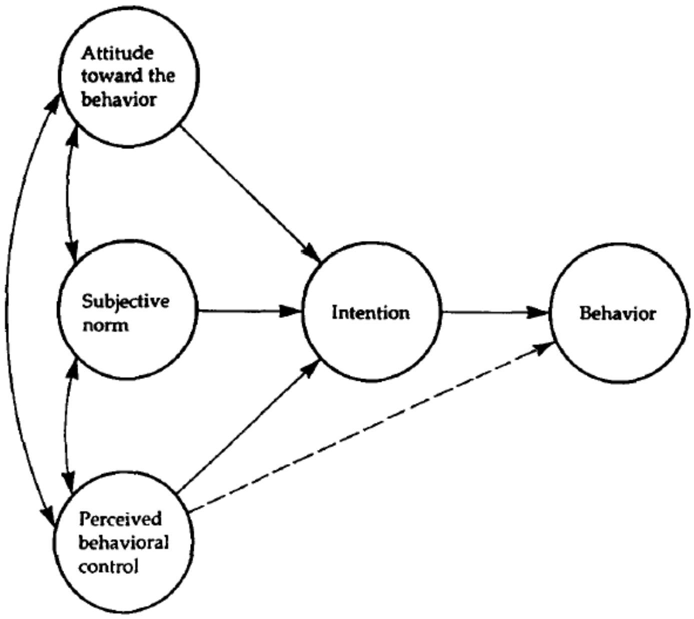

Figure 2.3: The Theory of Planned Behaviour (Adapted from Ajzen, 1991)

A food choice process model

Unlike the above theories, this model was developed from a different approach and it represents a broad and integrated model of food choice (Sobal et al., 2006). A personal food system represents "the types of factors and the process involved in a single choice event" (Furst et al., 1996). This food choice process model includes three major components: 1) life course, 2) influences, and 3) personal system (Figure 2.4) (Furst et al., 1996). Each component interacts with the others and generates the process leading to a selection of food (Furst et al., 1996). The *life course* is a key component of this model (Sobal et al., 2006) and includes "the personal roles and the social, cultural and physical environments to which a person has been and is exposed" (Furst et al., 1996, p. 250). This *life course* generates a set of *influences*: 1) ideals, 2) personal factors, 3) resources, 4) social framework, and 5) food contexts. For example, *ideals* reflect the cultural environment learned through socialisation and represent the norm of what and how one should eat (Sobal et al., 2006). These five factors uniquely interact with each other and, in turn, influence the third component *personal system*. This component originally had two elements: 1) value negotiations and 2) strategies for recurring events (Furst et al., 1996); however, three more elements were added: 3) classification of foods and situations, 4) value negotiation, 5) balancing competing values (Sobal et al., 2006). Values identified in this model are interconnected and these values are sensory perceptions (taste), convenience, monetary considerations (cost), health and nutrition, managing relationships, and other values (e.g. quality, variety, symbolism, ethics, safety and waste) (Sobal et al., 2006).

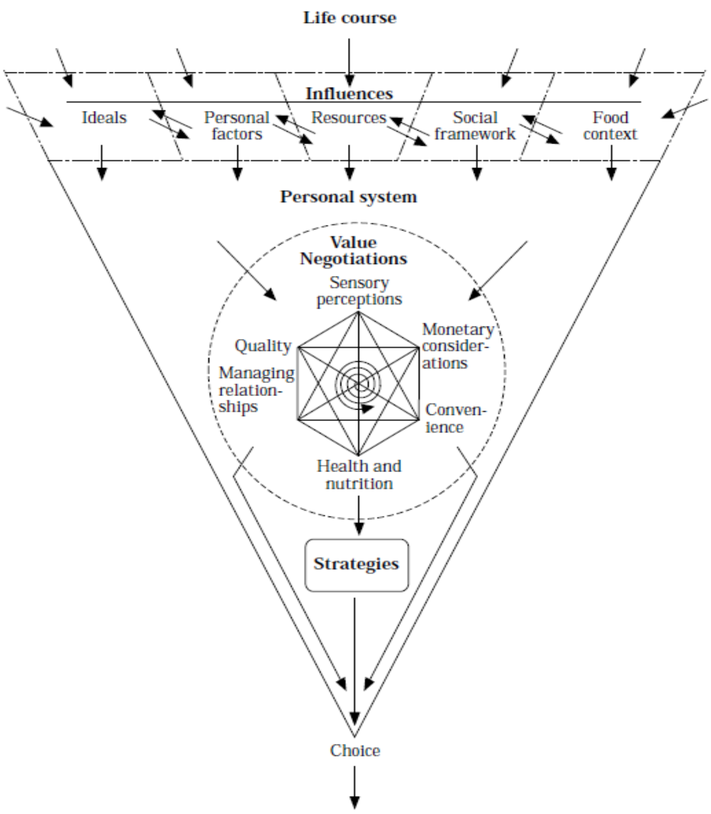

Figure 2.4: The food choice process model (Adapted from Furst et al., 1996)

This food choice process model identifies broader key elements that may influence food choice among Western society such as life course (e.g. experiences) and social framework (Sobal et al., 2006). This model can be useful for understanding the complex nature of food choice in a variety of settings (Furst, et al., 1996). However, this model has some limitations: the food choice process model was developed based on western countries and this model may not be applicable to developing countries or individuals with different cultures (Sobal et al., 2006). In addition, no known studies used this model to quantitatively assess factors important for food choice. It is, therefore, not known how well this model predicts a particular food choice.

In summary, these five theories and models have been applied to identify, understand and predict dietary behaviours to varying levels of efficacy. The KAB model was too simple to explain dietary behaviour, and the fundamental limitations of the EVT were the limited ability to predict behaviour and attitude. Among the theories introduced here, the TPB appears to have more ability to predict dietary behaviours than other theories, including some models not discussed here; however, more sophisticated "real world" models are required to understand the complex nature of dietary behaviour as no single existing theory has explained dietary variations sufficiently. Additionally, these theories do not consider socio-demographic characteristics or environmental factors, and deal only with cognitions.

One model that has been used to holistically identify factors that influence food choice was a food choice process model which integrates a much wider array of factors that influence food choice (e.g. cultural, biological). This model may be able to facilitate, identify and understand important factors when individuals choose food. However, the food choice process model is relatively new and it is unknown how well this model explains a given dietary behaviour quantitatively. Therefore, both theories and models are unlikely to sufficiently predict, explain or quantify why socioeconomic differences in diet behaviours exist.

2.5.2 Factors that may affect socioeconomic differences in dietary behaviours

There are number of factors that are likely to contribute to socioeconomic differences in dietary behaviours. For example, cognitive, social, and environmental factors are known determinants of dietary behaviour and these factors are likely to be differently distributed across socioeconomic groups. This section provides information on factors that influence dietary behaviours, especially takeaway food consumption, fruit and vegetable intake, and socioeconomic differences in these factors that influence dietary behaviours. The various factors reviewed in the following sections are: nutritional knowledge, attitudes, food preference, belief in diet-health relationship, convenience, time, cooking skills and cooking-related behaviours, value, cost and price of food, social environment and inter-personal influences.

Nutritional knowledge

Knowledge is a prerequisite to selecting food for optimal health (Parmenter, Waller, & Wardle, 2000) and is the reason nutrition information is provided to promote healthy eating (Guthrie, Derby, & Levy, 1999). However, it has been reported that increased knowledge often does not translate to behavioural change (Baranowski et al., 2003; Brien & Davies, 2007). Nevertheless, nutritional knowledge has been found to be associated with better dietary intakes (Wardle, Parmenter, & Waller, 2000).

Most research has assessed general nutritional knowledge by asking a number of nutrition-related questions such as the nutrient content of different food and links to diet-health (Ball et al., 2006; Harnack, Block, Subar, Lane, & Brand, 1997; Parmenter et al., 2000; Turrell & Kavanagh, 2006). These studies have consistently reported that adults with higher nutritional knowledge are more likely to have a diet that is consistent with dietary recommendations such as higher fruit and vegetable intake and a lower intake in fat (Ball et al., 2006; Beydoun, Powell, & Wang, 2008b; Harnack et al., 1997; Wardle et al., 2000).

Socioeconomic differences in nutritional knowledge have also been reported. Australian and international studies have consistently shown that lower socioeconomic groups are more likely to have lower nutritional knowledge compared with their more advantaged counterparts (Parmenter et al., 2000; Turrell & Kavanagh, 2006; Wardle et al., 2000). Available evidence suggests that nutritional knowledge possibly explains socioeconomic differences in dietary behaviour as nutritional knowledge has been shown to attenuate education differences in grocery food purchasing (Turrell & Kavanagh, 2006) and vegetable intake among women (Ball et al., 2006).

One issue relating to this area is the variation in the measurement of nutritional knowledge. Although all studies used a questionnaire to measure nutritional knowledge, the number and contents of each questionnaire were different. In general, there are three types of nutritional knowledge: awareness (e.g. awareness of dietary guidelines), principal knowledge (e.g. French fries are high in fat), and how to do something (e.g. how to read nutritional labels) (Guthrie et al., 1999). Some studies addressed all aspects of nutritional knowledge while others assessed only part of them. These different types of knowledge may be useful in different cases for specific food choices or dietary behaviours (Wetter et al., 2001). Another issue is studies use the term "knowledge" and "belief" interchangeably. Worsley (2002) argued that a belief is a perception whereas knowledge is a system of beliefs and are related to an intellectual domain. Therefore, these two terms should not be used interchangeably.

Attitudes

Attitude is also an important predictor of behaviour as it may determine whether the individual is motivated to implement that change (Guthrie et al., 1999). Attitudes toward food or diet are assessed in a number of ways: collection of nutrition-related beliefs, importance of specific food attitudes (e.g. taste), evaluation of specific food groups (e.g. good or bad), or perceived barriers or importance of a specific diet (e.g. low-fat diet).

A number of studies have examined attitudes to dietary behaviours and summaries of these studies are shown Table 2.15. The majority of studies have consistently found that attitude was able to predict specific dietary behaviours such as positive attitudes associated with higher servings of fruit intake. Among them, a recent US study assessed four aspects of attitudes toward fast-food: perceived convenience, fun and entertaining, dislikes cooking, and perceived healthiness of fast-food (Dave et al., 2009). The results showed that some aspects of attitudes towards fast-food were significantly associated with fast-food consumption (once or more per week): convenience aspects of fast food and dislike of cooking were associated with frequent fast-food consumption (Dave et al., 2009).

Limited evidence has shown that SEP and nutritional attitudes are associated, with socioeconomically disadvantaged groups having more negative attitudes toward healthy eating (Girois, Kumanyika, Morabia, & Mauger, 2001; Hearty, McCarthy, Kearney & Gibney, 2007; Kearney, Kelly, & Gibney, 1998). However, only a few studies have examined these associations.

While a number of studies have examined attitude and dietary behaviours, their definition and measurement of attitudes were varied, making it difficult to compare between studies. For example, one study defined attitude as expectations and evaluations about a given health behaviour (Brug, de Vet, de Nooijer, & Verplanken, 2006) whereas others defined attitude as subjective evaluations toward food, being either positive or negative (Hearty et al., 2007). Some studies measured attitude comprehensively (Bogers et al., 2004; Brug et al., 2006) whereas others did not (Hearty et al., 2007). Additionally, some studies have examined attitudes toward specific food groups (e.g. fruit) whereas other studies have examined these in relation to the broader diet (e.g. healthy eating) (Conner, Norman, & Bell, 2002; Hearty et al., 2007). These differences may have affected the study results as the definition of "healthy eating" may be highly variable between individuals and socioeconomic groups. Furthermore, it has been suggested that any association between attitude and behaviour may be influenced by habitual attitude, rather than attitude predicting a given behaviour (Bogers et al., 2004; Brug et al., 2006).

Table 2.15: Association between attitude and dietary behaviours

Author & year	Country, sample	Attitude measure	Dietary behaviours	Main findings
Bogers et al. (2004)	The Netherlands, N=159 women, mean age 41 years.	Attitude towards eat at least two pieces of fruit a day was assessed by four items: very bad–very good, very unpleasant–very pleasant, tastes very bad–very tasty, very unhealthy–very healthy.	Intention to eat at least two pieces of fruit/vegetables/day. Fruit/vegetable intake (portions/day), FFQ	Positive attitudes predicted intention to eat at least two pieces of fruit a day and actual consumption of fruit and vegetables.
Kvaavik, Lien, Tell & Klepp (2005)	Norway, N=519 and n=519, mean age 25 and 33 years (74.6% RR and 73.5% RR)	Seven items beliefs in healthy eating assessed: very unlikely to very likely (5-scale) and not important at all to very important (7-scale) (range 1–20).	Four dietary habit score: fruit and vegetable score, whole grain score, fat score, and sugar score. FFQ	Higher attitude predicted higher fruit and vegetable intake among men but not women. Attitude did not predict other dietary intake.
Hearty et al. (2007)	Ireland, N=1256 (63% RR), 18-64 years.	Attitudes toward following each diet: 1) I make conscious efforts to try and eat a healthy diet; 2) try to keep the amount of fat I eat to a healthy amount; 3) I don't need to change my diet as it is healthy enough (5-point scale).	Nutrient intakes using A 7-day food diary	Having negative attitude towards eating healthily is associated with higher energy intake, % food energy from carbohydrate, lower fibre, calcium and vitamin C intake.
Mahon, Cowan & McCarthy (2006)	England, N=1004	Attitudes toward consuming ready-prepared meals were measured by three items using 7-point scale (completely disagree to completely agree).	Frequency of consumption for ready meals and takeaway food	Attitudes predict intention to consume ready meals (R=0.079, p<0.05) and takeaway food (R=0.078, p<0.05).
Trudeau, Kristal, Li & Patterson (1998)	USA, N=1450 (63.5% RR), ≥18 years	Attitudes toward health and food: 1) interest in newspaper/magazine articles about health and 2) importance of food plays in ones diet (4-point scale: strongly disagree to strongly agree).	usual daily fruit and vegetable intake over the past month, FFQ	Positive attitudes predicted higher consumption of fruit and vegetables among men but not women.
Brug et al. (2006)	The Netherlands. N=916 (62% RR), ≥18 years.	Attitude towards intention to eat at least two serves of fruit was assessed with eight items: bad/good; unpleasant/pleasant; expensive/cheap; unhealthful/healthful; unhandy/handy; foul/nice; messy/clean; unproblematic/problematic.	Intention to eat two serves of fruit; fruit and vegetable intake (servings/day), FFQ.	Positive attitude predicted intention to consume at least two serves of fruit daily but not actual consumption.
Dave et al. (2009)	USA, N=530 (51.3% RR), 18–76 years (mean 42.3) FF consumed at least once in the past week.	Four aspects of attitudes toward FF 1) Perceived convenience of fast food (three items) 2) Fun & social (three items) 3) Dislike cooking (three items) 4) Perceived healthfulness of FF (two items) Response options: strongly disagree to strongly agree (5-point scale).	Frequency of FF consumption, dichotomised into high (>once/week) or low (once/week) FF = food from FF restaurants e.g. Burger King, Hardee's, Kentucky Fried Chicken, Pizza Hut, and similar.	Perception of convenience and dislike cooking were associated with frequent fast-food consumption. • Convenience: OR 1.16 (95% CI 1.09, 1.23) • Fun & social: NS • Dislike cooking: OR 1.12 (95% CI 1.06, 1.18) • Healthfulness: NS

RR=response rate; FFQ = food frequency questionnaire, FF=fast-food; NS=not significant.

Food preference

Food preference, or taste has been reported to be a strong predictor of attitude (Aikman, Min, & Graham, 2006) and it appears to be a primary consideration for most people when choosing food (Sobal et al., 2006). In the US, studies have reported that taste is one of the most important determinants of food choice (Aikman et al., 2006; Glanz et al., 1998; Guthrie et al., 1999; Stewart, Blisard & Jolliffee, 2006). In Ireland, 43% (N=1009) of a nationally representative sample reported taste was the most important food choice factor (Kearney, Kearney, Dunne, & Gibney, 2000). A limited number of studies have examined the association between SEP and taste and two of them reported that there are no socioeconomic differences in the importance of taste when choosing food (Glanz et al., 1998; Kearney et al., 2000). However, more detailed examinations of socioeconomic differences in food preference revealed that lower household income groups were more likely to report they disliked a number of healthy foods (e.g. low fat yoghurt) (Turrell, 1998b). This suggests that food preferences may be socioeconomically patterned.

When reasons to eat fast-food were examined, 69% of participants (n = 594) reported taste was the reason to eat fast-food (Rydell et al., 2008). Additionally, participants who ate fast-food frequently (five times per week or more) rated taste as more important than those who ate fast-food less frequently (twice a week or less) (Rydell et al., 2008). However, the importance of taste was not different between people who consumed or did not consume fast-food in the US (Binkley, 2006). One study found a trend in positive taste attitude toward fast-food by education: lower educated groups were more likely to agree that taste was the reason to eat fast-food compared with highly educated groups; however, the difference did not reach statistical significance (Rydell et al., 2008).

There is a lack of studies that have examined taste and dietary behaviours and socioeconomic differences in these factors. This may be due to taste being frequently assessed as part of other measures such as attitude or food choice factors (Beydoun & Wang, 2008b). Nevertheless, as there is some evidence of socioeconomic differences in food preference, it may be one important factor that explains socioeconomic variations in food choice.

Belief in the diet-health relationship

There are different types of beliefs that relate to dietary intakes such as nutritional belief (e.g. eating vegetables are healthy) and beliefs in the diet-health relationship. In this section, belief in diet-health relationship was reviewed.

The measures of beliefs about diet-health relationships were inconsistent between studies. However, the studies examining this area have consistently found an association between the belief in diet-health relationship and dietary behaviour. In Australia, people who believe in the diet-health relationship were more likely to make healthy food choices (Turrell, 1998a). In the USA, strong beliefs about diet with cancer were associated with higher fruit and vegetable intake (Harnack et al., 1997; Trudeau et al., 1998) and lower fat and higher fibre intakes (Harnack et al., 1997). Likewise, a longitudinal study found that participants with strong beliefs in the association between diet and cancer were more likely to change to healthy eating practice, reduce the percentage of energy from fat, and increase their fibre intake compared with those who did not, or only had weak belief (Patterson, Kristal, & White, 1996).

One study that examined the association between SEP and beliefs about the diet-health relationship found that higher socioeconomic groups were more likely to believe strongly in the diet-health relationship (Parmenter et al., 2000). However, there was a lack of studies examining this area and this finding is possibly as a result of diet-disease relationship being assessed within the broader concept of nutritional knowledge (Ball et al., 2006; Harnack et al., 1997; Parmenter et al., 2000; Wardle et al., 2000). Although the finding of socioeconomically disadvantaged groups having a weaker belief in the diet-health relationship compared with advantaged groups is plausible, as disadvantaged groups have lower belief in health control and health consciousness (Wardle & Steptoe, 2003), more evidence is needed to confirm this association.

With regard to takeaway or fast-food consumption, no known study has examined the associations between these behaviours and beliefs in the diet-health relationship among population-representative studies. In addition, there was no known research that has examined socioeconomic differences in this area. Therefore, examining beliefs in the diet-health relationship and takeaway food consumption and whether this association explains socioeconomic differences in dietary behaviours provides important information to enable understanding of socioeconomic differences in dietary behaviours.

Convenience

Convenience is a broad concept in the area of food or food products, and relates to reductions or savings in the actual “time, physical ability and the mental or physical involvement it takes for a person to acquire, prepare, consume and clean-up after eating or drinking” (Sobal et al., 2006, p.8). Convenience has been found to be an important determinant of food consumption (Jekanowski, Binkley & Eales, 2001; Stewart et al., 2006) and is one motivator in the selection of food (Glanz et al., 1998). Among American adults, convenience was the third most important aspect when choosing food (Stewart et al., 2006). Similarly, an Irish study reported that 14% of participants selected convenience in preparation as one of the most important influences on food choice (Kearney et al., 2000).

Consuming fruit and vegetables seems to be considered inconvenient. In Australia, 14% of adult participants reported the perception that a plant-based diet was inconvenient (Lea, Crawford, & Worsley, 2006). For fruit intake, a higher proportion of participants who usually consume less than one serve of fruit daily agreed to the statement eating fruit is inconvenient if they were not home compared with those who consume two serves or more per day (10.8% vs 7.2%) (Schätzer, Rust & Elmadfa, 2010).

Consuming takeaway or fast-food is generally perceived to be convenient (Stewart et al., 2006) as these foods can save time, mental and physical energy for meal preparation, and clean-up activities. For example, purchasing takeaway or fast-food may result in fewer visits to grocery stores, fewer products to buy and carry from grocery stores, and fewer (or no) dishwashing activities (Darian & Tucci, 1992). Studies examining convenience and use of takeaway food have reported that convenience orientation or convenience-related aspects were significantly associated with more frequent use or purchase of takeaway meals (Candel 2001; de Boer, McCarthy, Cowan, & Ryan, 2004). Likewise, among American adults the perceived convenience of fast-food was significantly associated with frequent fast-food consumption (once a week or more) (Dave et al., 2009).

Socioeconomic differences in the importance of convenience for food products or convenience orientation seem to have received little attention in the literature as only three known studies have examined this issue. Among nationally representative sample of Irish adults, there were no socioeconomic differences in the importance of convenience when choosing food (Kearney et al., 2000). Similarly, there were no education differences in the perceived convenience of fast-food among American adults (Dave et al., 2009). On the other hand, in the UK participants with lower social class were more likely to have convenience seeking behaviours (Buckley et al., 2007). Nevertheless, there may be socioeconomic differences in convenience orientation, and this may possibly contribute to socioeconomic differences in dietary behaviours as Scholderer and Grunert (2005) suggest convenience orientation may be a mediator between demographic factors and convenience shopping and product usage.

Convenience appears to predict dietary behaviours; however, there is insufficient evidence to suggest how strongly it is associated with dietary behaviour, and socioeconomic differences in these. A lack of research that examines convenience and dietary behaviours, and socioeconomic differences in convenience may be due to convenience encompassing broader aspects such as time factors, and may be measured by each factor. Similarly, convenience is frequently assessed within other broader concepts such as attitude or barriers toward a specific dietary component (e.g. nutrients) or food groups (Baker & Wardle, 2003; Beydoun & Wang, 2008b; Brug et al., 2006; Buckley et al., 2007).

Time

Time is one of the factors that determines food choice (Gofton, 1995). Time constraints affect all aspects of dietary activities: obtaining nutrition information to prepare meals and clean-up which could be used for other activities, such as for leisure (Blaylock, Smallwood, Kassel, Variyam, & Aldrich, 1999) and have been identified as a barrier to healthy eating (Blaylock et al., 1999; Pollard, Kirk, & Cade, 2002; Welch, McNaughton, Hunter, Hume, & Crawford, 2009). In Australia, 41% of women reported time pressure is a barrier to healthy eating, and these women were less likely to meet the recommended level of fruit and vegetable intake compared with those who did not report time pressure as a barrier (Welch et al., 2009). The same study also found that higher educated groups were more likely to report time as a barrier compared with the lower educated (Welch et al., 2009). Similarly, higher socioeconomic groups were more likely to report that a busy lifestyle was a barrier to healthy eating than lower socioeconomic groups (López-Azpiazu, Martínez-González, Kearney, Gibney, & Martínez, 1999). In general, higher socioeconomic groups perceived more time constraints (Baxter, 2009) and this pressure is likely to influence dietary behaviours (Harnack et al., 1997).

Studies indicated that a perceived lack of time may be associated with consumption of takeaway or fast-food. Among Irish primary food purchasers in the household, participants who frequently purchased takeaway food were more likely to perceive time pressure than those who do not buy these foods or purchased them less frequently (de Boer et al., 2004). Likewise, among frequent fast-food consumers (once a week or more) in the US, 92% (n = 594) of participants agreed with the statement “fast-food restaurants are quick”, and 53.2% agreed with “I am too busy to cook” (Rydell et al., 2008). On the other hand, an Australian study has reported that there was no association between women who identified time as a barrier to healthy eating and infrequent fast-food consumption (Welch et al., 2009). Although the findings are mixed, it is plausible that takeaway and fast-food consumption may result from (perceived) time constraints as people can save significant meal preparation time by purchasing these foods.

Time spent on cooking may also be associated with takeaway or fast-food consumption. Time spent cooking reflects attitude towards cooking, and spending a short time for cooking may imply a dislike of cooking which may lead people to seek convenience in meal preparation including purchasing takeaway food (Buckley et al., 2007). However, only one known study has examined time spent on cooking and takeaway or fast-food consumption, and findings are mixed. While time spent cooking was associated with frequent fast-food consumption, it was not associated with frequency of takeaway food consumption (fast-food not included) among Swiss adults (van der Horst et al., 2011a). Scholderer and Grunert (2005) suggested the relationships between time factors and the use of convenience food may be more complex: the association between time constraints (full-time and part-time employment) and convenience product usage was mediated by perceived time budget, and subsequently these associations are mediated by attitude to convenience products.

More research is needed to understand the relationship between time factors, dietary behaviour, and SEP.

Cooking skills and meal preparation-related behaviours

Differences in cooking skills and meal preparation behaviours may also influence convenience orientation (Sobal et al., 2006) as "convenience is conceptualised as consisting of not only time saving, but also energy saving and the transference of culinary skills" (Candel 2001, p.17). Declining cooking skills have been identified as a factor that increases demand for convenience food (Buckley et al., 2007).

Lack of cooking skills is identified as a barrier food preparation among young adults (Larson, Perry, Story, & Neumark-Sztainer, 2006). An Australian study has shown that women who were less involved in food preparation behaviours (e.g. very often spend less than 15minutes preparing dinner, more frequently found cooking a chore) were less likely to eat two or more serves of fruit and vegetables (Crawford, Ball, Mishra, Salmon, & Timperio, 2007). Similarly, Australian adults who lacked confidence to prepare vegetables were more likely to purchase fewer vegetables, and participants with primary school or less education and those in the lowest 20% of household income were more likely to have reported low confidence to prepare vegetables (Winkler & Turrell, 2009).

Pre-prepared meals such as takeaway foods require no or minimum cooking skills (Beck, 2007). A US study has reported that 44.3% (N = 594) of participants who ate fast-food at least once a week disliked for food preparation, and of these, a high proportion of those who consumed fast-food five or more times per week 59.1% (n = 75) reported disliking cooking (Rydell et al., 2008). Likewise, Irish adults who purchase takeaway meals frequently were less interested in cooking compared with those who did not purchase, or purchased takeaway food less frequently (de Boer et al., 2004). Among Swiss households, lower self-reported cooking skills were associated with frequent ready-meal consumption; however, their definition of "ready meal" did not include takeaway food (van der Horst, Brunnera, & Siegrista, 2011b).

The results of these studies are generally consistent: compared with people who have higher cooking skills, those who have lower cooking skills are more likely to consume or purchase fewer fruit/vegetables, and also more likely to consume or purchase takeaway/fast-food and ready-meals. However, the measurement of cooking skills reviewed here are inconsistent: cooking skill, like/dislike cooking or cooking involvement. Although these concepts are related, they are not the same, and consequently the results are difficult to compare.

Value

Perceived value of food can influence food choice (Jekanowski et al., 2001) and is another factor that increases demand for convenience (Buckley et al., 2007). From an economic viewpoint, the value of food can be defined as the retail price of a product and the time and energy (mental and physical) consumers would have saved in cooking, meal preparation or clean up (Jekanowski et al., 2001) and product price relative to portion size (Buckley et al., 2007). The food value of eating out can be defined not only from an economic aspect but also can include a hedonic or enjoyment aspect (Park, 2004). In terms of takeaway/fast-food consumption, it represents fun and entertainment through receiving a service, a new or variety of menus, and socialising with other people (Park, 2004).

People may perceive takeaway food is "worth" purchasing for them as they can trade off a small expense for a reduction of time and effort for meal planning, preparation and clearing up (Beck, 2007). Among Irish adults, participants with frequent use of takeaway food were more likely to report that convenience food (including frozen food and takeaway foods) was value for money compared with those who use takeaway food less frequently (de Boer et al., 2004). However, among fast-food consumers, there was no association between hedonic aspects of food value (fast-food as fun and socialising) and frequency of fast-food consumption (Dave et al., 2009).

One study that examined the association between education and the hedonic aspect of fast-food value found no association between education and perception of fast-food as fun and socialising (Dave et al., 2009). There has been no known study that has reported socioeconomic differences in the perception of "economic value" towards takeaway or fast-foods; however, higher income households may perceive that purchasing takeaway/fast-food represents value as they have a greater disposable income but also a lack of time.

Cost and price of food

Cost is one of the value factors that represent the monetary considerations (price and the perceived worth of food) (Connors, Bisogni, Sobal, & Devine, 2001; Furst et al., 1996). Price has been reported as an important factor when choosing food (Darmon, Ferguson, & Briend, 2002; Glanz et al., 1998): in 1998, 64% of Americans rated price as “very important” (Guthrie et al., 1999). Cost constraint has been reported to have negative effects on healthy diet (e.g. high fruit and vegetable intake in a diet) (Darmon et al., 2002; White, 2007) and a healthy diet may be more costly compared with a less healthy diet (Drewnowski & Barratt-Fornell, 2004). Additionally, the cost of healthy food has increased more than less healthy items in Australia (Harrison et al., 2010). However, previous research has reported that healthy foods are not more expensive compared with less healthy foods (Cummins & Macintyre, 2002; Giskes, Van Lenthe, Brug, Mackenbach, & Turrell, 2007).

A recent Australian study reported that the perception of price of healthy food was more strongly associated with food choice compared with actual food price (Giskes et al., 2007). In Australia, people who perceived healthier food to be more expensive were less likely to make food purchasing consistent with dietary recommendations (Giskes et al., 2007). Research from Australia and other countries has found that perceived cost concern was associated with lower fruit and vegetable intake (Mushi-Brunt, Haire-Joshu & Elliott, 2007) and less healthy food purchasing (Turrell & Kavanagh, 2006). Although Beydoun and Wang (2008b) have reported higher perceived food price concern was associated with reduced fibre intake, they failed to find an association with diet quality.

For socioeconomically disadvantaged groups, cost is one of the most important factors (Dibsdall, Lambert, Bobbin, & Frewer, 2003; Glanz et al., 1998) as disadvantaged groups often have more limited budgets (Inglis, Ball & Crawford, 2005). Among Irish adults, a higher proportion of lower educated and social class rated that the price of food was important compared with their counterparts when choosing food (Kearney et al., 2000). In Australia, socioeconomically disadvantaged groups were more likely to report food-cost as a barrier to purchasing healthy food (Turrell & Kavanagh, 2006) or follow a plant-based diet (Lea et al., 2006) compared with advantaged groups. Likewise, a Spanish study found that a higher proportion of people in lower occupation levels reported price of healthy food as a barrier to healthy eating compared with higher level of occupation; however, no association with education and employment status was found (López-Azpiazu et al., 1999). Although there are some inconsistencies, a majority of studies find an association between perceived food cost concerns and less healthy dietary patterns, and higher perceived cost concerns were more likely to be reported by lower socioeconomic groups.

Social environment and inter-personal influences

Eating occasions often take place in the presence of other people (Nestle et al., 1998). Families and households provide one of the most important interpersonal influences on food choice (Furst et al., 1996; Harnack, Block, & Lane, 1997; Nestle et al., 1998; Raine, 2005). When a family or household share meals, similar patterns of dietary intakes are seen (Brown, 2006; Furst et al., 1996). In addition to family and household members, inter-personal influences include friends, colleagues and other social networks (Booth et al., 2001; Larson & Story, 2009; Wetter et al., 2001) and these networks influence food choice through modelling, reinforcement, support or encouragement, and perceived norms (Larson & Story, 2009).

Studies have found that interpersonal influences on dietary behaviour can be negative. In Australia, family members' unwillingness to change their current diet has been reported as a barrier to adopting a plant-based diet and 25% (n = 415) of participants agreed with this statement (Lea et al., 2006). Conversely, interpersonal influences can be positive in terms of having a healthy diet. An Australian study found that family member's support for healthy eating was associated with higher vegetable intake (Ball et al., 2006). Alternatively, the influence can be both positive and negative. An Irish study reported that other people's preferences and other people's decisions were important influences on their food choice (Kearney et al., 2000). Additionally, family and friends may encourage or discourage eating specific foods or diet (Ball et al., 2006; Harnack et al., 1997; Nestle et al., 1998).

Social norms also appear to influence dietary behaviour (Larson & Story, 2009). A health promotion randomised controlled study at two different settings (community and work sites) reported that more supportive social norms were significantly associated with greater improvements in fruit and vegetable intake after adjustment for baseline consumption, intervention group, and randomization units (community sites $\beta = 0.24$ serves per day, $p<0.001$; work sites $\beta = 0.39$, $p=0.02$) (Sorensen et al., 2007).

Choice and consumption of food may change due to the presence of other people; friends may be influencing the consumption of high energy food whereas smaller meals are consumed when eating alone (Meiselman, 2006). However, the presence of other people seems to influence differently between overweight and normal weight groups (Larson & Story, 2009). Interpersonal influence may; therefore, depend on the situations and conditions.

There are no known studies that have reported socioeconomic differences in inter-personal influences. However, social norms and support have been suggested as potential mediators between SEP and fruit and vegetable intake (Ball et al., 2006; Sorensen et al., 2007). Examining social environment/interpersonal influences as a potential mediating factor between SEP and dietary behaviours will provide a greater understanding in this area.

Summary

In summary, several health behaviour theories and models have been used to identify or predict dietary behaviours. This review identified some of the theories frequently applied to understanding dietary behaviours. These theories are useful as they suggest some psychosocial variables that need to be considered in understanding the association between SEP and takeaway food consumption. However, these theories are also limited in not considering a number of important psychosocial factors such as social environment and socioeconomic factors.

From the literature, multiple factors that are likely influence dietary behaviours and socioeconomic differences in these have been discussed. However, evidence pertaining to the concept of convenience (including overarching aspects) and dietary behaviours are under researched and only a few studies have been conducted in

Australia. Additionally, which factors and to what extent these factors are influencing dietary behaviours is still unknown as multiple factors are likely to be influencing food choice. The magnitude of the association is likely dependent on the particular food or dietary behaviour. For example, the negative impact of the “perceived cost” of fruit and vegetable intake may be more pronounced than the consumption of takeaway food.

The limited evidence suggests that lower socioeconomic groups are less likely to have higher nutritional knowledge and cooking skills, strong health concern/belief in diet-health relationship, and are more likely to have a concern about the cost and price of food. However, research into socioeconomic differences in most psychosocial factors is also limited. Understanding the factors that influence socioeconomic variations in dietary behaviour is important for developing effective interventions and policies to reduce socioeconomic differences in diet and to improve the diets of disadvantaged groups.

The review also identified some methodological issues. First, variables that influence dietary behaviours are conceptualised in different ways. For example, the terms “knowledge” and “belief” are often used interchangeably although they belong to different domains. Another example is that attitudes were defined differently from study to study and these differences are likely to have resulted in measuring different aspects and therefore, the results may not be directly comparable. Another issue identified from this review is analytical limitations. The majority of studies that examined socioeconomic variations in dietary intake were descriptive in nature, and they did not examine why inequalities in diet were observed. Therefore, the reasons for dietary inequalities and to what extent the identified factors were contributing to these inequalities need to be determined in order to understand and reduce socioeconomic differences in dietary behaviours.

2.6 CONCLUSIONS

Dietary intake is believed to have a significant impact on health. A high consumption of takeaway and fast-food and low fruit and vegetable intake may increase the risk of developing health conditions such as insulin resistance, dyslipidema, hypertension, and overweight/obesity, and may lead to the development of chronic diseases. Socioeconomically disadvantaged groups are more likely to consume diets that are less consistent with dietary recommendations for the prevention of diet-related chronic diseases and related risk factors. During the last few decades, takeaway food has become an important part of our diet; however, these foods typically have nutrient content opposite to those in the dietary recommendations for the prevention of chronic disease. Since low socioeconomic groups have less healthy dietary patterns, these groups may consume higher levels of takeaway food compared with their counterparts. However, little attention has focused in this area, and only a limited number of studies have examined the association between SEP and takeaway food consumption, and the majority of these only focused on fast-food rather than examining the more inclusive food type of takeaway food.

A limited number of health behaviour theories and models were described in this chapter. Despite the potential usefulness of these theories and models in understanding dietary behaviours, crucial limitations exist: theories focused on the cognitive process but exclude socioeconomic and socio-environmental factors that are also likely to influence dietary behaviours. Additionally, food process models are limited in their ability to quantify which factors predict given dietary behaviours.

A number of factors are likely to influence dietary behaviours. However, existing research is limited in a number of ways. First, there are only a limited number of studies examining the association between psychosocial factors and dietary behaviours, and among these, the direction of associations are often mixed. Similarly, limited attention has also been given to the association between SEP and psychosocial factors that may influence dietary behaviours. Third, we have lack of knowledge on what extent the given psychosocial factors contribute to the socioeconomic differences in dietary behaviours, especially takeaway and fast-food consumption. Therefore, there is a need to examine which factors influence takeaway and fast-food consumption, whether there are any socioeconomic differences in these, and whether and to what extent these factors explain socioeconomic differences in takeaway and fast-food consumption. This may help prioritise the issues and assist the development of intervention programs and policies to decrease socioeconomic inequalities in diet, and subsequently reduce socioeconomic inequalities in diet-related health conditions and diseases. The present chapter informed the methods employed for this thesis, and these are presented in the next chapter (Chapter 3).

Chapter 3: Overview of methods

3.1 INTRODUCTION

The research reported in this thesis used two data sets. The first part was a secondary analysis of the 1995 Australian National Nutrition Survey (NNS), the most recent national nutrition survey among adult. The analyses provided information on the takeaway food consumption patterns of Australians, and how these varied by SEP. The second part used primary data collected by the candidate in 2009 specifically for this thesis called the Food and Lifestyle Survey (FLS) which is a cross-sectional representative sample of Brisbane adults aged between 25–64 years. These data were collected to address the research questions not able to be answered using the secondary analyses of the NNS. Brief details of the methods for each study are provided in the following published papers, while this chapter provides more detail and description of the methods used.

3.2 INTEGRATION OF THE STUDIES

Two sets of data were used for a number of reasons. First, while the 1995 NNS provides quantitative dietary intake estimates for a large nationally representative sample, it was conducted more than 15 years ago. The original data collection was needed to examine current takeaway food consumption patterns. Additionally, although the NNS provides national trends of dietary intake across socioeconomic groups, it does not provide information on why socioeconomic differences exist. An increasing number of studies have examined socioeconomic determinants of diet; however, little is known about why such differences exist. Understanding socioeconomic variations in this area is important for developing effective evidence-based interventions and policies to promote healthy dietary behaviours. Second, only a few studies have examined socioeconomic differences in takeaway food consumption among adults in Australia (Smith et al., 2009; Turrell & Giskes, 2008) or internationally (van der Horst et al., 2011a). In addition, no known studies have specifically investigated the habitual intake of a more detailed takeaway food consumption. There are a wide variety of takeaway food types and they have different nutritional characteristics that can be categorised into “healthy” and “less healthy” choices. Choosing different types of takeaway food may be socioeconomically patterned and frequent consumption of takeaway food, especially “less healthy” options, may partly contribute to socioeconomic inequalities in dietary intakes, and subsequently the higher prevalence of diet-related chronic disease and overweight/obesity among socioeconomically disadvantaged groups. In these respects, using the two sets of data addresses all of the research questions examined in this thesis.

3.3 METHOD OF THE 1995 AUSTRALIAN NATIONAL NUTRITION SURVEY (NNS)

This part addressed the following research questions:

1. What is the direction and magnitude of socioeconomic inequalities in takeaway food consumption?
2. What is the direction and magnitude of socioeconomic inequalities in fruit and vegetable intake?
3. What is the direction and magnitude of the association between takeaway food consumption patterns and fruit and vegetable intake?
4. Is the association between SEP and fruit and vegetable intake influenced by takeaway food consumption?

3.3.1 Sampling procedure

The NNS was conducted using a sub-sample of the 1995 Australian National Health Survey (ANHS) which had a total sample of 57,633 (97% response rate). The ANHS was conducted using multi-stage sampling from all States and Territories to ensure all segments of the population were represented in the sample. Each State and Territory was divided into a number of areas called “strata”, and each stratum contained a number of census Collection Districts (CDs). Each CD contained approximately 250 private and non-private dwellings. In capital cities and other major urban or high-population areas, the sample was selected in three stages:

- A sample of CDs was selected from each stratum with the probability proportional to the number of dwellings in each CD
- Each selected CD was divided into groups of dwellings or blocks of similar size, and one block was selected from each CD, with the probability proportional to the number of dwellings in the block
- Within each selected block a list of all private dwellings was prepared and a systematic random sample of dwellings was selected. Dwellings selected were not contiguous, with 6–9 dwellings between each one selected.

The sample for the NNS was a systematically selected sub-sample of CDs from the base ANHS private dwelling sample. A maximum of two people per household in urban areas and three people in rural areas were randomly selected from the household. People aged two years or more who were usual residents of the private dwellings were included in the survey; however, the following persons were excluded: non-Australian diplomatic personnel, service personnel and their dependents, and overseas visitors whose usual place of residence was outside Australia. During the ANHS interview, participants selected for the NNS were asked whether they would agree to be contacted to participate in the NNS. A total of 22,562 persons were selected from the ANHS to be interviewed for the NNS. After excluding refusals, non-contacts, and other non-respondents, the sample size for the NNS was 13,858 aged two years and over (61.4% response rate). For this study, participants aged between 25 and 64 years were included in the analyses (n=7,319).

3.3.2 Data collection and their quality assurances

Data on dietary intake intakes were collected by qualified nutritionists trained in the NNS. Each member of the household was personally interviewed; proxy interviews were conducted with another family member or carer for those who could not be interviewed due to physical or mental limitations.

The NNS employed two methods to collect dietary information: 24-hour dietary recall and food frequency questionnaire (FFQ). This research used the 24-hour recall to estimate the food and nutrient intakes of participants; however, it did not use the non-quantitative FFQ as the FFQ did not collect information on takeaway food. The 24-hour recall collected information on all food and beverages consumed from midnight-to-midnight on the day prior to the interview. Detailed descriptions were obtained for each food item participants reported consuming, and for each of these food items data were collected on the eating occasion (e.g. breakfast, lunch, snack), the quantity of food consumed, and where the food was obtained (e.g. food store).

To ensure the quality of the data, a number of activities were undertaken:

1. Interviewers were all qualified nutritionists and were trained and tested prior to the actual data collection. To avoid response errors and to achieve a high level of accuracy in recording responses, a standard interview protocol was employed. This protocol formed a part of interviewer training.
2. To increase the accuracy of the recall and description of items consumed, a multiple-pass 24-hour recall process was used in the NNS which was adapted from the US Continuing Survey of Food Intakes of Individuals. The quality of the 24-hour recall can be compromised by misreporting, and the multiple-pass interviews can minimise the omission of possibly forgotten items being consumed (Poslusna, Ruprich, de Vries, Jakubikova, & van't Veer, 2009).
3. To maintain the quality of the data collected, the interviewers were regularly monitored through a series of reviews conducted during the data collection, such as the regular review by supervisors of the quality of the food intake data.

4. To minimise data processing errors, detailed coding instructions were developed, and staff who coded the 24-hour recall were trained regularly. Initially, all the coders' work was recorded by a more experienced coder, and discrepancies were discussed. When a coder's error rate was confirmed to be less than 5%, 10% of their work was routinely verified. Warning messages were generated by the coding software if exceptionally high or low values were entered. After all foods were entered, there were also a number of checks to ensure reported data and entered data were consistent.

3.3.3 The 24-hour dietary recall

The 24-hour recall method required respondents to remember and report all food and beverages that had been consumed in the previous 24-hour period. In the NNS, the data were collected by face-to-face interview.

Strengths and weaknesses of the 24-hour recall

The 24-hour recall is the most widely employed method to collect quantitative dietary intakes. The strengths of this method are:

- Participant's literacy is not required if the data are collected by interview (Thompson & Byers, 1994)
- Participant's burden is less than the dietary record method, therefore, the 24-hour recall method generally has a high response rate (Rutishauser, 2005) which is likely to give more representative data
- The 24-hour recall allows the collection of detailed information on dietary intakes
- The method is less likely to change dietary intakes as the recall takes place after the food has been consumed (Thompson & Byers, 1994).

There are also some weaknesses of the 24-hour recall.

- The 24-hour recall cannot provide information on an individual's habitual intake (Rutishauser, 2005; Thompson & Byers, 1994)
- The method relies on the participant's ability to recall and describe the types and amount of food consumed (Rutishauser, The Commonwealth Department of Health and Aged Care & National Food and Nutrition Monitoring Unit, 2000). Similarly, the data may not be accurate as participants may not report all of the food consumed (social desirability bias) (Thompson & Byers, 1994).

Repeatability of the 24-hour recall

Repeatability of the 24-hour recall is dependent on several factors: time, interviewers, and coding of the recall data (Thompson & Byers, 1994). Developing a standardised interview and coding system is needed to avoid unnecessary errors. However, the main difficulty is that the food intake of individuals varies depending on the time such as a weekday or weekend and seasonal changes due to the food availability (Rutishauser, 2005). In particular, the 24-hour recall method has low repeatability for single days of intake for a single individual because of the day-to-day food intake variability (Buzzard, 1998). Nevertheless, at the group level, the 24-hour recall has high reproducibility of the mean of a single day of food intake (Buzzard, 1998).

Validity of the 24-hour recall

Assessing the validity of a dietary intake method involves the comparison of the method with one or more objectively measured methods (Rutishauser, 2005). There are several ways to assess the validity of the 24-hour recall method: comparing energy or nutrient intake estimated from the 24-hour recall with 1) biochemical or physiological markers that reflect these intakes, and 2) energy or nutrient intake estimated from the weighed food record. The various biochemical or physiological measures can be employed to assess nutrient intakes and provide a useful estimate of certain nutrients such as urinary markers; however, assessing the validity of the 24-hour recall (also other dietary intake methods) is difficult. There are no single biomedical measures that universally and accurately reflect intakes of food and nutrients (Hunter, 1998). Another method often employed to assess the validity of the 24-hour recall is a comparison with the weighed record as this dietary method is considered the most accurate description of the amount and types of foods consumed (Rutishauser, 2005). Although there can be some inconsistencies in the estimated nutrients and energy intake between the two methods at the individual level, the mean intakes of nutrients and energy intake are generally in high agreement at the group level (Poslusna et al., 2009; Thompson & Byers, 1994).

While the 24-hour recall data has some disadvantages, it is considered an appropriate dietary intake method to describe and compare food intake (in this case consumption of takeaway food and fruit and vegetable intake) across different socioeconomic groups (Rutishauser, 2005; Thompson & Subar, 2008).

3.4 METHOD OF THE FOOD AND LIFESTYLE SURVEY (FLS)

The FLS was conducted specifically for this thesis by the candidate. The FLS extended the NNS in several ways by describing current socioeconomic differences in takeaway food consumption patterns as the NNS was conducted in 1995, and also allowed the following research questions to be investigated:

1. What is the direction and magnitude of socioeconomic inequalities in takeaway food consumption patterns?
2. What is the direction and magnitude of socioeconomic inequalities in fruit and vegetable intake?
3. What is the direction and magnitude of the association between takeaway food consumption patterns and fruit and vegetable intake?
4. Does takeaway food consumption mediate the association between SEP and fruit and vegetable intake?
5. What is the direction and magnitude of socioeconomic differences in psychosocial factors related to takeaway food consumption?
6. Whether and which psychosocial factors explain the association between SEP and takeaway food consumption patterns?

3.4.1 Definition of “healthy” and “less healthy” takeaway food

Dietary behaviours are inherently complex and the demarcation of foods into “healthy” and “less healthy” choices is acknowledged as being a somewhat arbitrary division. Many factors, including the nutrient contents of foods, contribute to their health promoting or health risk profiles. Other factors that play a significant role in the health implications of foods are the amount and frequency of their consumption. In the research undertaken in this thesis, a division of foods into those that are more (or less) health promoting was made primarily on the nutrient contents of food items. It is acknowledged that this distinction is somewhat limited in addressing the overall healthiness of foods for individuals; however, it provides some important insights into factors influencing choices that potentially could be associated with increased health risks. In the first study (the NNS), the classification of “healthy” and “less healthy” takeaway foods was based on the Dietary Guidelines for Australians which recommend to consumption of foods that are lower in total fat saturated fat, and higher in fibre (NHMRC, 2003a). “Healthy” options were considered as those that have 10 g or less of total fat per 100 g.

In the FLS, the AGHE provided the basis for the classification of “healthy” and “less healthy” takeaway choices. “Less healthy” options are based on the “extra” foods as defined in the AGHE. These “extra” foods are not essential parts of individual’s diet which include biscuits, cakes, soft drinks, and sausage rolls, as these foods lack adequate nutritional values and are typically high in fat, salt or added sugar (The Commonwealth Department of Health and Family Services, 1998). Most of the “less healthy” takeaway items in the present study were consistent with the “extra” foods as defined in the AGHE. Nutrient composition data were used to classify foods not identified in the “extra” food list and foods meeting one or more of the following criteria were classified as “less healthy”: greater than 2500kJ of energy per serving, greater than 3g of saturated fat; and less than 2g of fibre per serving; and beverages classified as “less healthy” were those containing energy 600 kJ or greater per serving and/or greater than 3g of saturated fat per 100g. The definitions used to categorise the chosen nutrient content levels are based on *Fresh Tastes at School NSW Healthy School Canteen Strategy: Canteen Menu Planning Guide* (New South Wales Department of Health and New South Wales Department of Education and Training, 2006) and *A Better Choice – Healthy Foods and Drink Supply Strategy for*

Queensland Health Facilities (Queensland Health, 2007). The objectives of these strategies are to identify and promote healthy food and beverages, and to identify and reduce the availability of less healthy choices (Queensland Health, 2007). These changes were made in order to reduce subjectivity in the definition used in the first study. Despite this change between the two studies, the classification of the takeaway items used remained the same under either definition.

3.4.2 Development of the FLS questionnaire

The FLS was conducted using a postal questionnaire. Several factors dictated the choice of method. First, the data needed to be from a representative population in order for the findings from a study to be generalisable. There are no comprehensive sampling frames available for telephone or the internet contact information among the general population (Dillman, 2007; Olsen 2009). A random sample from the Australian Electoral Roll can provide a representative adult sample; however, it does not contain phone numbers or email addresses. Additionally, studies using telephone or internet-based surveys have been found to have low response rates (Dillman, et al., 2009; Dobrow, et al., 2010; Leece, et al., 2004). Sampling bias, either from non-representative sampling frames or non-response bias, can result in findings that will not be generalisable (Dillman, 2007). Second, the project had resource constraints. Using the list from the Australian Electoral Roll, face-to-face interviews can be conducted; however, this method is likely to require more resources. Third, the responses to surveys need to be compatible. Although a mixed method such as a combination of postal survey and other methods could overcome issues in resource constraints and low response rates, it has been reported that participants' response behaviours may change between the survey methods (Dillman, et al., 2009). In addition, research has shown that most people prefer to receive postal surveys rather than internet-based surveys (Callas, Solomon, Hughes, & Livingston, 2010; Dillman, 2007). As a result, a self-administered postal questionnaire was developed by the candidate specifically for this project. The questions covered usual fruit and vegetable intake, socio-demographic information, usual overall takeaway food consumption and consumption of 22 specific takeaway items, as well as psychosocial factors that may influence takeaway food consumption. The specific takeaway items were identified from the NNS as the most frequently consumed items. Most of question items were identified from the literature and these details are provided in Appendix A.

3.4.3 The piloting procedure for the FLS

The questionnaire was piloted during June 2009. Firstly, flyers detailing the piloting process were distributed to the faculty and administration staff at Queensland University of Technology (QUT) and public housing apartments near QUT. An email was then circulated to QUT staff via a self-subscribed email service available to QUT staff members. A convenience sample was selected from the responses based on gender and occupation to attempt to obtain an even number of sample characteristics: gender, age groups, and blue-collar vs white-collar occupations. This is to ensure the questionnaire was able to be comprehended by a wide range of potential participants. The selected participants (N = 10) were contacted to arrange face-to-face appointments. The characteristics of the participants are presented in Table 3.1.

Table 3.1: Characteristics of participants

N=10	N	Median (min, max)
Age (year) [mean (SD)]	45 (11)	45 (28, 58)
Gender		
Males	3	
Employment status		
Full-time	5	
Part-time	1	
Casual	2	
Home duties	1	
Student	1	
Number of people in household [mean (SD)]	3 (1)	3 (1, 5)
Household structure		
Living alone, no children	2	
Single parent living with ≥ one children	1	
Couple living with no child(ren)	1	
Couple living with ≥ one child(ren)	5	
Other (couple living with another couple)	1	
Time taken to complete the questionnaire (minutes) [mean (SD)]	15 (9)	11 (6, 38)

Selected participants were asked to complete the questionnaire as if they had received it in the mail. The time taken to complete the questionnaire was also recorded. After participants completed the questionnaire, they were asked the following questions in a face-to-face interview:

- Whether the questionnaire was difficult to answer, and if so what was difficult about it
- Whether they felt that all relevant response categories had been included
- Whether there was anything missing
- How they found the questionnaire to fill out
- If they had any suggestions for improving the questionnaire
- If they had any suggestions for maximising response rates.

All responses to the suggestions about the questionnaire were recorded on a piloting evaluation form shown in Appendix B. The format of the questionnaire was generally well received. The main changes to the questionnaire were:

- Adding words to improve comprehension or accuracy
- Adding one more response category to a few questions
- Key words of some questions were emphasised (made bold) to reduce confusion over similarly formatted questions
- Questionnaire instructions and navigation were clarified by adding more explanation or by emphasising existing instructions.

The results of the pilot and changes made to the questionnaire were summarised in Appendix C.

3.4.4 Sampling procedure

Sample size estimates were derived to detect the statistically significant minimum differences between low and high socioeconomic groups (two-tailed hypothesis at 5% level of significance) outlined below:

- 7% prevalence in frequent takeaway food consumption
- 10% prevalence in frequent "healthy" and "less healthy" takeaway food consumption
- 10% prevalence in high takeaway food consumption scores
- 6% prevalence in vegetable intake less than four serves per day
- 10% prevalence in fruit intake less than two serves per day.

These socioeconomic group differences represent arbitrary cut-offs for between-group differences. Currently, there is no existing literature that quantifies a meaningful difference in these dietary outcomes in relation to diet-related chronic disease. In the sample size estimations a conservative difference of 6–10% was considered. Additional considerations in deriving minimum between-group differences were logistic and budgetary constraints. With 90% power, this survey required total of 1500 persons to be approached (Table 3.2). This assumed that 40% of those approached will not respond. Additionally, a non-experimental study design inflation factor of 15% was assumed. The following equations were used to derive the sample size estimate.

i) $A = \text{proportion}_1 \times (1 – \text{proportion}_1)$
ii) $B = \text{proportion}_2 \times (1 – \text{proportion}_2)$
iii) Sample size = $[10.5 \times (A + B)]/(\text{proportion}_1 – \text{proportion}_2)^2 \times 1.15$
iv) Final sample size = [sample size calculated in step iii)] x 2 (groups)

Table 3.2: Estimated sample size requirements

Measure	Socioeconomic measure	Minimum difference (%)[a]	Required sample (persons)
Frequent takeaway food consumers	Education	7%	1280
	Household income	7%	1280
Frequent healthy takeaway food consumers	Education	10%	938
	Household income	10%	938
Frequent less healthy takeaway food consumers	Education	10%	1285
	Household income	10%	1347
High healthy takeaway food score	Both measures	10%	1251
High less healthy takeaway food score	Both measures	10%	1251
Fruit intake < 2 serves/day	Education	10%	1347
	Household income	10%	1216
Vegetable intake < 4 serves/day	Education	6%	1043
	Household income	6%	875

[a] Minimum difference: between the highest and lowest socioeconomic groups

A representative population sample of Brisbane residents aged between 25–64 years was identified using the electoral roll for the Brisbane Statistical Subdivision. It is the most comprehensive sampling frame in Australia, as voting is compulsory for Australian citizens 18 years and over. The age range of 25–64 years was chosen for the following reasons. First, SEP is well established by 25 years of age because education is likely to have been completed and most people would have started to earn a wage. Second, younger Australians (17–25 years) are less likely to be enrolled on the electoral roll compared to other age groups (82% in the 17–25 year group vs 95% in other age groups) (Print, Saha, & Edward, 2004). Furthermore, age is associated with mail survey response, with younger adults (less than 25 years old) being less likely to respond to surveys compared with older adults (Eaker, Bergström, Bergström, Adami & Nyren, 1998; Tolonen et al., 2006). The coverage of this age group (25–64 years) was shown to be 95% (Australian Electoral Commission [AEC], 2008) and the same age group was the focus of the secondary analyses of the NNS.

The sample was drawn using a two-step process. First, the Australian Electoral Commission (AEC) randomly selected 20000 individuals residing in the study area. Second, the candidate selected 1500 individuals by simple random sampling from the

AEC list using a random number generator in SPSS (version 16.0, SPSS Inc., Chicago, Illinois, USA).

3.4.5 Ethical clearance

Ethical approval was obtained prior to undertaking the survey. The ethics approval certificate is provided in Appendix D.

3.4.6 Survey administration procedure and data collection

Data were collected by self-administered postal questionnaire (Appendix E) using the Dillman method (2000) to maximise the response rate. Briefly, Dillman (2000) states that there are five elements to improve the response to mail surveys in most situations. However, due to financial and time constraints, four elements were employed. The first element is to construct a respondent-friendly questionnaire which means that all questions need to be clear and use easy language, format, and order. Secondly, up to five compatible contacts with the questionnaire recipient should be made. These include:

1. A brief pre-notice letter that informs recipients that a questionnaire for an important survey will arrive in a few days
2. A questionnaire mailing that indicates why a response is important
3. A thank-you letter which expresses appreciation for responding
4. A replacement questionnaire for non-respondents
5. The final contact for non-respondents

The third element is to personalise survey mails. For example, print real names and use a real signature rather than a pre-printed salutation of “Dear Resident”. This personalised letter provides a positive sense of receiving a letter from a person rather than from someone anonymous. Lastly, a small gratuity was sent with the survey request rather than sending gratuities later (e.g. on receipt of a completed questionnaire) as sending in advance has shown to significantly improve response rate whereas sending gratuities later has shown little or no effect (Dillman, 2000): this effect is due to a sense of reciprocal obligation.

Based on these recommendations, one week before the first questionnaire was sent, a pre-notification letter was mailed to the selected participants. The first questionnaire package contained a cover letter, a self-administered questionnaire, a reply-paid self-addressed envelope, and a gratuity (to the value of $1). A reminder letter was sent to all participants one week after the initial questionnaire delivery to thank participants and to prompt non-responders to participate. Two weeks after the thank-you/reminder letter was sent, replacement questionnaires were sent to individuals who had not responded to the survey, and from whom an indication of refusal had not been obtained. A further two weeks after the replacement questionnaire was sent, a final reminder letter was sent to those who had not yet completed the survey.

Of the 1500 surveys mailed, n = 78 were returned to sender and n = 4 had health problems that inhibited the completion of the survey. Consequently, these people were out of scope and n = 1418 became the denominator used to calculate the response rate. A total of 903 participants returned the survey by the end of 2009, giving a response of 63.7%.

3.4.7 Test-retest reliability

Test-retest reliability of the survey was used to assess the reproducibility of the main outcome measurements used in the study. The main outcome measures were usual takeaway food consumption and fruit and vegetable intake, and were collected by self-administered FFQ. This dietary intake method is typically and widely employed to examine habitual dietary intake; however, FFQs have the potential to introduce substantial measurement error which raises concerns as such error can obscure the true associations (Kipnis et al., 2003). To date, a number of studies have examined the reproducibility of a FFQ; however, most of these have assessed reproducibility of nutrient intakes rather than intakes of specific food groups. In addition, no known study has assessed the reproducibility of survey items designed to elicit information about takeaway food consumption using an FFQ.

The test-retest study was conducted in 2009. A separate sample of 100 individuals from the main survey aged between 25–64 years was randomly selected from the electoral roll. These participants were administered the same survey twice, 4 weeks apart using a mail survey method. The selected participants received a pre-notification letter advising them of the study and that they would receive a survey shortly afterwards. One week later, a first questionnaire package was sent to these selected individuals and it contained: a cover letter, a self-administered questionnaire, a reply-paid and self-addressed envelope, and a gratuity (to the value of $1). A reminder letter was sent to all participants one week later. All non-respondents received a replacement questionnaire two weeks after the reminder. A final reminder letter was sent to those who had not yet completed the survey after a further two weeks. When the respondent's questionnaire was received, the date was noted and a second identical questionnaire was mailed one month later. After the survey was mailed to the selected 100 individuals, eight were returned to sender. Fifty-three replied to the first questionnaire (57.6% response rate) and 37 replied to the second questionnaire (69.8% response rate).

The main outcome measures assessed were fruit and vegetable intake, overall takeaway food consumption, and consumption of the 22 specific takeaway items. Two methods were used to evaluate reproducibility. The linear weighted kappa statistic was used to assess ordered categorical measures (Munoz & Bangdiwala, 1997), and the intra-class correlation (ICC) and the Bland-Altman method were used to evaluate the continuous measures (Bland & Altman, 1999; Blizzard & Stankovich, 2002).

Reproducibility of categorical dependent variables

The reproducibility of the measures of categorical outcome variables was evaluated by the linear weighted kappa statistic (Lantz, 1997; Sim & Wright, 2005) which is recommended for assessing agreement with ordered categorical data and it takes account of agreement due to chance (Landis & Koch, 1977). Interpretation of the kappa coefficient was based on Landis and Koch's classification: 0.00–0.20 = slight, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, and 0.81 and higher = almost perfect agreement (Landis & Koch, 1977). Crude agreement for each measure was also presented, as the magnitude of the kappa statistic is influenced by a highly skewed distribution to one category (Feinstein & Cicchetti, 1990; Sim & Wright, 2005).

Test-retest reliability of categorical variables is reported in Table 3.3. Measures for overall takeaway food and consumption of sushi, hamburger, pizza, and vegetable intake had “substantial” agreement. The mean kappa coefficient for “healthy” takeaway items was 0.48 (ranged from 0.17 to 0.71) whereas “less healthy” items was 0.53 (ranged from 0.34 to 0.66). All crude agreement exceeded 50% (ranged from 51 to 78%). One item for the consumption of pasta showed a kappa coefficient of 0.17 which indicates slight agreement although crude agreement showed 66%. This is likely to be due to one response category having a very high prevalence as the kappa coefficient is dependent on the distribution of the responses (Feinstein & Cicchetti, 1990; Sim & Wright, 2005). Therefore, it is not necessarily indicative of poor reliability. Overall, according to the kappa coefficients, the reproducibility of the categorical measures was in moderate agreement.

Table 3.3: Kappa coefficients and crude agreement for the main categorical outcome measures

	Kappa coefficient	% Crude agreement
Overall takeaway foods	0.71	63
"Healthy" items		
Sushi	0.71	78
Fruit or vegetable juice	0.59	58
Soft drink, diet	0.58	64
Asian-style noodles	0.54	75
Sandwiches	0.50	56
Salad (including fruit salad)	0.46	51
Kebab	0.41	77
Fried rice	0.36	67
Pasta	0.17	66
"Less healthy" items		
Hamburger	0.66	64
Pizza	0.61	70
Savoury pies, sausage rolls or pastries	0.60	70
Cakes, sweet buns, muffins or scones	0.58	61
Fried fish or fried seafood	0.57	66
Fried chicken	0.53	69
Soft drink, non-diet	0.53	64
Potato chips, fries or wedges	0.50	53
Curry	0.50	61
Ice-cream, ice-confection, or frozen yoghurt	0.50	53
Fried spring roll, dim sim or wonton	0.46	72
Flavoured milk or smoothie	0.45	75
Thick shake or milk shake	0.34	72
Fruit intake	0.54	71
Vegetable intake	0.65	74

Reproducibility of quantitative dependent variables

The ICC is "a measure of the proportion of variance that is attributable to objects of measurement" (McGraw & Wong, 1996, p. 30). In this study, the ICC was estimated using one-way ANOVA which assumed the data were a randomly selected sample (McGraw & Wong, 1996). There is no established guideline to interpret the ICC (Bartlett & Frost, 2008); however, the widely used Landis and Koch's classification was used to interpret the ICCs: 0.00–0.20 = slight, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, and 0.81 and higher = almost perfect (Landis & Koch, 1977).

The reproducibility of the outcome variables was also assessed by the 95% LOA. This method calculates the mean difference between two measurements on the same subject which indicates the "bias" as the mean differences of two reported values should be zero if the response to the first and the second item or scale is the same. Additionally, variance of these differences are calculated using SD of the difference, and 95% of the variation of these differences are expected to lie between ±2SD of the differences which indicate precision of the two measurements. Plotting the difference between a pair of response values against the mean difference values can visualise the agreement (disagreement) of the distribution and the extent of the agreement (or disagreement) for the responses to the two questionnaires (Bland & Altman, 1999). Using both methods to assess reproducibility of the test-retest reliability of quantitative measures has been recommended (Blizzard & Stankovich, 2002). Both methods are used here for following reasons: although the interpretation of the ICCs is difficult, there are some indications of cut-off points for the coefficients. However, the main limitation of the ICC is that this method is largely influenced by the variance of the measurements (Bartlett & Frost, 2008; Blizzard & Stankovich, 2002). In contrast, the Bland-Altman method is not influenced by these variances, but allows direct assessment of random and systematic error and is able to present these errors (Blizzard & Stankovich, 2002). Additionally, 95% LOA allows comparison to other studies relatively easily. However, the interpretation of the LOA may be difficult as this method does not have guidelines for interpretation. Therefore, two methods are employed to complement each limitation.

Both methods assume the differences between two measurements being approximately normally distributed. Since the differences of the repeated reports for overall takeaway food consumption and “less healthy” takeaway food index were not normally distributed, these measures were log-transformed (Bland & Altman, 1999).

The ICC, the mean difference of the two responses and their 95% LOA for these measures (Bland-Altman plots) are presented in Table 3.4 and Figure 3.1. The ICCs for overall takeaway food and vegetable intake measures had “excellent” reliability, whereas “healthy” and “less healthy” takeaway food indices and fruit intake measures had “fair to good” reliability. The bias (mean difference) for all main continuous outcome measures were generally small (ranged from –0.06 to 1.28) with reasonably good precision (inside of the limits of agreement).

Table 3.4: ICCs, mean difference and 95% limits of agreement (LOA) for continuous measures

Measure	ICC (95% CI)	Mean difference of two responses	95% LOA
Overall takeaway food	0.83 (0.70, 0.91)	0.91[a]	0.24, 3.42[a]
"Healthy" takeaway food index	0.72 (0.52, 0.85)	–1.28	–16.04, 13.48
"Less healthy" takeaway food index	0.69 (0.46, 0.83)	0.96[a]	0.26, 3.54[a]
Fruit intake	0.64 (0.40, 0.80)	–0.06	–1.12, 1.00
Vegetable intake	0.76 (0.57, 0.87)	–0.09	–1.08, 0.90

[a] Antilog value

Overall, the evaluation of the outcome variables' reproducibility (regardless of the nature of variables) indicates that all outcome measures had acceptable reproducibility and can be used for population-based dietary research among adults.

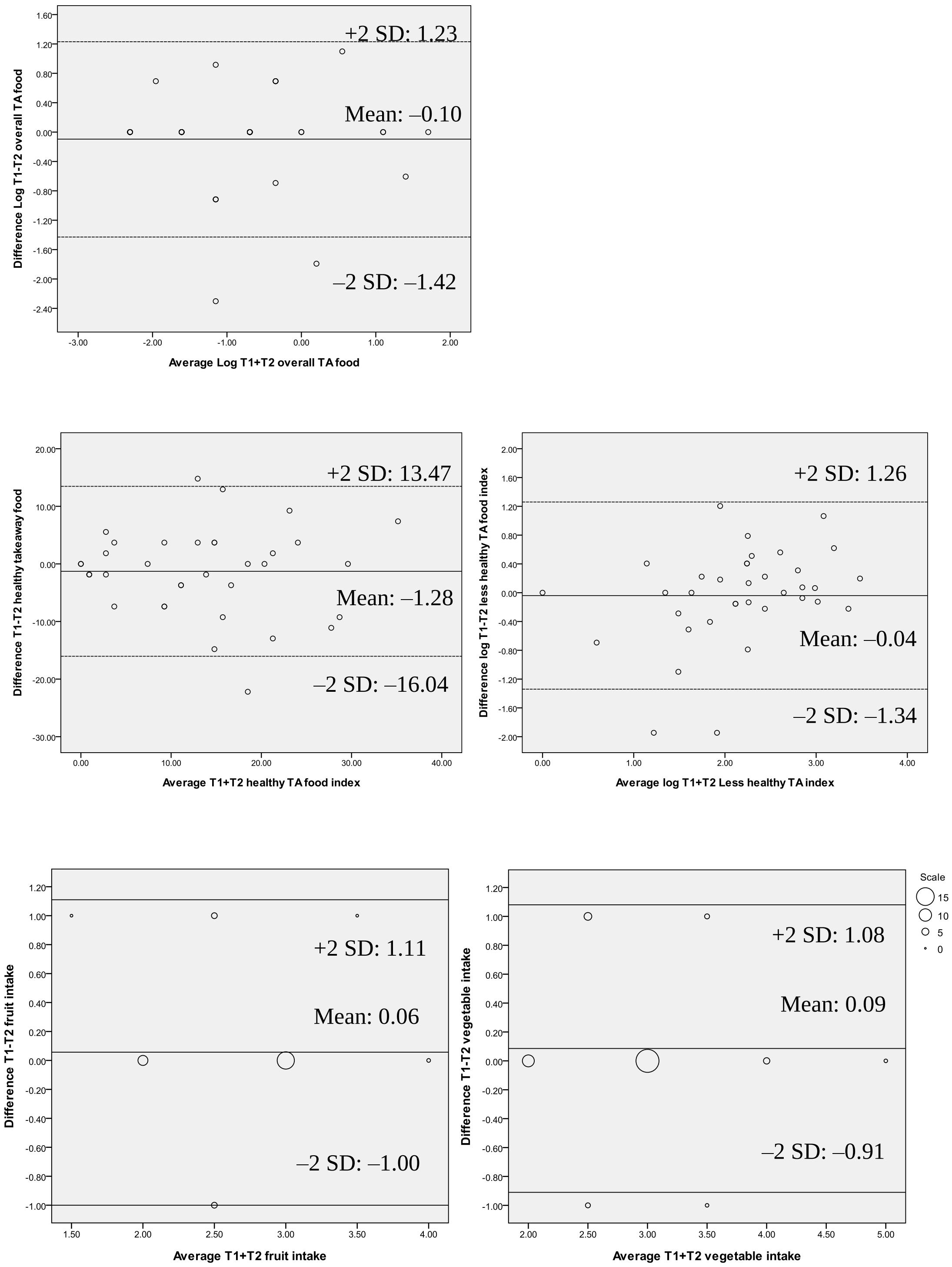

Figure 3.1: Bland-Altman plot of test-retest overall takeaway food, "healthy" and "less healthy" takeaway food indices, and measures for fruit and vegetable intake

3.4.8 Non-respondents and missing data

The only information for non-respondents available was gender and age. Compared with the Brisbane population (ABS, 2010), the study non-respondents were slightly more likely to be males and tended to be younger (Table 3.5). This suggests that the frequency of takeaway food consumption may be underestimated as men and younger age groups are more likely to consume these foods more frequently (Binkley, 2006; Mohr et al., 2007; Smith et al., 2009).

Table 3.5: Demographic characteristics of non-respondents

N=520[a]	n (%)	Census (%)[b]
Gender		
Males	271 (52.1)	49.2
Age (years)		
25–29	88 (16.9)	14.2
30–34	94 (18.1)	14.6
35–39	93 (17.9)	14.3
40–44	54 (10.4)	13.5
45–49	72 (13.8)	12.9
50–54	50 (9.6)	11.8
55–59	33 (6.3)	10.9
60–64	36 (6.9)	7.8

[a] Five survey respondents erased their ID numbers which prevented from identify who they were. Therefore, N=520, include these five survey respondents. True non-respondents were n=515.
[b] Compared with 2006 Census data (ABS, 2010).

Table 3.6 shows the socio-demographic comparisons of survey partial completers. Participants who had at least one item of missing information tended to be older, lower educated, have low income, and did not report their education or household income levels. However, there were no gender differences in having missing information in the survey responses. These results suggest that participants who had item non-response were likely to have different characteristics from the survey non-respondents. Having item non-response may be simply due to mistakes such as turning two pages together, or be a result of the characteristics of participants such as having poor eye sight (Dengler, Roberts, & Rushton, 1997) as those who had item non-response were more likely to be older.

Table 3.6: Characteristics of participants with and without missing data

N=903	Had at least one missing	No missing
Age (years) [mean (n, %)] (n=886)	46.1 (11.4)	43.9 (11.1)
F(1, 885)=4.11, p=0.043[a]		
Gender		
Males	55 (14.9)	313 (85.1)
Females	89 (16.6)	446 (83.4)
p=0.496 [b]		
Education		
Bachelor degree or higher (n=310)	26 (8.4)	284 (91.6)
Diploma (n=108)	16 (14.8)	92 (85.2)
Vocational (n=161)	26 (16.1)	135 (83.9)
No post-school qualifications (n=305)	60 (19.7)	245 (80.3)
Missing and inadequately described (n=19)	16 (84.2)	3 (15.8)
p<0.01 [b]		
Household income (AUS$)		
≥62000 (n=203)	30(14.8)	173 (85.2)
465001–61999 (n=203)	23 (11.3)	180(88.7)
30001–46500 (n=189)	18(9.5)	171 (90.5)
≤30000 (n=197)	33 (16.8)	164 (83.2)
Missing, don't want to report or don't know (n=111)	40 (36.0)	71 (64.0)
P<0.01 [b]		

[a] ANOVA for between groups
[b] X^2 analyses

Table 3.7 presents the education and household income differences for those with missing information on the main outcome variables. There are no significant differences in rates of missing data across different education or household income levels with one exception: the lowest educated group had slightly higher missing data for "healthy"/"less healthy" takeaway scores. Similarly, participants who did not report/did not want to report or did not know their income levels tended not to report the main outcome variables although this difference was not statistically significant. These results suggest that the dietary intake questions were easily understood by those who responded to the survey regardless of their level of education or household income. Previous research has reported that when questions have several options, participants tend to complete only those that apply to them (Dengler et al., 1997). This means that those who had missing information for either of the outcome measures in this study, may not consume any fruit and vegetables or never consume takeaway foods. In addition, as there were no socioeconomic differences in missing data for these outcome variables (with one exception) this may simply reflect the respondents' error in completing in the questionnaire.

Table 3.7: Missing in main outcome variables by education and household income

	n (%) Fruit	Vegetables	Overall takeaway food	Healthy and less healthy takeaway food
Education				
Bachelor degree or higher (n=310)	7 (2.3)	8 (2.6)	11 (3.5)	1 (0.3)
Diploma (n=108)	5 (4.6)	5 (4.6)	3 (2.8)	0 (0.0)
Vocational (n=161)	9 (5.6)	7 (4.3)	4 (2.5)	1 (0.6)
No post-school qualifications (n=305)	9 (3.0)	9 (3.0)	6 (2.0)	7 (2.3)
Missing and inadequately described (n=19)	1 (5.3)	1 (5.3)	1 (5.3)	1 (5.3)
	p=0.352	p=0.738	p=0.751	p=0.037
Household income				
≥62000 (n=203)	8 (3.9)	8 (3.9)	3 (1.5)	2 (1.0)
465001–61999 (n=203)	5 (2.5)	6 (3.0)	7 (3.4)	1 (0.5)
30001–46500 (n=189)	5 (2.6)	4 (2.1)	4 (2.1)	2 (1.1)
≤30000 (n=197)	7 (3.6)	6 (3.0)	6 (3.0)	2 (1.0)
Missing, don't want to report or don't know (n=111)	6 (5.4)	6 (5.4)	5 (4.5)	3 (2.7)
	p=0.663	p=0.604	p=0.525	p^2=0.505

P-values are from X2 analyses

Conclusions

This chapter briefly described the methods used to undertake this thesis that were not dealt with in the following research, but were not included in the published papers. The rationale for using two data sets for the research was presented, and each of the survey methods used was described. The following chapters present the four papers and the resulting analyses of these data.

Chapter 4: Socioeconomic differences in takeaway food consumption and their contribution to inequalities in dietary intakes

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified* that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
5. they agree to the use of the publication in the student's thesis and its publication on the Australasian Digital Thesis database consistent with any limitations set by publisher requirements.

In the case of this chapter:

Socioeconomic differences in takeaway food consumption and their contribution to inequalities in dietary intakes. (2009) *Journal of Epidemiology and Community Health*, *63*, 820–826.

Contributor	Statement of contribution*
Kyoko Miura	Conceptualised, analysed and interpreted the data, and drafted and revised the manuscript. Kyoko Miura (signature) 29/12/2011 Signature Date
Katrina Giskes*	Aided the study design, aided the data analyses and interpretation, and aided revising the manuscript.
Gavin Turrell*	Aided interpretation of the data and aided revising the manuscript.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors confirming their certifying authorship.

GAVIN TURRELL (signature) 5/1/12

Name Signature Date

Title: Socioeconomic differences in takeaway food consumption and their contribution to inequalities in dietary intakes

Citation:

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Official URL: http://jech.bmj.com/content/63/10/820

4.1 ABSTRACT

Background

Takeaway consumption has been increasing and may contribute to socioeconomic inequalities in overweight/obesity and chronic disease. This study examined socioeconomic differences in takeaway consumption patterns, and their contributions to dietary intake inequalities.

Method

Cross-sectional dietary intake data from adults aged between 25 and 64 years from the Australian National Nutrition Survey (N = 7319, 61% response rate). Twenty-four hour dietary recalls ascertained intakes of takeaway food, nutrients and fruit and vegetables. Education was used as socioeconomic indicator. Data were analysed using logistic regression and general linear models.

Results

Thirty-two percent (n = 2327) consumed takeaway foods in the 24 hour period. Lower-educated participants were less likely than their higher-educated counterparts to have consumed total takeaway foods (OR 0.64; 95% CI 0.52, 0.80). Of those consuming takeaway foods, the lowest-educated group was more likely to have consumed “less healthy” takeaway choices (OR 2.55; 95% CI 1.73, 3.77), and less likely to have consumed “healthy” choices (OR 0.52; 95% CI 0.36, 0.75). Takeaway foods made a greater contribution to energy, total fat, saturated fat, and fibre intakes among lower than higher-educated groups. Lower likelihood of fruit and vegetable intakes were observed among “less healthy” takeaway consumers, whereas a greater likelihood of their consumption was found among “healthy” takeaway consumers.

Conclusions

Total and the types of takeaway foods consumed may contribute to socioeconomic inequalities in intakes of energy, total and saturated fats. However, takeaway consumption is unlikely to be a factor contributing to the lower fruit and vegetable intakes among socioeconomically-disadvantaged groups.

4.2 INTRODUCTION

Socioeconomic health inequalities in many developed countries have been extensively documented, with disadvantaged groups experiencing higher rates of morbidity and mortality (Blakely et al., 2002; Mackenbach, Bakker, Kunst, & Diderichsen, 2002; Ramsay et al., 2008; Turrell et al., 2006). One major contributing factor to these inequalities in health is diet (Davey Smith & Brunner, 1997; James, Nelson, Ralph, & Leather, 1997). Socioeconomically disadvantaged groups have diets that are least consistent with recommendations for the prevention of chronic disease, including higher intakes of fat (Beydoun & Wang, 2008b; Friel et al., 2003), and lower intakes of micronutrients (e.g. vitamin C and folate) (Friel et al., 2003; Giskes et al., 2002b), fibre (Friel et al., 2003), and fruit and vegetables (Beydoun & Wang, 2008a; Forshee & Storey, 2006; Galobardes et al., 2001; Giskes et al., 2002b; Irala-Estevez et al., 2000; Lindström et al., 2001; Shohaimi et al., 2004).

The reasons for the poorer diets of disadvantaged groups are still unknown; however, dietary differences across socioeconomic groups may be due, in part, to concomitant differences in takeaway or fast-food consumption. Takeaway and fast-foods are forming an increasingly important component of the diet, with an ever-greater proportion of household food expenditure being spent on foods prepared outside the home (ABS, 1996, 2000, 2006). Frequent fast-food consumption has been found to have negative dietary and health consequences. Compared to those that do not eat fast-food, fast-food consumers have higher intakes of energy and fat (Bowman & Vinyard, 2004), and lower intakes of micronutrients (Guthrie et al., 2002). Additionally, fast-food consumption is thought to displace fruit and vegetable intakes, as a negative association between fast-food consumption and fruit and vegetable intakes has been found (Paeratakul et al., 2003; Pereira et al., 2005; Satia, Galanko, & Siega-Riz, 2004). Furthermore, frequent fast-food consumption has been shown to be associated with overweight or weight gain (Bowman & Vinyard, 2004; Duffey et al., 2007; Pereira et al., 2005). Therefore, more frequent takeaway (especially fast-food) consumption among disadvantaged groups may be a contributing factor to the dietary inequalities between socioeconomic groups, and their subsequent health inequalities.

Despite this, the results of studies from Australia, U.S. and Europe are mixed in terms of showing an association between socioeconomic position (SEP) and consumption of takeaway and fast-food. Some studies show a positive association (Bowman & Vinyard, 2004; Mohr et al., 2007; Paeratakul et al., 2003; Schröder et al., 2007; Turrell & Giskes, 2008), whereas others report a negative relationship (Pereira et al., 2005) or no association (Mohr et al., 2007; Satia et al., 2004). These inconsistent results may be due to two factors. Firstly, most studies have examined fast-food consumption, rather than the (more inclusive) category of takeaway food. "Fast-foods" are defined as foods from major fast-food chains (Larson et al., 2008; Paeratakul et al., 2003; Pereira et al., 2005) or places with no wait-staff, payment prior to receiving food, quick food service (Block, Scribner & DeSalvo, 2004) and self-service or carry-out places (Lin, Guthrie & Frazao, 1999). "Takeaway foods" comprise a wider variety of food types, although they have no standard definition (Turrell & Giskes, 2008). By broadening the scope of food included to incorporate takeaway foods rather than just fast-foods, associations between SEP and their consumption may change. Secondly, takeaway food is a heterogeneous category that includes both healthy and less-healthy foods, and socioeconomic groups may differ in their choice of these options. For example, advantaged groups may (on average) be more likely to choose salad sandwiches, whereas disadvantaged groups may choose potato fries. These different choices may lead to different dietary intakes and, consequently, to health differences across socioeconomic groups. Despite this, few known studies have examined socioeconomic differences in takeaway food consumption patterns, or have examined differences in the consumption of both healthy and less-healthy takeaway choices. A greater appreciation of socioeconomic differences in takeaway food consumption patterns may be an important step to understanding dietary inequalities and (subsequently) reducing the high prevalence of diet-related chronic diseases among disadvantaged groups.

This study examined whether socioeconomic groups differed in their takeaway food consumption, the types of takeaway foods they chose and whether takeaway food consumption made a differential contribution to intakes of energy, total fat, saturated fat and fibre. Furthermore, the study also sought to examine whether takeaway consumption was associated with fruit and vegetable intakes, and if inequalities in fruit and vegetable consumption were due (at least in part) to differences in takeaway food consumption.

4.3 METHODS

The data used in this study were collected by the Australian Bureau of Statistics (ABS) as part of the 1995 National Nutrition Survey (NNS), the most recent survey of its type conducted in Australia. Detailed information on the survey's sampling, scope and coverage, data collection procedures and data process have been published elsewhere (McLennan & Podger, 1998). Only a brief overview is provided here.

4.3.1 Scope and participants

The NNS was conducted among a sub-sample of participants from the 1995 Australian National Health Survey (ANHS). Sample selection for the ANHS was based on a multistage area sample of households. This method was employed to achieve appropriate representation of participants from urban and rural areas, all age groups, and sex across all States and Territories of Australia (McLennan & Podger, 1998). A total of 22,562 persons were selected from the ANHS to be interviewed for the NNS. After excluding refusals, non-contacts, and other non-respondents, the sample size for the NNS was 13,858 participants aged two years and over (response rate 61%) (McLennan & Podger, 1998). For this study, participants aged between 25 and 64 were selected from the NNS data (N = 7831). This age group was chosen as takeaway consumption patterns are likely to be established among this age group, and not influenced by transitory life circumstances (e.g. being a student) that characterise younger age groups. Furthermore, people's socioeconomic circumstances are more established by 25 years of age as education is often completed and they are more likely to be in occupations within their chosen profession.

4.3.2 Data collection

Qualified dietitians, trained in the NNS face-to-face interview procedure, collected data on food and nutrient intakes. Dietary intakes were collected by administering a 24-hour dietary recall. Interviews took place on all days of the week, with weekend days being equally represented as weekdays. The NNS adapted the multiple-pass 24-hour recall process from the US Continuing Survey of Food Intakes of Individuals (McLennan & Podger, 1998). Interviewers also collected data on a range of participants' socio-demographic characteristics.

4.3.3 Takeaway food consumption

During the 24-hour recall, detailed information was collected about where food was obtained for each food item participants reported consuming. This was classified in a 15-category variable on the NNS data set: 1) food store; 2) restaurant, café, cafeteria, takeaway/pizza/fast food place; 3) bar, tavern, hotel, club, pub; 4) school canteen; 5) vending machine; 6) childcare establishment; 7) welfare service; 8) meals on wheels; 9) grown/caught; 10) someone else/gift; 11) mail order purchase; 12) workplace tea trolley; 13) residential dining facility; 14) other or; 15) don't know. In order to identify takeaway foods, we initially considered all food items obtained from eating establishments in category 2. However, this category did not comprise establishments that sell takeaway foods exclusively. In order to further identify takeaway foods within this category, we listed the major food and drink items sold by the most frequent takeaway food stores in Australia. These include major chain takeaway franchises, snack bars and Asian takeaway outlets (Turrell & Giskes, 2008). This list comprised approximately 47 food types and is available from the authors on request. All food codes in the 24-hour recall pertaining to each of the 47 food types were determined. The 20 most frequently consumed takeaway food types were identified, and formed the basis of the analyses of takeaway food consumption in the current study.

To characterise participants' takeaway food consumption, a number of variables were constructed. Firstly, a dichotomous variable identified whether or not participants reported consuming any of the 20 takeaway food items. Secondly, takeaway foods were classified into "less healthy" and "healthy" choices. A number of factors informed on this classification: the Dietary Guidelines for Australians that promote choices lower in total and saturated fat, and higher in fibre (NHMRC, 2003a); and each food type's nutrient contents ("healthy" options were considered as those that have 10 g or less total fat per 100 g) as ascertained by the Foodworks® database (Xyris Software, 2007). Furthermore, the 20 takeaway foods were classified by two dietitians/nutritionists into "healthy" and "less healthy" choices.

4.3.4 Nutrient intakes

The nutrients examined in the current study pertain to those that have been associated with overweight/obesity and the development of chronic diet-related diseases such as cardiovascular diseases and some types of cancers, specifically energy, total fat, saturated fat and fibre intakes (NHMRC, 2003a; The U.S. Department of Agriculture & the U.S. Department of Health and Human Services, 2005; Van Duyn & Pivonka, 2000; World Cancer Research Fund & American Institute for Cancer Research, 2007). Food intake data were converted to nutrient intakes by a customised nutrient composition database developed by the Australian and New Zealand Food Authority (ANZFA). The primary source of information for foods in this database was the Composition of Foods Australia (Cashel, 1989). Other sources that were consulted were British, United States (US) and New Zealand food tables, as well as food industry data and unpublished food composition data from ANZFA (McLennan & Podger, 1998).

To ascertain the contribution of takeaway foods to total daily nutrient intakes, total intakes of each nutrient from takeaway food sources were determined for the 24-hour dietary reference period. Proportion contribution to daily intakes was calculated for each nutrient for all takeaway foods combined, as well as "less healthy" and "healthy" takeaway choices.

4.3.5 Fruit and vegetable consumption

From the 24-hour dietary recall, fruit and vegetable consumption was determined. Fruit or vegetables in mixed dishes (e.g. fruit yoghurt, spaghetti bolognaise) were not considered in estimates of fruit and vegetable consumption. The only exceptions to this were fruit and vegetable salads, which were included in estimates of fruit or vegetable intakes. Fruit consumption included pure fruit juices, raw, cooked, canned, frozen, or dried fruits. Vegetable consumption included all raw, cooked, canned, frozen, or dried vegetables and legumes; but excluded potatoes. Participants were dichotomised as consuming fruit and vegetables (yes/no).

4.3.6 Measurement of socioeconomic position

Individual-level measures of SEP available in the NNS data were occupation, household income, and education. Education was used in this present study as information on education was reported by most participants, whereas a large proportion of participants did not report their household income (n = 1377, 17.6%). Similarly, a significant number of participants (especially women) were not in the work force; therefore, they could not be classified into occupation (n = 2142, 27.4%). Education level also reflects material, intellectual, and other resources of family origin and has relevance to people regardless of age or working circumstances [37]. Participants' education was measured as age when they first left school, and was coded into three groups: under 15 years, 16–17 years, 18 years or more.

4.3.7 Demographic information

A range of demographic characteristics were collected from participants and used as co-variates in the analyses. These include age, sex, and country of birth. Age was collected as a continuous variable; however, it was categorised into five-year age intervals. Country of birth was grouped into five categories: Australia and New Zealand, UK and Ireland, Europe and Middle East, Asia, and other.

4.3.8 Statistical analyses

Of the 13,858 participants in the original NNS sample, those 24 years or younger and 65 years and older were excluded from the analyses (n = 6027). Participants reporting extreme nutrient intakes were also excluded (n = 505). Extreme intakes were defined as the smallest and greatest 1% of each nutrient and fruit and vegetable intakes. The only exception to this was dietary fibre, where only participants in the greatest 1% of intakes were excluded as it is plausible to have a fibre intake of 0 g per day. Those with missing information on education level (n = 7) were also excluded. The resulting analytic sample comprised of 7319 participants.

Logistic regression was performed to examine differences in the consumption of takeaway food, fruit and vegetables between education groups. The highest education level was used as the referent category in these analyses. General linear models were employed to examine the differences in the contributions of takeaway foods to total daily intakes between education groups. All analyses were adjusted for age, sex, country of birth. Analyses were conducted using SPSS version 16.0. Statistical significance was considered at $p \leq 0.05$ (two-tailed) for all tests.

4.4 RESULTS

Table 4.1 shows the demographic characteristics of the participants and their takeaway consumption patterns. More than half of the participants were women, and about three-quarters were born in Australia/New Zealand. The majority first left school between 15 and 17 years of age, and approximately one-third consumed takeaway food in the 24-hours prior to the interview. Among the "less healthy" takeaway choices, potato chips, fries, or wedges were the most-popular items. Among the "healthy" options, sandwiches were the most-popular item.

Table 4.1: Sociodemographic characteristics of participants and their takeaway consumption patterns

All participants (N=7319)	N (%)
Gender	
Male	3380 (46.2)
Female	3939 (53.8)
Age (years)	
25-29	1034 (14.1)
30-34	1134 (15.5)
35-39	1093 (14.9)
40-44	955 (13.0)
45-49	955 (13.0)
50-54	796 (10.9)
55-59	700 (9.6)
60-64	652 (8.9)
Country of birth	
Australia & New Zealand	5535 (75.6)
United Kingdom & Ireland	826 (11.3)
Europe & Middle East	482 (6.6)
Asia	261 (3.6)
Other	215 (2.9)
Age when first left school	
Under 15 years (low)	898 (12.3)
15-17 years (med)	5302 (72.4)
18 years or more (high)	1119 (15.3)
Consumed takeaway food	
Yes	2327 (31.8)
No	4992 (68.2)
Participants consuming takeaway foods (n = 2327):	
Takeaway item(s) consumed	
"Less healthy" options	
Potato chips, fries, or wedges	645 (27.7)
Soft-drink, non-diet	492 (21.2)
Hamburger	269 (11.6)
Pizza	221 (9.5)
Cakes, sweet buns, muffins, scones	193 (8.3)
Savoury pie, sausage roll, pastry roll	177 (7.6)
Fried fish or seafood	159 (6.8)
Ice cream, ice-confection, frozen yoghurt	152 (6.5)
Fried chicken	113 (4.9)
Flavoured milk, smoothie, non-diet	97 (4.2)
Deep fried spring roll, dim sim, or wonton	64 (2.7)
Thick shake, milk shake	59 (2.5)
"Healthy" options	
Sandwich	712 (30.6)
Fruit and fruit products (except juice)	209 (9.0)
Fruit and/or vegetable juice	183 (7.9)
Salad (except potato, coleslaw, pasta, rice salad)	181 (7.8)
Fried rice	120 (5.2)
Soft-drink, diet	114 (4.9)
Coleslaw salad	109(4.7)
Pasta	103 (4.4)

When socioeconomic differences in the types of takeaway foods consumed were examined, highly significant differences were observed (Table 4.2). Lower-educated participants were significantly less likely to consume takeaway foods (of any type) compared to their higher-educated counter parts ($p<0.01$ for between-group differences). Among takeaway consumers, the least educated group was nearly 2.6 times (OR 2.55, 95% CI 1.73 to 3.77) more likely to consume any type of “less healthy” choices compared to the highest-educated group. The least educated takeaway consumers were also about 50% less likely (OR 0.52, 95% CI 0.36 to 0.75) to consume any of the “healthy” takeaway choices. When specific foods within the “less healthy” category were examined the least-educated takeaway consumers were significantly more likely to consume potato chips (OR 2.12, 95% CI 1.40 to 3.21), non-diet soft-drinks (OR 2.05, 95% CI 1.28 to 3.28), and hamburgers (OR 1.96, 95% CI 1.11 to 3.44). In contrast, among takeaway consumers, the lowest-educated group were significantly less likely to consume most of the “healthy” takeaway choices, such as sandwiches (OR 0.57, 95% CI 0.38 to 0.85), fruit and fruit products (OR 0.26 95% CI 0.12 to 0.59), and salad (OR 0.34, 95% CI 0.15 to 0.78).

Table 4.2: Socioeconomic differences in the types of takeaway foods consumed[a]

	Age when first left school (years) OR (95% CI)			
	Under 15 (low)	**15-17 (med)**	**18 or more (high) (reference)**	**p-value[b]**
Consumed takeaway food (n=2327)	0.64 (0.52, 0.80)	0.81 (0.70, 0.93)	1.00	<0.01
***"Less healthy" options* (n=1391)**				
Potato chips, fries, or wedges	2.12 (1.40, 3.21)	1.44 (1.11, 1.86)	1.00	<0.01
Soft-drink, non-diet (include fruit drink)	2.05 (1.28, 3.28)	1.46 (1.10, 1.94)	1.00	0.01
Hamburger	1.96 (1.11, 3.44)	1.07 (0.76, 1.50)	1.00	0.04
Pizza	0.51 (0.24, 1.10)	0.88 (0.62, 1.26)	1.00	0.22
Cakes, sweet buns, muffins	0.81 (0.42, 1.57)	0.89 (0.60, 1.34)	1.00	0.80
Savoury pie, sausage roll, pastry roll	1.18 (0.53, 2.64)	1.78 (1.11, 2.86)	1.00	0.04
Fried fish or seafood	1.44 (0.68, 3.03)	1.49 (0.90, 2.46)	1.00	0.30
Ice-cream, ice confection, or frozen yoghurt	2.03 (1.00, 4.14)	1.40 (0.85, 2.31)	1.00	0.15
Fried chicken	1.14 (0.47, 2.80)	1.11 (0.67, 1.84)	1.00	0.92
Total "less healthy" options	2.55 (1.73, 3.77)	1.48 (1.18, 1.85)	1.00	<0.01
***"Healthy" options* (n=1191)**				
Sandwich	0.57 (0.38, 0.85)	0.73 (0.58, 0.92)	1.00	0.01
Fruit and fruit products (except juice)	0.26 (0.12, 0.59)	0.76 (0.53, 1.10)	1.00	0.01
Fruit and/or vegetable juice	0.51 (0.25, 1.03)	0.56 (0.39, 0.81)	1.00	0.01
Salad (except potato, coleslaw, pasta, rice salad)	0.34 (0.15, 0.78)	0.82 (0.55, 1.21)	1.00	0.04
Fried rice	2.19 (1.01, 4.76)	1.39 (0.80, 2.43)	1.00	0.14
Soft-drink, diet	1.48 (0.60, 3.67)	1.39 (0.80, 2.40)	1.00	0.48
Total "healthy" options	0.52 (0.36, 0.75)	0.72 (0.57, 0.89)	1.00	<0.01

a Analyses adjusted for gender, age and country of birth.
b P-value for between-group differences.

When socioeconomic differences in the contribution of takeaway foods to nutrient intakes were examined among those who reported consuming takeaway foods, takeaway consumption made a greater contribution to the energy, total fat, saturated fat, and fibre intakes of lower-educated groups (Table 4.3). With the exception of fibre intakes, education differences in the contribution of takeaway foods to nutrient intakes were either statistically significant or borderline significant (i.e. $p \leq 0.07$ for between-group differences). When consumption of “healthy” and “less healthy” choices was examined separately, similar education trends were observed; however, these did not reach statistical significance.

Table 4.3: Nutrient intakes from takeaway foods by socioeconomic position (percentage contributions)[a]

	Contribution of all takeaway foods to total daily intakes (% of total daily intake) Mean (95% CI)			
	Energy	**Total fat**	**Saturated fat**	**Fibre**
n=2327				
All groups combined [median (range)]	22.1 (0, 100.0)	25.4 (0, 100.0)	23.5 (0, 100.0)	20.0 (0, 100.0)
Age when first left school				
Under 15 years (low)	26.8 (23.7, 30.0)	29.4 (25.7, 33.0)	29.7 (26.0, 33.5)	23.1 (19.6, 26.5)
15-17 years (med)	24.6 (22.8, 26.4)	28.5 (26.4, 30.6)	27.9 (25.8, 30.0)	22.9 (21.0, 24.9)
18 years or more (high)	22.7 (20.5, 25.0)	25.7 (23.2, 28.3)	24.6 (21.9, 27.2)	21.2 (18.7, 23.6)
P-value for between-group differences	0.06	0.07	0.01	0.31
	Contribution of “less healthy” options to total daily intakes (% of total daily intake) Mean (95% CI)			
n=1391	**Energy**	**Total fat**	**Saturated fat**	**Fibre**
All groups combined [median (range)]	20.6 (0.30, 92.4)	23.8 (0, 100.0)	23.9 (0, 100.0)	17.7 (0, 100.0)
Age when first left school				
Under 15 years (low)	24.0 (20.7, 27.3)	27.2 (22.9, 31.4)	28.4 (24.0, 32.8)	19.9 (16.0, 23.8)
15-17 years (med)	22.6 (20.6, 24.6)	26.9 (24.3, 29.4)	27.7 (25.1, 30.4)	19.2 (16.8, 21.5)
18 years or more (high)	21.3 (18.8, 23.8)	25.3 (22.1, 28.5)	25.8 (22.5, 29.1)	17.3 (14.3, 20.3)
P-value for between-group differences	0.37	0.57	0.43	0.38
	Contribution of “healthy” options to total daily intakes (% of total daily intake) Mean (95% CI)			
n=1191	**Energy**	**Total fat**	**Saturated fat**	**Fibre**
All groups combined [median (range)]	16.1 (0, 96.3)	17.2 (0, 98.4)	13.7 (0, 100.0)	16.9 (0, 100.0)
Age when first left school				
Under 15 years (low)	17.2 (13.9, 20.4)	18.0 (13.7, 22.3)	17.1 (13.0, 21.3)	17.6 (13.6, 21.6)
15-17 years (med)	16.8 (15.1, 18.6)	18.9 (16.6, 21.3)	16.9 (14.6, 19.2)	20.1 (18.0, 22.3)
18 years or more (high)	16.4 (14.2, 18.5)	18.1 (15.3, 20.9)	16.0 (13.2, 18.8)	19.7 (17.0, 22.3)
P-value for between-group differences	0.88	0.76	0.77	0.44

a Analyses adjusted for gender, age and country of birth.

The results for the education differences in fruit and vegetable intake showed that lower- educated participants were more than three times as likely (OR 3.40, 95% CI 2.34 to 4.95) as the highest educated group to not consume fruits or vegetables (Table 4.4). Takeaway consumption and the type of takeaway choices did not markedly contribute to the education inequalities in fruit and vegetable consumption, as seen by negligible attenuation of educating inequalities when takeaway consumption (and type of takeaway consumed) was added to the model. Participants who made “less healthy” takeaway choices were less likely to consume fruit and vegetable (OR for not consuming fruit and vegetables 1.71, 95% CI 1.42 to 2.07), whereas those consuming “healthy” takeaway options were more likely to consume fruit or vegetables (OR for not consuming fruit and vegetables 0.38, 95% CI 0.28 to 0.51). Participants who consumed any takeaway food were less likely (OR for not consuming fruit and vegetables 1.29, 95%CI 1.08 to 1.53) to have consumed fruit and vegetables.

Table 4.4: The contributions of takeaway food consumption to education inequalities in fruit and vegetable intake[a]

Age when first left school	OR of consuming no fruit/vegetables (95% CI)			
	All participants (N=7319)			
	Base model	**Base model + "less healthy" takeaway foods**	**Base model + "healthy" takeaway foods**	**Base model + all takeaway foods**
Did not consume any fruit and vegetables (include fruit juice, exclude potato)				
Under 15 years (low)	3.40 (2.34, 4.95)	3.40 (2.34, 4.95)	3.16 (2.17, 4.61)	3.49 (2.40, 5.09)
15-17 years (med)	2.02 (1.52, 2.69)	2.02 (1.52, 2.70)	1.94 (1.45, 2.59)	2.05 (1.54, 2.73)
18 years or more (high)	1.00	1.00	1.00	1.00
Consumed "less healthy" takeaway foods				
Yes		1.71 (1.42, 2.07)		
No		1.00		
Consumed "healthy" takeaway foods				
Yes			0.38 (0.28, 0.51)	
No			1.00	
Consumed any takeaway foods				
Yes				1.29 (1.08, 1.53)
No				1.00

a Analyses adjusted for age, sex, country of birth

4.5 DISCUSSION

4.5.1 Main results

The findings of this study showed that lower-educated participants were significantly less likely to consume takeaway foods compared to their higher-educated counterparts. However, among those that consumed takeaway foods, lower-educated participants were more likely to consume “less healthy” takeaway foods and less likely to consume the “healthy” options. Among takeaway consumers, takeaway foods also made a greater contribution to the energy, total fat, saturated fat, and fibre intakes of lower-educated groups. Takeaway consumers were less likely to consume fruit and vegetables. However, those reporting “healthy” takeaway choices were more likely to eat fruit and vegetables. Takeaway consumption patterns did not make a marked contribution to explaining socioeconomic inequalities in fruit and vegetable consumption.

4.5.2 Study limitations

A number of limitations need to be considered. Firstly, the data used for this study were collected in 1995. From 1995 to the present time trends in eating patterns, particularly the prevalence and the frequency of takeaway food consumption, may have increased. Nevertheless, the 1995 NNS is the most-recent Australian quantitative dietary intake estimate for a large nationally-representative sample. Additionally, there is no evidence to suggest that the relationships between SEP and takeaway food consumption have changed during this time. Secondly, the 24-hour recall method relies on participant’s ability to recall, describe and quantify consumption in detail. However, cognitive function including recall ability has been shown to be lower among socioeconomically disadvantaged groups (Kaplan et al., 2001; Lee, Kawachi, Berkman, & Grodstein, 2003). Consequently, our results may underestimate the true socioeconomic differences. Twenty-four hour dietary recalls only represent one day in the participant’s diet, therefore may not represent ‘typical’ consumption patterns. Use of multi-day dietary intake data and/or food frequency questionnaire may represent ‘usual’ intakes more adequately. However, this is unlikely to influence the direction and magnitude of the associations with SEP reported in this study. Furthermore, our measure of takeaway food was not inclusive of all takeaway foods consumed by participants. However, the list of takeaway food includes the major food and drink items sold by the most-frequent takeaway food outlets in Australia. Therefore, the foods considered in the current study are likely to capture the major takeaway food consumption patterns in Australia.

4.5.3 Comparison with previous studies

Similar to our results, studies from Spain and Australia have found that higher-educated groups are more likely to consume takeaway foods (Schröder et al., 2007; Turrell & Giskes, 2008). However, a US study showed opposite results (Pereira et al., 2005), and other studies from Australia and the US have shown no association (Mohr et al., 2007; Satia et al., 2004). These inconsistent results may be due to the inclusion of different foods in the definitions of “fast food”, and the more-encompassing category of “takeaway food”. Furthermore, inconsistency in some of the associations found may be due to the different measures of education used—some studies assess the highest (attained) level of education, whereas others (such as the current study) use age left school, which may be less sensitive in differentiating socioeconomic disadvantage.

Previous studies have found that takeaway foods contain higher energy and fat contents compared to food prepared at home (Bowman & Vinyard, 2004; Guthrie et al., 2002). In particular, a number of foods prepared outside the home including potatoes, filled rolls and hamburgers were found to make a higher contribution to energy intakes (Burns et al., 2002). The high fat and consequently high energy contents of these foods may explain why “less healthy” takeaway foods made a higher contribution to participants’ energy, total fat, and saturated fat intakes compared to those consuming “healthy” choices. Similar to the findings of our study, several studies also reported a negative association between takeaway food consumption and fruit and vegetable intakes (Bowman & Vinyard, 2004; Schröder et al., 2007).

4.5.4 Explanation of findings

Higher takeaway consumption was observed among the higher-educated groups. This finding may be related to time constraint factors as time allocation for eating and longer working hours have been shown to be related to takeaway consumption (Binkley, 2006; Candel, 2001; Mohr et al., 2007). Socioeconomically advantaged groups are more likely to be employed full time (Turrell, 1998b). This may lead to a lack of time for meal preparation and the decision to eat takeaway foods among higher socioeconomic groups. Furthermore, the relatively higher price of takeaway meals compared to home-prepared meals may be less of a barrier for higher socioeconomic groups.

To date, there have been no known published studies that have examined the nature of takeaway food choices by SEP using a nationally-representative sample. A number of factors may contribute to socioeconomic differences in the choices of takeaway foods observed. Firstly, when disadvantaged people choose takeaway food, they may consider the cost rather than the nutrient content of the food. According to Drewnowski and Spector (2004), foods that are high in energy density (MJ per kg) are lower in cost ($ per MJ). These factors may result in disadvantaged groups choosing less expensive but energy dense ("less healthy") foods. Secondly, among disadvantaged groups, taste may influence the choice of takeaway foods more strongly than among educated groups. Socioeconomically-disadvantaged groups are less likely to have food preferences consistent with dietary guideline recommendations (Turrell, 1998b). Furthermore, although taste is an important factor in food choice (Guthrie et al., 1999), higher educated groups may consider other factors such as nutrient contents and/or weight concerns (Inglis et al., 2005; Kearney et al., 2000).

Additionally, the availability and accessibility of "healthy" takeaway choices between low- and high-socioeconomic groups may differ. Australian and US studies have found that low-income neighbourhoods have a higher density of fast-food outlets (Block et al., 2004; Reidpath, Burns, Garrard, Mahoney, & Townsend, 2002). One Australian study has shown that disadvantaged areas have greater accessibility to fast-food outlets compared to more-advantaged areas (Burns & Inglis, 2007). However, another Australian study found that the number of takeaway shops, road distance to the closest takeaway outlets and purchase of takeaway food was not associated with the deprivation characteristics of areas (Turrell & Giskes, 2008).

Participants consuming "healthy" takeaway choices were more likely to consume fruit and vegetables than those making "less healthy" choices. Differential health and diet awareness, nutritional knowledge and skills may contribute to these differences. Studies have found that takeaway food consumers are less likely to be concerned about diet and health (Mohr et al., 2007; Satia et al., 2004). Similarly, frequent takeaway food consumers were more likely to perceive difficulties preparing and purchasing healthy meals (Satia et al., 2004). Conversely, people who choose "healthier" takeaway options may have better nutritional skills. For example, people who purchased food at Subway obtained food that had a lower energy content and were more likely to consult the calorie information compared with other fast-food consumers (Bassett et al., 2008). In addition, "healthy" takeaway foods such as a salad are more likely to contain fruits or vegetables whereas less healthy options such as cake are not.

4.5.5 Recommendations

In summary, choice of takeaway food and the contributions of these foods to dietary intakes were significantly different across socioeconomic groups. The popularity of "less healthy" takeaway choices and the higher contributions of these choices to total intakes of energy, fat and saturated fat among disadvantaged groups may have an impact on the higher prevalence of overweight/obesity and chronic diseases seen among these groups. The lower fruit and vegetable intakes among disadvantaged groups and takeaway consumers are of concern. As more people consume takeaway foods with increasing frequency, takeaway foods are becoming an important part of the diet. Therefore, increasing the availability and promotion of healthy takeaway foods will be necessary to improve dietary quality and to promote health, particularly among disadvantaged groups. Further research is needed to understand the takeaway consumption patterns found in the current study, and the contributions of different factors such as nutrition knowledge and cooking-related skills, to the choice and frequency of takeaway consumption across socioeconomic groups.

Chapter 5: Socioeconomic differences in takeaway food consumption among adults

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified* that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
5. they agree to the use of the publication in the student's thesis and its publication on the Australasian Digital Thesis database consistent with any limitations set by publisher requirements.

In the case of this chapter:

Socio-economic differences in takeaway food consumption among adults. (2012) *Public Health Nutrition*. 15, 218–226.

Contributor	Statement of contribution*
Kyoko Miura	Conceptualised the study, collected the data, analysed and interpreted the data, and drafted and revised the manuscript. [signature] 29/12/2011 Signature Date
Katrina Giskes*	Aided the study design, revision of the manuscript.
Gavin Turrell*	Aided the interpretation of the data and the drafting and revision of the manuscript.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors confirming their certifying authorship.

GAVIN TURRELL [signature] 5/1/12

Name Signature Date

Title: Socioeconomic differences in takeaway food consumption among adults

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5.1 ABSTRACT

Objective:

To examine socioeconomic differences in the frequency and types of takeaway foods consumed.

Design:

Cross-sectional postal survey.

Setting:

Participants were asked about their usual consumption of overall takeaway food (less than four times a month, or four times or more per month) and 22 specific takeaway food items (less than once a month, or once or more per month): these latter foods were grouped into “healthy” and “less healthy” choices. Socioeconomic position was measured using education and equivalised household income and differences in takeaway food consumption were assessed by calculating prevalence ratios using log binomial regression.

Subjects:

Adults aged 25–64 years from Brisbane, Australia were randomly selected from the electoral roll (N = 903, 63.7% response rate).

Results:

Compared with their more educated counterparts, the least educated were more regular consumers of overall takeaway food, fruit/vegetable juice, and less regular consumers of sushi. For the “less healthy” items, the least educated more regularly consumed potato chips, savoury pies, fried chicken, and non-diet soft drinks; however, the least educated were less likely to consume curry. Household income was not associated with overall takeaway consumption. The lowest income group were more regular consumers of fruit/vegetable juice compared with the highest income group. Among the “less healthy” items, the lowest income group were more regular consumers of fried fish, ice-cream, and milk shakes, while curry was consumed less regularly.

Conclusions:

The frequency and types of takeaway foods consumed by socioeconomically disadvantaged groups may contribute to inequalities in overweight/obesity and chronic disease.

5.2 INTRODUCTION

The association between socioeconomic position (SEP) and takeaway food has been examined in a number of Australian (Inglis et al., 2008; Miura, Giskes, & Turrell, 2009; Mohr et al., 2007; Smith et al., 2009; Thornton et al., 2011; Turrell & Giskes, 2008) and international studies (Fanning et al., 2010; Pereira et al., 2005; Schröder et al., 2007). To date, the findings of this work are mixed, with some studies showing that socioeconomically advantaged groups are more likely to purchase or consume takeaway food (Fanning et al., 2010; Miura et al., 2009; Turrell & Giskes, 2008) whereas others report the opposite (Inglis et al., 2008; Pereira et al., 2005; Schröder et al., 2007; Thornton et al., 2011) or no association (Mohr et al., 2007; Smith et al., 2009). This mixed evidence is hindering efforts to better understand dietary inequalities between socioeconomic groups, and ultimately address diet-related risk factors and higher rates of chronic disease among the disadvantaged.

The inconsistent evidence in relation to SEP and takeaway food may be due to the fact that studies have conceptualised and measured takeaway foods in different ways. Most have used measures that reflect the consumption of so-called "fast-foods" such as hamburgers, pizza, chips, and meat pies which are typically purchased from fast-food restaurants, snack bars, or convenience stores (Fanning et al., 2010; Inglis et al., 2008; Mohr et al., 2007; Paeratakul et al., 2003; Pereira et al., 2005; Schröder et al., 2007; Thornton et al., 2011). Other studies have used a more encompassing definition of takeaway food that includes fast-food and other food-types such as sandwiches, Asian takeaway foods, kebabs, and sushi (Miura et al., 2009; Smith et al., 2009; Turrell & Giskes, 2008). Although there is no standard definition of "takeaway" foods, they include a wide variety of foods that may be more (or less) consistent with dietary recommendations (hereafter termed "healthy" and "less healthy" choices). Socioeconomic groups may differ in their choices of these types of takeaway foods; for example, disadvantaged groups may be more likely to choose "less healthy" options such as hot chips while advantaged groups may select "healthy" options such as sushi. Differences in the nature of takeaway food choices may account for the inconsistent evidence in the findings of studies that examine SEP and takeaway food. Furthermore, different takeaway choices by socioeconomic groups may be reflected in higher intakes of fat and sugar and lower fibre intakes among disadvantaged groups (Beydoun & Wang, 2008b), and thus contribute to inequalities in diet-related chronic disease and associated risk factors such as obesity.

Other factors are limiting our understanding of socioeconomic differences in takeaway food consumption. First, there is a lack of up-to-date information about takeaway consumption among socioeconomic groups in Australia using a more inclusive definition of takeaway foods, with the most recent Australian estimates being derived from the 1995 National Nutrition Survey (Miura et al., 2009). The intervening 15 years have been characterised by marked changes in the takeaway and fast-food environment in Australia, with a significant increase in takeaway food sales (ABS, 2008) and product diversification to include healthier takeaway food choices (Australian Food News., 2008). Given takeaway food has become an increasingly important part of the diet in Australia (Miura et al., 2009), USA (Paeratakul et al., 2003) and other countries, examining socioeconomic differences in takeaway consumption, and the types of choices made, is a necessary prelude to addressing diet-related health inequalities.

Second, no known study has examined the reliability of survey items designed to elicit information about takeaway food consumption using a food frequency questionnaire (FFQ), which is one of the most widely used methods of collecting habitual dietary information in epidemiologic research (Willett, 1998). A number of studies have discussed the reproducibility of FFQs; however, most of these have assessed reproducibility of nutrient intakes rather than intakes of specific food groups (Boucher et al., 2006; Smith, Mitchell, Reay, Webb, & Harvey, 1998; Stevens et al., 1996). Takeaway food consumption is a specific dietary behaviour that can affect nutrient intakes and therefore, dietary quality. Assessing the reliability of self-reported responses to items measuring takeaway food consumption is critical, as self-reports can introduce substantial measurement error which may lead to biased risk estimates (Kipnis et al., 2003). These errors may contribute to the inconsistent findings of studies examining socioeconomic variations in takeaway food consumption. Therefore, reliability assessment is necessary to estimate the quality of takeaway food consumption information collected to determine the reproducibility of peoples' responses (Willett, 1998).

The aim of this study is to examine the association between SEP and takeaway food where "takeaway" is defined as foods or meals that are pre-prepared commercially and require no further preparation by the consumer, and can be consumed immediately after purchase. The takeaway food data were collected in 2009, and consumption patterns are examined on the basis of food-types that reflect the large diversity and "healthiness" of takeaway foods available in contemporary Australia. Further, the study assesses the reliability of people's responses to questions that ask about takeaway food consumption using a test-retest study.

5.3 METHODS

Ethical approval for this research was obtained from the Queensland University of Technology Human Research Ethics Committee (ID 0900000445).

5.3.1 Participants

This cross-sectional study was conducted in the Brisbane metropolitan area, Australia in 2009. The sampling frame was the electoral roll for the Brisbane Local Government Area and comprised men and women aged between 25 and 64 years. This age group was chosen as takeaway food consumption patterns are likely to be well established by adulthood, and not influenced by transitory life circumstances (e.g. being a student) that characterise younger age groups. Furthermore, individuals' socioeconomic circumstances are established by 25 years of age as education is often completed and they are more likely to be in occupations within their chosen profession. The sample was drawn using a two-step process. First, the Australian Electoral Commission (AEC) randomly selected 20000 individuals residing in the study area, and second, the principal author (K.M) selected 1500 individuals by simple random sampling from the AEC list using a random number generator in SPSS (version 16.0, SPSS Inc., Chicago, Illinois, USA).

Data were collected by a self-administered 16-page mail survey that asked about usual takeaway food consumption patterns and socio-demographic characteristics. The selected participants received questionnaires with postage-paid return envelopes. Up to three contacts were made after the participants received the first survey to maximise the response rate (Dillman, 2000). A total of 903 participants returned the survey (response rate 63.7%). Those who did not report or provide sufficient information on age, education, and takeaway food consumption were excluded (n = 44), which reduced the analytic sample to 859.

5.3.2 Measures

Overall takeaway food consumption

Participants were asked whether they ate any takeaway food in the last 12 months. Response options were: never, rarely, less than once a month, 1–3 three times per month, once a week, 2–4 times per week, 5–6 times per week, and once a day. To characterise participants as frequent takeaway food consumers, these responses were subsequently categorised into two groups: less than 4 times per month, and 4 times or more per month. This decision was made according to the sample distribution of takeaway food consumption.

Consumption of specific takeaway items

Participants who reported eating takeaway food (n=841) were asked how often they usually ate each of 22 takeaway items. Similar to the overall takeaway food measure, seven response options ranged from "never or rarely" to "once per day or more". Initially, these responses were grouped into two groups in the same manner as overall takeaway food; however, small numbers of participants reported consuming some takeaway items 4 times or more per month. Consequently, responses for the 22 takeaway items were dichotomised into two groups for analysis: less than once per month, and once or more per month. The 22 takeaway items were identified from the 1995 National Nutrition Survey and a more recent marketing report as the most-frequently consumed takeaway items in the Australian population (BIS Shrapnel, 2008; Miura et al., 2009).

To characterise takeaway food consumption patterns, each of these 22 items were classified as either "healthy" or "less healthy" choices. Similar to a previous study (Miura et al., 2009), this classification was based on the Australian Guide to Healthy Eating (AGHE) (The Commonwealth Department of Health and Family Services, 1998) which categorises foods into five core food groups and "extra" foods.

The “extra” foods (e.g. cakes, pastry, deep-fried takeaway foods, ice-cream, and non-diet soft-drinks) are a non-essential part of a diet, do not provide many essential nutrients, and are typically high in fat, salt, or sugar. Most of the “less healthy” takeaway items in this study were consistent with the “extra” foods as defined in the AGHE. Nutrient composition data were used to classify foods not identified in the “extra” food list (New South Wales Health and New South Wales Department of Education and Training, 2006; Queensland Health, 2007). Foods meeting one or more the following criteria were classified as “less healthy”: greater than 2500 kJ of energy per serve; greater than 3g of saturated fat per 100 g; less than 2 g of fibre per serve. Beverages classified as “less healthy” were those containing 600 kJ or higher energy per serve and/or greater than 3 g of saturated fat per 100 g. Foods or beverages not meeting any of these criteria were considered “healthy” options. This classification resulted in nine “healthy” and 13 “less healthy” items.

Socioeconomic measure

SEP was measured using the respondent’s highest completed education qualification and total gross household income. Education was coded as 1) bachelor degree or higher (included graduate diploma or graduate certificate, masters degree or doctorate), 2) diploma, 3) vocational (trade or business certificate), and 4) no post-school qualifications. This educational classification has been used in other Australian studies examining SEP and diet (Turrell et al., 2003; Turrell & Kavanagh, 2006).

For household income, participants were asked to estimate their total pre-tax household income from 11 pre-defined categories. Equivalised household income was calculated by allocating a weight of 1.0 to the first adult in the household: additional adults thereafter were weighted as 0.5, and children under 18 years were weighted 0.3 (Atkinson, Rainwater, & Smeeding, 1995; OECD, 2009). Total annual household income was then divided by the number of household income units. Equivalised household income was categorised into quartiles: 1) $62000 or higher, 2) $46501–$61999, 3) $30001–$46500, 4) $30000 or lower.

5.3.3 Test-retest reliability

A separate sample of 100 individuals in the target age range was randomly selected from the electoral roll. These participants received the same survey twice, four weeks apart. Eight individuals did not reside at the same address, 53 replied to the first questionnaire (response rate 57.6%), and 37 participants replied to the second questionnaire (response rate 69.8%). Reliability for the measures of overall takeaway food consumption and consumption of the 22 takeaway items was assessed by the linear weighted kappa statistic (Lantz, 1997; Sim & Wright, 2005). The original categories for each measure (eight categories for the consumption of overall takeaway food, and seven categories for the 22 takeaway items) were used to obtain kappa statistics. Interpretation of the kappa coefficient was based on Landis and Koch's classification: 0 or lower = poor agreement, 0.01–0.20 = slight, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, and 0.81–1.00 = almost perfect agreement (Landis & Koch, 1977). Crude agreement (%) for each measure was also presented as low kappa values can result from skewed distributions (which actually reflect a highly reliable response pattern).

5.3.4 Statistical analyses

Descriptive statistics were used to describe the participant's demographic and takeaway food consumption characteristics. Socioeconomic differences in the consumption of overall takeaway food and the 22 takeaway items were assessed by calculating prevalence ratios and their 95% confidence intervals (CI) using log binomial regression (Barros & Hirakata, 2003; Blizzard & Hosmer, 2007). The highest education and income groups were the referent categories in these analyses. All multivariable analyses were adjusted for age and sex. Bivariate analyses were performed in SPSS (version 18.0.1, SPSS Inc., Chicago, Illinois) and log binomial regression was computed using SAS (version 6.2, SAS Institute, Cary, NC).

5.4 RESULTS

Table 5.1 shows the participants' socio-demographic characteristics. More than 50% of participants were female, and the mean age was 44.2 years. Compared with the Brisbane population (ABS, 2010) the study sample slightly over-represented females, older and more educated groups. Participants in the test-retest reliability study had similar gender proportions to the main study. However, they were slightly younger (mean 43.2 years) with fewer participants from the highest educated and household income groups.

Table 5.1: Socio-demographic characteristics of participants

	Study sample N=859	Census*	Test-retest N=37
Gender (%)			
Male	40.9	49.2	40.5
Females	59.1	50.8	59.5
Age †	44.2 (11.1)	42.7 (11.0)	43.2 (11.6)
Highest completed education (%)			
Bachelor degree or higher	34.8	28.7	21.6
Diploma	12.2	10.0	16.2
Vocational	18.3	19.0	24.3
No post-school qualifications	34.7	42.3 ‡	37.8
Household income § (%)			
≥ $62000	25.6		17.6
$46501–$61999	25.6		29.4
$30001–$46500	23.9		26.5
≤ $30000	24.9		26.5

* Compared with 2006 Census data (ABS, 2010).
† Mean (standard deviation).
‡ People who answered ‘not applicable’ to non-school qualifications.
§ Equivalised household income (AUS $).

5.4.1 Frequency of takeaway food consumption

Over one-third (37.7%) of participants reported eating takeaway foods ≥ 4 times per month (Figure 5.1, Table 5.2). Among the 22 takeaway items, salads (18.4%) and fruit or vegetable juices (20.9%) were the most frequently consumed “healthy” takeaway items. Potato chips, fries or wedges (14.6%), and non-diet soft drinks (15.9%) were the most frequently consumed “less healthy” takeaway items.

Table 5.2: Frequencies of different types of takeaway item consumption

	n	Takeaway food consumption (%)		
		<1/month	**1–3 times /month**	**≥ 4 times /month**
Overall takeaway foods*	859	28.6	33.6	37.7
"Healthy" items				
Fruit or vegetable juice	829	64.4	14.7	20.9
Salad (including fruit salad)	825	66.8	14.8	18.4
Sandwiches	830	56.9	26.5	16.6
Soft drink, diet	820	76.6	7.1	16.3
Sushi	832	76.0	16.7	7.3
Pasta	830	86.1	8.7	5.2
Asian-style noodles	828	83.8	12.6	3.6
Fried rice*	833	86.1	11.2	2.8
Kebab	825	90.9	8.0	1.1
"Less healthy" items				
Soft drink, non-diet	828	73.7	10.4	15.9
Potato chips, fries or wedges*	831	56.6	28.9	14.6
Cakes, sweet buns, muffins or scones	832	66.6	20.4	13.0
Ice-cream, ice-confection, or frozen yoghurt	833	75.3	15.6	9.1
Flavoured milk or smoothie	831	84.6	9.1	6.3
Savoury pies, sausage rolls or pastries*	830	79.6	14.9	5.4
Hamburger	826	76.0	18.8	5.2
Pizza	816	70.1	25.6	4.3
Fried fish or fried seafood	831	77.0	18.7	4.3
Thick shake or milk shake	829	88.7	8.3	3.0
Curry	827	78.6	18.0	3.4
Fried chicken	824	82.6	14.6	2.8
Fried spring roll, dim sim or wonton*	827	90.1	8.5	1.5

* Does not add to 100% as numbers were rounded.

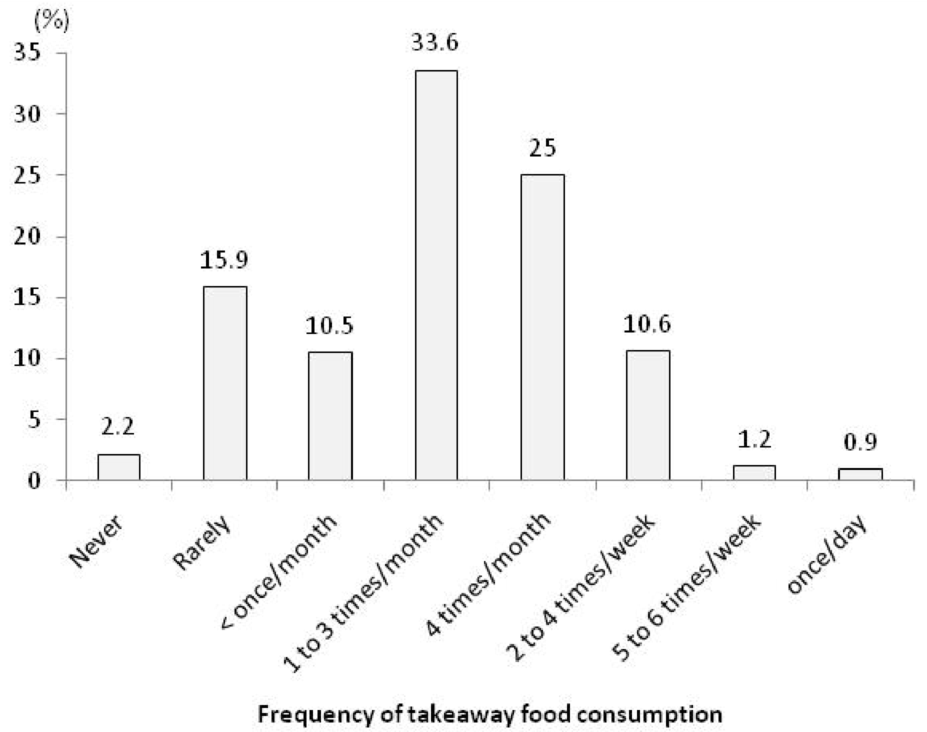

Figure 5.1: Frequency of takeaway food consumption among Australian adults aged between 25 and 64 years (N=859)

5.4.2 Education differences in takeaway food consumption

The least educated group was significantly more likely to have reported consuming overall takeaway foods 4 times or more per month compared with their highly educated counterparts (Table 5.3). For the individual takeaway items, participants with no post-school and vocational qualifications were less likely to consume sushi and more likely to consume fruit or vegetable juice compared with those having a bachelor degree or higher. Participants with diploma qualifications were more likely to consume kebabs, pasta and diet soft drink, and fruit or vegetable juice compared with those having a bachelor degree or higher. In contrast, most “less healthy” takeaway foods were more likely to be consumed once a month or more by lower educated groups although the higher prevalence often did not reach statistical significance. Participants with no post-school qualifications were significantly more likely to consume: potato chips, fries, or wedges; savoury pies, sausage rolls or pastries; fried chicken; non-diet soft drinks; and less likely to consume curry once a month or more compared with those having bachelor degree or higher. Participants with vocational and diploma qualifications were also more likely to consume fried chicken compared with those having a bachelor degree or higher.

Table 5.3: Prevalence ratios (PR) and 95% confidence intervals (CI) for differences in takeaway food consumption by education*

	Education			
	Bachelor degree or higher	Diploma	Vocational	No post-school qualifications
Overall takeaway foods (≥ 4 times/month)	1.00	1.17 (0.88-1.56)	1.05 (0.82-1.33)	1.26 (1.03-1.54)
"Healthy" takeaway items (≥ once/month)				
Kebab	1.00	1.94 (1.08-3.46)	1.30 (0.74-2.29)	0.80 (0.45-1.44)
Sandwiches	1.00	1.08 (0.84-1.39)	0.93 (0.75-1.17)	1.09 (0.91-1.30)
Fried rice	1.00	1.23 (0.71-2.12)	1.33 (0.85-2.08)	1.22 (0.81-1.84)
Pasta	1.00	1.69 (1.03-2.76)	1.34 (0.85-2.13)	1.28 (0.86-1.93)
Asian-style noodles	1.00	1.10 (0.69-1.77)	0.90 (0.59-1.39)	0.92 (0.64-1.32)
Sushi	1.00	1.11 (0.82-1.51)	0.58 (0.40-0.85)	0.62 (0.46-0.83)
Salad (including fruit salad)	1.00	1.18 (0.87-1.61)	1.17 (0.90-1.53)	1.10 (0.87-1.38)
Soft drink, diet	1.00	1.60 (1.10-2.31)	1.26 (0.88-1.80)	1.27 (0.94-1.73)
Fruit or vegetable juice	1.00	1.38 (1.03-1.85)	1.36 (1.06-1.75)	1.27 (1.01-1.59)
"Less Healthy" takeaway items (≥ once/month)				
Potato chips, fries, or wedges	1.00	1.19 (0.93-1.52)	1.11 (0.89-1.38)	1.28 (1.08-1.53)
Hamburger	1.00	1.33 (0.94-1.87)	0.97 (0.71-1.33)	1.08 (0.82-1.42)
Pizza	1.00	1.05 (0.76-1.45)	0.75 (0.55-1.02)	1.02 (0.81-1.29)
Savoury pies, sausage rolls or pastries	1.00	0.93 (0.55-1.58)	1.42 (0.99-2.03)	1.67 (1.22-2.27)
Fried fish or fried seafood	1.00	1.08 (0.71-1.65)	1.07 (0.75-1.53)	1.28 (0.96-1.71)
Fried chicken	1.00	2.01 (1.25-3.24)	2.03 (1.36-3.04)	1.70 (1.16-2.52)
Fried spring roll, dim sim, or wonton	1.00	1.45 (0.74-2.81)	1.41 (0.81-2.46)	1.53 (0.93-2.50)
Curry	1.00	0.96 (0.66-1.41)	0.77 (0.55-1.10)	0.60 (0.43-0.84)
Cakes, sweet buns, muffins or scones	1.00	1.09 (0.80-1.49)	0.99 (0.74-1.31)	1.16 (0.93-1.45)
Ice-cream, ice-confection, or frozen yoghurt	1.00	1.31 (0.91-1.88)	1.01 (0.71-1.43)	1.23 (0.93-1.63)
Soft drink, non-diet	1.00	1.25 (0.88-1.77)	1.11 (0.82-1.50)	1.29 (1.01-1.65)
Thick shake or milk shake	1.00	1.33 (0.73-2.44)	1.29 (0.77-2.17)	1.24 (0.78-1.98)
Flavoured milk or smoothie	1.00	1.22 (0.74-2.00)	1.07 (0.69-1.65)	1.03 (0.70-1.52)

* Adjusted by age and sex.

5.4.3 Income differences in takeaway food consumption

There was no association between household income and overall takeaway food consumption, and few discernable income differences in the consumption of the individual items (Table 5.4). For the "healthy" takeaway items, residents of households in the lowest income group were more likely to consume fruit or vegetable juice compared with the highest income group. On the other hand, the second lowest income group was less likely to consume sushi and sandwiches, and the second highest income group was less likely to consume salad compared with the highest income group. For the "less healthy" takeaway items, residents of households in the lowest income group were more likely to report consuming fried fish or seafood; ice-cream, ice-confection, or frozen yoghurt; and thick shakes or milk shakes; and less likely to consume curry compared with the highest income group.

Table 5.4: Prevalence ratios (PR) and 95% confidence intervals (CI) for differences in takeaway food consumption by household income*

	Equivalised household income (AUS $)			
	≥ $62000	$46501–$61999	$30001–$46500	≤ $30000
Overall takeaway foods (≥ 4 times/month)	1.00	0.91 (0.72-1.16)	0.90 (0.71-1.14)	0.86 (0.67-1.09)
"Healthy" takeaway items (≥ once/month)				
Kebab	1.00	0.54 (0.27-1.08)	0.93 (0.51-1.71)	1.39 (0.80-2.40)
Sandwiches	1.00	0.88 (0.72-1.08)	0.81 (0.65-1.00)	0.87 (0.70-1.07)
Fried rice	1.00	0.83 (0.51-1.34)	0.84 (0.51-1.38)	1.02 (0.64-1.64)
Pasta	1.00	1.08 (0.65-1.79)	1.27 (0.78-2.09)	1.40 (0.86-2.27)
Asian-style noodles	1.00	1.13 (0.75-1.71)	0.70 (0.43-1.15)	1.14 (0.74-1.74)
Sushi	1.00	0.88 (0.65-1.18)	0.69 (0.49-0.97)	0.72 (0.51-1.01)
Salad (including fruit salad)	1.00	0.75 (0.56-0.99)	0.82 (0.62-1.09)	1.06 (0.83-1.37)
Soft drink, diet	1.00	0.93 (0.64-1.33)	0.97 (0.67-1.40)	1.18 (0.83-1.67)
Fruit or vegetable juice	1.00	0.83 (0.64-1.09)	0.81 (0.61-1.08)	1.28 (1.01-1.61)
"Less Healthy" takeaway items (≥ once/month)				
Potato chips, fries, or wedges	1.00	1.04 (0.83-1.30)	1.06 (0.84-1.33)	1.10 (0.88-1.38)
Hamburger	1.00	0.91 (0.67-1.25)	0.86 (0.62-1.20)	0.97 (0.70-1.35)
Pizza	1.00	1.16 (0.89-1.50)	0.96 (0.72-1.28)	0.79 (0.57-1.08)
Savoury pies, sausage rolls or pastries	1.00	0.87 (0.60-1.26)	0.97 (0.68-1.40)	0.99 (0.68-1.42)
Fried fish or fried seafood	1.00	1.10 (0.76-1.58)	0.90 (0.61-1.34)	1.45 (1.03-2.05)
Fried chicken	1.00	0.90 (0.58-1.37)	0.78 (0.49-1.24)	1.26 (0.85-1.88)
Fried spring roll, dim sim, or wonton	1.00	1.09 (0.60-1.97)	1.20 (0.66-2.16)	1.22 (0.67-2.23)
Curry	1.00	0.87 (0.64-1.20)	0.81 (0.58-1.14)	0.44 (0.28-0.69)
Cakes, sweet buns, muffins or scones	1.00	1.05 (0.79-1.40)	1.11 (0.84-1.49)	1.23 (0.93-1.62)
Ice-cream, ice-confection, or frozen yoghurt	1.00	1.05 (0.74-1.50)	1.06 (0.74-1.53)	1.39 (1.00-1.95)
Soft drink, non-diet	1.00	0.91 (0.67-1.22)	0.88 (0.64-1.20)	1.04 (0.78-1.39)
Thick shake or milk shake	1.00	1.46 (0.81-2.62)	1.13 (0.60-2.13)	2.41 (1.39-4.26)
Flavoured milk or smoothie	1.00	0.85 (0.53-1.36)	0.89 (0.55-1.44)	1.40 (0.92-2.12)

* Adjusted by age and sex.

5.4.4 Test-retest reliability of takeaway food consumption measures

Table 5.5 presents the reliability estimates for the takeaway food items. Kappa coefficients for overall and three takeaway items had "substantial" agreement. Most takeaway foods (10 "less healthy", and six "healthy" items) had "moderate" agreement, three items had "fair" agreement, and one item had "slight" agreement. All crude percentage agreements exceeded 50% (mean 65.3, SD 7.8, minimum 51.4, maximum 77.8).

Table 5.5: Test-retest reliability of overall takeaway foods and 22 takeaway food measures

	Kappa coefficient*	% Crude agreement
Overall takeaway foods	0.71	62.9
"Healthy" items		
Sushi	0.71	77.8
Fruit or vegetable juice	0.59	58.3
Soft drink, diet	0.58	63.9
Asian-style noodles	0.54	75.0
Sandwiches	0.50	55.6
Salad (including fruit salad)	0.46	51.4
Kebab	0.41	77.1
Fried rice	0.36	66.7
Pasta	0.17	65.7
"Less healthy" items		
Hamburger	0.66	63.9
Pizza	0.61	69.7
Savoury pies, sausage rolls or pastries	0.60	69.4
Cakes, sweet buns, muffins or scones	0.58	61.1
Fried fish or fried seafood†	0.57	65.7
Fried chicken†	0.53	68.5
Soft drink, non-diet	0.53	63.9
Potato chips, fries or wedges	0.50	52.8
Curry	0.50	61.1
Ice-cream, ice-confection, or frozen yoghurt	0.50	52.8
Fried spring roll, dim sim or wonton	0.46	72.2
Flavoured milk or smoothie	0.45	75.0
Thick shake or milk shake	0.34	72.2

* Original categories for each measure were used to calculate kappa coefficients: overall takeaway foods had eight categories; the 22 specific takeaway items had seven categories.

5.5 DISCUSSION

5.5.1 Education differences in takeaway food consumption

This study of socioeconomic differences in takeaway food consumption found that lower educated groups consumed takeaway foods more frequently and were more likely to choose “less healthy” options than their higher educated counterparts. This finding was consistent with previous studies that reported lower educated groups were more likely to consume or purchase fast-food (Pereira et al., 2005; Schröder et al., 2007; Thornton et al., 2011). Similar to our findings, previous Australian research (using data from the most recent Australian National Nutrition Survey in 1995) found the least educated groups were significantly more likely to consume potato chips, non-diet soft drinks, and fried chicken compared with the highly educated group (Miura et al., 2009). These items are generally high in fat or sugar and are low in fibre, and can contribute to higher energy intakes (Burns et al., 2002). Increased energy intake from eating such takeaway foods, in particular “less healthy” takeaway foods, can lead to over-consumption of energy and saturated fat (Bowman & Vinyard, 2004). Consequently, frequent consumption of these items over a long period of time may influence weight status and increase the risks of development of cardiovascular disease and type 2 diabetes (Pereira et al., 2005).

Contrary to our findings, some studies have reported a reverse association between education and takeaway food consumption or purchasing (Miura et al., 2009; Turrell & Giskes, 2008) and still others have shown no association (Inglis, et al., 2008; Mohr, et al., 2007; Smith, et al., 2009). Inconsistencies in the directions of the associations found in the current and previous studies may be due to differences in the scope of takeaway foods considered (many studies have only focussed on “fast-food”), differences in how education was measured (highest education achieved or age when participants left school), and the type of dietary behaviour examined (i.e. some studies have examined intakes whereas others have examined purchasing behaviour).

5.5.2 Income differences in takeaway food consumption

Previous research has reported that higher income groups are more likely to consume or purchase takeaway or fast-food (Mohr et al., 2007; Paeratakul et al., 2003; Thornton et al., 2011; Turrell & Giskes, 2008). The results of this present study were inconsistent with this earlier work: we found no association between household income and overall takeaway consumption, and limited associations between income and the consumption of "healthy" and "less healthy" takeaway items. In an attempt to understand these results, we further examined the association between household income and takeaway consumption using a number of different analytic approaches. First, the largely null associations may have been attributable to misclassification error: income was measured at the household level and takeaway consumption at the individual level, hence, individuals of low SEP measured on the basis of education (who were more likely to consume less healthy takeaway) may have been classified in the high income category at the household level, thereby weakening associations. To test for this, we de-limited our income analysis to single-person households which resulted in both the predictor and outcome variables being operationalised at the same (individual) level. Second, takeaway consumption was regressed on household income using different income categories [1) $25000 or less; 2) $25001–$52000; 3) $52001–$71999; 4) $72000 or higher] to increase the socioeconomic variability between the income groups. Third, we adjusted the association between household income and takeaway consumption for respondent's education to see if the unmeasured effects of this socioeconomic factor were confounding the income-takeaway association. None of these analytic approaches made an appreciable difference to the direction or magnitude of the association between household income and takeaway consumption. In addition, these three analyses did not change the original findings. Based on this evidence we cautiously conclude that in the contemporary Australian context, where the range of inexpensive takeaway foods is extensive, that households differing in their income may not have a measurably different consumption pattern for most types of takeaway food.

5.5.3 Test-retest reliability of takeaway food consumption measures

The present study assessed the reliability of self-reported takeaway food consumption measures and most showed moderate agreement. Although one takeaway item (pasta) exhibited only "slight" agreement (kappa = 0.17), this low coefficient was not necessarily indicative of the measure's poor reliability as kappa is affected by prevalence (Feinstein & Cicchetti, 1990). For pasta, there was a very high prevalence of responses in the never/rarely group and very low prevalence in the remaining categories which resulted in a low kappa even though the crude agreement was 65.7%. Overall, the guideline for interpretation of kappa (Landis & Koch, 1977) indicates the reliability of takeaway food measures were in moderate agreement and supporting their use for population-based dietary research among adults.

5.5.4 Strengths and limitations

The present study has several strengths. First, socioeconomic differences in takeaway food consumption were examined using a more inclusive definition of takeaway food than previous research which has tended to focus on “fast-food”. Second, each specific type of takeaway item was examined across socioeconomic groups. Thirdly, this is a population-based study with a moderately high response rate and the sample’s socio-demographic characteristics were similar to the target population (i.e. Brisbane residents aged 25–64 years).

A number of limitations of the current study need to be taken into account in the interpretation of the findings. First, there are likely to be variations in nutrient contents within each type of specific takeaway item. The classification of “healthy” or “less healthy” choices was made according to the AGHE (The Commonwealth Department of Health and Family Services, 1998) and nutrient composition criteria. However, not all items in the “healthy” and “unhealthy” choice categories are actually healthy or unhealthy respectively as there are variations in nutrient content within each food group (Dunford, Webster, Barzi, & Neal, 2010). For example, in this study sandwiches are considered a healthy option; however, the nutrient content will vary greatly depending on what the sandwich contains. Additionally, the 22 specific takeaway food choices were not inclusive of all takeaway items sold in Australia. Marked socioeconomic differences may occur in less frequently consumed takeaway items not considered in this study. However, the list comprises the most popular takeaway items in Australia (Miura et al., 2009) and is therefore, likely to represent the takeaway items contributing to the dietary intakes of most Australians.

Second, this study used self-reported data, measured by a FFQ. This method is prone to bias, especially social desirability bias, given that the items considered as "less healthy" tend to be under reported (Gibson, 2005). Likewise, a postal survey cannot validate who has actually completed the questionnaire or whether they have understood the questions. However, to prevent the latter, the questionnaire was validated with various socioeconomic groups during a pilot study.

Third, while this study achieved a moderately high response rate, 36.7% of those sampled did not respond. Similar to other studies (Batty & Gale, 2009; Tolonen, Dobson, Kulathinal, & the WHO MONICA Project, 2005), disadvantaged groups were under-represented and these are more likely to have adverse health behaviours and risk factors compared with advantaged groups (Tolonen et al., 2005). Therefore, disadvantaged non-respondents to the survey may possibly be consuming takeaway food more frequently than disadvantaged respondents; hence the magnitude of socioeconomic differences in the consumption of takeaway items reported in this study may be underestimated. Additionally, participants were Brisbane residents and are not a representative sample of the Australian population. The findings may not be generalisable especially to non-metropolitan areas where more limited takeaway food options are available. Lastly, this is a cross-sectional study, and therefore, any associations observed cannot be ascribed as causal.

In conclusion, more frequent takeaway food consumption among less educated groups, and especially takeaway food choices that are less consistent with recommendations for good health, may be contributing to higher rates of overweight/obesity and diet-related chronic disease among the socioeconomically disadvantaged. Health promotion programs may be needed to encourage people to choose healthier takeaway food options. Furthermore, policies to reduce access to less healthy options and increase the availability of healthy choices may improve the diet of the whole population, particularly among disadvantaged groups leading to reductions in socioeconomic inequalities in diet-related disease. Further research is required to investigate the factors that may contribute to socioeconomic differences in takeaway food consumption. This study also suggests that self-report measures of takeaway food consumption are acceptably reliable and are suitable for use in population-based dietary research.

Chapter 6: Contribution of take-out food consumption to socioeconomic differences in fruit and vegetable intake: a mediation analysis

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified* that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
5. they agree to the use of the publication in the student's thesis and its publication on the Australasian Digital Thesis database consistent with any limitations set by publisher requirements.

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Contribution of take-out food consumption to socioeconomic differences in fruit and vegetable Intake: a mediation analysis. (2011) *Journal of the American Dietetic Association*, *111*, 1556–1562.

Contributor	Statement of contribution*
Kyoko Miura	Conceptualised the study, collected the data, analysed and interpreted the data, and drafted and revised the manuscript. Kyoko Miura (signature) 29/12/2011 Signature Date
Katrina Giskes*	Aided the study design, revision of the manuscript.
Gavin Turrell*	Aided the interpretation of the data and the drafting and revision of the manuscript.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors confirming their certifying authorship.

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Name Signature Date

Title: Contribution of take-out food consumption to socioeconomic differences in fruit and vegetable Intake: a mediation analysis

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6.1 ABSTRACT

Lower fruit and vegetable intake among socioeconomically disadvantaged groups has been well documented, and may be a consequence of a higher consumption of take-out foods. This study examined whether, and to what extent, take-out food consumption mediated (explained) the association between socioeconomic position and fruit and vegetable intake. A cross-sectional postal survey was conducted among 1500 randomly selected adults aged 25–64 years in Brisbane, Australia in 2009 (response rate = 63.7%, N = 903). A food frequency questionnaire assessed usual daily servings of fruits and vegetables (0 to 6), overall take-out consumption (times/week) and the consumption of 22 specific take-out items (never to ≥once/day). These specific take-out items were grouped into "less healthy" and "healthy" choices and indices were created for each type of choice (0 to 100). Socioeconomic position was ascertained by education. The analyses were performed using linear regression, and a bootstrap re-sampling approach estimated the statistical significance of the mediated effects. Mean daily serves of fruits and vegetables was 1.89 (SD 1.05) and 2.47 (SD 1.12) respectively. The least educated group were more likely to consume fewer serves of fruit (β = –0.39, $p<0.001$) and vegetables (β = –0.43, $p<0.001$) compared with the highest educated. The consumption of "less healthy" take-out food partly explained (mediated) education differences in fruit and vegetable intake; however, no mediating effects were observed for overall and "healthy" take-out consumption. Regular consumption of "less healthy" take-out items may contribute to socioeconomic differences in fruit and vegetable intake, possibly by displacing these foods.

6.2 INTRODUCTION

Socioeconomically disadvantaged groups experience a higher prevalence of cardiovascular disease, type 2 diabetes and their associated risk factors including overweight/obesity (Davey Smith & Brunner, 1997; James et al., 1997; Turrell et al., 2006). The likelihood of developing these chronic conditions can be lowered by regularly consuming an adequate amount of fruit and vegetables (Hung et al., 2004; Van Duyn & Pivonka, 2000). Socioeconomically disadvantaged groups are more likely to have a diet that is characterized by lower fruit and vegetable intake compared with their advantaged counterparts (Giskes et al., 2010; Giskes et al., 2002b; Irala-Estevez et al., 2000), and these dietary differences are thought to be one contributing factor to socioeconomic health inequalities (Davey Smith & Brunner, 1997; James et al., 1997).

To date, most studies have documented the nature and extent of socioeconomic differences in fruit and vegetable intake (Giskes et al., 2002b; Prättälä et al., 2009); however, very few have investigated why these intake differences exist. One possible explanation for the lower fruit and vegetable intake among lower socioeconomic groups is their take-out food consumption. Socioeconomically disadvantaged groups are more likely to eat/purchase take-out and fast-food compared with advantaged groups (Glanz et al., 1998; Pereira et al., 2005; Thornton et al., 2011), and these foods are associated with low diet quality, including reduced fruit and vegetable intake (Paeratakul et al., 2003; Schröder et al., 2007; Smith et al., 2009). These findings suggest that take-out food consumption may be displacing fruit and vegetable intake.

Previous studies have primarily examined fast-foods which are typically energy dense (Glanz et al., 1998; Paeratakul et al., 2003; Pereira et al., 2005; Schröder et al., 2007; Thornton et al., 2011). Take-out foods, on the other hand, encompass a wide variety of food types that range from energy dense to relatively nutrient rich, and can be categorized into “less healthy” and “healthy” choices according to their nutritional profiles. Choosing different take-out food-types may be socioeconomically patterned, as disadvantaged groups tend to have less healthy diets (Galobardes et al., 2001; Turrell et al., 2003). Furthermore, depending on the types of take-out food choices, the magnitude of the effect on fruit and vegetable intake may be different. A recent Australian study reported that participants who consumed "less healthy" take-out foods in the previous 24-hours were significantly less likely to eat any fruit and vegetables compared with those who did not; however, opposite associations were seen for "healthy" take-out foods (Miura et al., 2009). From these findings, it was hypothesized that socioeconomic differences in fruit and vegetable intake may be mediated by take-out food consumption and, especially, by the choice of take-out food. This previous Australian study, however, had a number of limitations. First, it used 1995 data, and the range and sales of take-out food have increased substantially during the last 16 years (ABS, 2008; BIS Shrapnel, 2008). Second, the study did not quantify the contribution of take-out food to socioeconomic inequalities in fruit and vegetable intake. Third, the study combined fruit and vegetable intake into a single dichotomized measure (consumed, not consumed) which did not allow a separate examination of the association between take-out food consumption and fruit and vegetable intake, or an assessment of how take-out foods are associated with meeting the recommended intakes of fruit and vegetables.

This current study advances knowledge of the factors contributing to the lower fruit and vegetable intake of socioeconomically disadvantaged groups by examining whether take-out food consumption mediates socioeconomic differences in fruit and vegetable intake, using data collected in 2009 and more detailed fruit and vegetable intake measures. Take-out food is defined as foods or meals that are pre-prepared commercially and require no further preparation by the consumer, and can be consumed immediately after purchase.

6.3 METHODS

Ethical approval was granted by the Queensland University of Technology Human Research Ethics Committee (ID 0900000445).

6.3.1 Study participants

This cross-sectional study was conducted in the Brisbane metropolitan area (Australia) between July and September 2009. A total of 1500 adults aged between

25–64 years were randomly selected from the electoral roll of the Brisbane statistical sub-division. Data were collected by a self-administered postal survey (Dillman, 2000) that asked about usual take-out food consumption, fruit and vegetable intake, and socio-demographic characteristics. A total of 903 participants completed the survey (response rate 63.7%). Respondents who had missing or inadequate information on age, sex, education, take-out food consumption, fruit and vegetable intake were excluded from the analyses (n = 98), reducing the analytical sample to N = 805.

6.3.2 Outcome measures

Standard questions were used to assess fruit and vegetable intake (McLennan & Podger, 1998). These questions are used widely (Crawford et al., 2007; Inglis et al., 2008; Smith et al., 2009) and have been shown to be valid measures of fruit and vegetable intake (Coyne et al., 2005). Fruit intake included pure juices, raw, cooked, canned, frozen, or dried fruits, and was measured by asking respondents how many serves of fruit they usually ate daily. A standard serve size for fruit was defined as one medium piece or two small pieces; or 1/2 cup of juice. Five response options ranged from “don’t eat fruit”, to “six serves or more per day”. Similar to that used in previous studies (Ball, et al. 2009; Cancer Council Victoria, 2009; Willett, 1998), responses were recorded to: don’t eat fruit = 0.0, one serve or more per day=1.0, two to three serves per day = 2.5, four to five serves per day = 4.5, and six or more serves per day = 6.0.

Vegetable intake was measured using an identical format and method to that used for fruit, and included intakes of all raw, cooked, frozen, canned or dried vegetables and legumes, but excluded potatoes. One serving of vegetables was defined as 1/2 cup of cooked vegetables/beans, or 1 cup of salad vegetables. The test-retest reliability of fruit and vegetable intake was assessed by weighted kappa statistic in a separate sample (n = 37) who completed the same survey twice, one month apart. The kappa coefficient was 0.54 for fruit intake and 0.65 for vegetable intake.

6.3.3 Mediators

Overall take-out food consumption

Participants were asked how often they usually consumed take-out foods in the last 12 months ("never" to "once per day"). Similar to the fruit and vegetable intake measures, responses were re-coded to: never = 0, rarely = 0.1, less than once a month = 0.2, one to three times per month = 0.5, once per week = 1.0, two to three times per week=3.0, five to six times per week = 5.5, and once per day = 7.0. The weighted kappa coefficient for this measure was 0.71.

"Less healthy" and "healthy" take-out food-types

Participants who reported consuming take-out foods in the last 12 months (n=804) were asked how often they usually ate each of 22 take-out foods, identified to be the most frequently consumed take-out foods in Australia (Miura et al., 2009). Similar to overall take-out food consumption, seven response options ranged from "never or rarely" to "once per day".

Each of these 22 items was classified as either "less healthy" or "healthy" choices. Similar to a previous study (Miura et al., 2009), this classification was based on the Australian Guide to Healthy Eating (The Commonwealth Department of Health and Family Services, 1998) which categorizes foods into five groups: cereals, vegetables, fruit, dairy, meat, and "extra" foods. The "extra" foods (e.g. cakes and deep-fried take-out foods) are a non-essential part of a diet and are typically high in fat, salt, or sugar. Most of the "less healthy" take-out items were consistent with the "extra" foods. To classify foods not identified in the "extra" food list, nutrient composition data were used (New South Wales Health and New South Wales Department of Education and Training, 2006; Queensland Health, 2007). Foods meeting one or more of the following criteria were classified as "less healthy": greater than 2500 kJ of energy per serve; greater than 3 g of saturated fat per 100 g; less than 2 g of fibre per serve. Beverages classified as "less healthy" were those containing 600 kJ or higher energy per serve and/or greater than 3 g of saturated fat per 100 g. Foods or beverages not meeting any of these criteria were considered "healthy" options. This classification resulted in 13 "less healthy" items and nine "healthy" items.

"Less healthy" take-out foods comprised: potato chips, hamburger, pizza, savoury pies, fried fish/seafood, fried chicken, fried dim-sum, curry, cakes, non-diet soft drink, thick/milk shake, flavoured milk, and ice-cream. "Healthy" take-out foods comprised: kebab, sandwiches, fried rice, pasta, Asian-style noodles, sushi, salad, diet soft drink, and fruit/vegetable juices. A score was calculated to characterize each participant's take-out food consumption as follows: never/rarely consumed the take-out item = 0, consumed less than once a month = 1, one to three times per month = 2, four times per month = 3, two to four times per week = 4, five to six times per week = 5, and once or more per day = 6. "Less healthy" and "healthy" take-out food indices were created by summing the items. Each respondent's score was rescaled to range 0–100. Higher scores were indicative of consuming a wider variety or greater frequency of consumption in the last 12 months. The weighted kappa coefficients for "less healthy" take-out foods ranged from 0.34–0.66 (mean 0.53, SD 0.08) and "healthy" items ranged from 0.17–0.71 (mean 0.48, SD 0.16).

6.3.4 Independent variable and covariates

Education was used as the socioeconomic measure and ascertained by the highest completed qualification. Participant's education was coded as 1) bachelor degree or higher (latter includes graduate diploma, graduate certificate, and postgraduate degree); 2) diploma (includes associate degree which is generally not a university-level education in Australia); 3) vocational (trade or business certificate); and 4) no post-school qualifications. Covariates used in the mediation analyses were age (continuous) and sex.

6.3.5 Statistical analyses

For the bivariate analyses, ANOVA was used for categorical variables, Pearson's correlation was used for normally distributed variables, and Spearman's correlation was used for non-normally distributed variables. The contribution of take-out food consumption to education differences in fruit and vegetable intake was examined using the mediation test outlined by Baron and Kenny (1986). A series of multiple regression models evaluated the various associations: Path a) associations between education and take-out food consumption behaviours; Path b) associations between take-out food consumption behaviours and fruit and vegetable intake; Path c) association between education and fruit/vegetable intake; Path c') examines the association between education and fruit/vegetable intake controlling for take-out food consumption behaviours; this is, a mediated effect by which education affects fruit/vegetable intake through take-out food consumption.

The mediated (indirect) effect was formally tested using a non-parametric bootstrapping procedure (n = 5000 samples) that estimated the sampling distribution of the indirect effect and the corresponding bias-corrected and accelerated 95% confidence interval (95% CI) (Preacher & Hayes, 2008); this procedure is more statistically robust than the Sobel test (Hayes, 2009; Preacher & Hayes, 2008; Preacher & Hayes, 2004). Indirect effects were considered significant when the 95% CI did not include zero. For all other tests, statistical significance was considered at $p \leq 0.05$ (two-tailed). All analyses were performed in SPSS (version 18.0.1, 2009, SPSS Inc., Chicago, Illinois).

6.4 RESULTS AND DISCUSSION

6.4.1 Characteristics of participants

Compared with 2006 census data (Australian Bureau of Statistics, 2010), participants were slightly older and over-represented by women and the more educated (Table 1). The median overall take-out food consumption was one to three times per month. A global test (ANOVA) showed education was significantly associated with daily servings of fruit ($p=0.001$) and vegetables ($p<0.001$) and intakes were highest among participants with a bachelor degree or higher. All take-out food consumption measures were negatively correlated with fruit and vegetable intake (all $p<0.001$ except "healthy" take-out food and fruit intake).

Table 6.1: Characteristics of participants and bivariate associations for fruit and vegetable intake by socio-demographic and take-out food variables among Australian adults aged between 25 and 64 years

	Total (N=805)	Census[a]	Fruit intake (serves per day)	Vegetable intake (serves per day)
Sex (%)			Mean (SD)	
Male	41.5	49.2	1.77 (1.12)	2.24 (1.05)
Females	58.5	50.8	1.98 (0.99)	2.64 (1.14)
Overall			1.89 (1.05)	2.47 (1.12)
			$p = 0.003$[b]	$p < 0.001$[b]
Highest completed education (%)				
Bachelor degree or higher	35.7	28.7	2.09 (1.09)	2.68 (1.03)
Diploma	11.9	10.0	1.89 (0.91)	2.43 (1.04)
Vocational	18.4	19.0	1.80 (0.96)	2.44 (1.18)
No post-school qualifications	34.0	42.3[c]	1.74 (1.07)	2.28 (1.17)
			$p = 0.001$[b]	$p < 0.001$[b]
			Pearson's correlation	
Age (years)	44.0 (11.1)[d]	42.7 (11.0)[d]	0.09*	–0.01
			Spearman's correlation	
Overall take-out food consumption (times/week)	0.5 (0.8)[e]		–0.17**	–0.18**
"Less healthy" take-out food index[f]	12.8 (11.5)[e]		–0.19**	–0.18**
"Healthy" take-out food index[f]	13.0 (13.0)[e]		–0.06	–0.04**

[a] Compared with 2006 Census data (ABS, 2010).
[b] p-value for the difference between group, based on the ANOVA test between socio-demographic groups.
[c] People who answered "not applicable" to non-school qualifications.
[d] Mean (standard deviation).
[e] Median (interquartile range).
[f] Among take-out food consumers (n=804).
*p < 0.05, **p < 0.01.

6.4.2 Association between education and take-out food consumption behaviors (Path a)

Participants with a diploma-level education had significantly higher overall take-out food consumption than those with a bachelor degree or higher (β = 0.317 times per week, p=0.017). For the "less healthy" take-out food, participants with vocational education (β = 1.818, p=0.042) and no post-school qualifications (β = 2.910, p=0.001) scored significantly higher compared with those with a bachelor degree or higher. Higher "healthy" take-out scores were observed among participants with a diploma-level education (β = 3.186, p=0.015) compared with those with a bachelor degree or higher. In all take-out food consumption measures, those with a bachelor degree or higher showed the lowest consumption. Similar to a previous Australian study, lower educated groups were more likely to consume "less healthy" take-out foods compared with highly educated groups (Miura et al., 2009). These results were generally consistent in showing that socioeconomically disadvantaged groups had poorer dietary intakes (Hulshof et al., 2003; Martikainen et al., 2003), and higher rates of diet-related chronic diseases (Davey Smith & Brunner, 1997; Paeratakul, Lovejoy, Ryan, & Bray, 2002) and overweight/obesity (Hulshof et al., 2003; Paeratakul et al., 2002).

6.4.3 Association between take-out food consumption behaviors and fruit and vegetable intake (Path b)

Overall and "less healthy" take-out food consumption was negatively associated with fruit intake. A one-unit increase in overall take-out food consumption was associated with a reduction of 0.08 daily serves of fruit (p=0.011), while a one-unit increase on the "less healthy" take-out food score was associated with a reduction of 0.01 daily serves (p=0.002). There was no significant association between the "healthy" take-out food index and fruit intake.

Likewise, overall and "less healthy" take-out food consumption was negatively associated with vegetable intake: a one-unit increase in overall take-out food consumption was associated with a reduction of 0.14 daily serves of vegetables ($p<0.001$) whereas a one-unit increase on the "less healthy" take-out food score was associated with a reduction of 0.02 daily serves ($p<0.001$). "Healthy" take-out food consumption was not associated with vegetable intake. These findings suggest that consuming “healthy” take-out food frequently may not have a detrimental effect on fruit and vegetable intake. Previous research has reported associations between higher nutritional knowledge and higher fruit and vegetable intake (Ball et al., 2006), suggesting that health promotion strategies that impart the skills and knowledge to select healthy take-out foods may improve fruit and vegetable intake. However, as the majority of participants in this present study reported not consuming the recommended amount of vegetables (five or more serves) (The Commonwealth Department of Health and Family Services, 1998), programs and policies are still needed to improve vegetable intake among the whole population.

6.4.4 Education differences in fruit and vegetable intake (Path c) and the mediation effect of take-out food consumption (Path c’)

Lower educated groups reported fewer daily serves of fruit (Path c, Table 6.2). Participants with no post-school qualifications ($p<0.001$) and those with a vocational education ($p=0.009$) had significantly lower fruit intake compared with those with a bachelor degree or higher. When take-out food consumption measures were included in the model (Path c’), all associations were slightly attenuated; however, those with no post-school qualifications and vocational education remained significantly different from the highest educated in terms of their fruit intake. The indirect effects through overall take-out food were significant among participants with no post-school qualifications and diploma-level education as the 95% CI did not include zero. Likewise, the indirect effects of “less healthy” take-out food were significant at all education levels. There was no significant indirect effect through “healthy” take-out food at any education level.

For vegetables, lower educated groups consumed fewer serves per day (Path c): participants with no post school qualifications had a significantly lower intake ($p<0.001$) compared with those with a bachelor degree or higher. Those with vocational ($p=0.059$) and diploma-level education ($p=0.051$) also showed reduced intake; however, the differences were not statistically significant at $p\leq0.05$. After the inclusion of any take-out food consumption variables (Path c’), the associations became slightly weaker for all education levels. Among the least educated, however, the association remained significant ($p<0.001$) with adjustment for each type of take-out food. Significant indirect effects were observed for overall take-out food among participants with no post-school qualifications and diploma-level education, and all education levels for “less healthy” take-out food. No significant indirect effects were observed for “healthy” take-out food consumption.

Table 6.2: Regression coefficients for mediation analysis and indirect effects among Australian adults aged between 25 and 64 years

		Fruit intake (serves/day)					
Education	Mediator	**Path c**	**p**	**Path c'**	**p**	**Indirect effects (95% CI)[a]**	**% mediated**
Bachelor degree or higher	Overall take-out food	–	–	–	–	–	
Diploma		–0.205	0.089	–0.179	0.138	–0.026 (–0.076, –0.003)	12.7
Vocational		–0.271	0.009	–0.263	0.011	–0.008 (–0.037, 0.006)	3.0
No post school qualifications		–0.390	<0.001	–0.375	<0.001	–0.015 (–0.047, –0.001)	3.9
Bachelor degree or higher	Less healthy take-out food	–	–	–	–	–	
Diploma		–0.205	0.089	–0.179	0.136	–0.026 (–0.067, –0.003)	12.7
Vocational		–0.271	0.009	–0.248	0.017	–0.042 (–0.119, –0.004)	8.5
No post school qualifications		–0.387	<0.001	–0.349	0.001	–0.037 (–0.074, –0.016)	9.8
Bachelor degree or higher	Healthy take-out food	–	–	–	–	–	
Diploma		–0.205	0.089	–0.200	0.097	–0.004 (–0.032, 0.016)	2.4
Vocational		–0.271	0.009	–0.269	0.010	–0.002 (–0.020, 0.005)	0.7
No post school qualifications		–0.387	<0.001	–0.384	<0.001	–0.002 (–0.021, 0.007)	0.8
		Vegetable intake (serves/day)					
Bachelor degree or higher	Overall take-out food	–	–	–	–	–	
Diploma		–0.251	0.052	–0.205	0.108	–0.046 (–0.114, –0.006)	18.3
Vocational		–0.209	0.059	–0.196	0.073	–0.014 (–0.056, 0.013)	6.2
No post school qualifications		–0.429	<0.001	–0.403	<0.001	–0.026 (–0.066, –0.003)	6.1
Bachelor degree or higher	Less healthy take-out food	–	–	–	–	–	
Diploma		–0.251	0.051	–0.211	0.097	–0.041 (–0.099, –0.004)	15.9
Vocational		–0.209	0.059	–0.173	0.115	–0.036 (–0.083, –0.005)	17.2
No post school qualifications		–0.425	<0.001	–0.366	0.001	–0.058 (–0.104, –0.027)	13.9
Bachelor degree or higher	Healthy take-out food	–	–	–	–	–	
Diploma		–0.251	0.051	–0.241	0.062	–0.010 (–0.045, 0.008)	4.0
Vocational		–0.209	0.059	–0.205	0.064	–0.004 (–0.028, 0.003)	1.9
No post school qualifications		–0.425	<0.001	–0.419	<0.001	–0.006 (–0.028, 0.004)	1.4

Path c = independent variable: education, dependent variable: fruit/vegetable intake, adjusted for age and sex.
Path c' = independent variable: education, dependent variable: fruit/vegetable intake, adjusted for take-out food consumption (mediator), age and sex.
[a] Bootstrap results for indirect effects with bias corrected and accelerated confidence intervals (5000 bootstrap re-samples).
% mediated = [1 – (c'/c)] x 100.

The results suggest that the frequency and choice of take-out food may play an important role in fruit and vegetable intake. However, the observed contributions of "less healthy" take-out food to education differences in fruit and vegetable intake were small although statistically significant. These may be attributable to the dietary assessment tool employed: dietary intake assessed by a self-administered survey is typically misreported (Johansson et al., 1998; Lutomski, van den Broeck, Harrington, Shiely, & Perry, 2011) and generally food frequency questionnaires underestimate "true" energy intakes (Tooze et al., 2004). Disadvantaged groups are likely to have lower abilities to recall and estimate dietary intakes (Giskes et al., 2010) and lower educated groups have been shown to underreport total energy intake measured by self-reported dietary behaviours (Johansson et al., 1998). People underreporting energy intake are more likely to report lower daily consumption of take-out food types such as muffins, donuts, and soft-drinks (Millen et al., 2009). Therefore, take-out consumption may be underestimated by lower educated groups.

The largest absolute indirect effects, on average, were observed among participants with no post-school qualifications for "less healthy" take-out food consumption compared with other groups. This suggests that discouraging the lower educated groups from consuming "less healthy" take-out food may reduce the education differences in fruit and vegetable intake. However, take-out food consumption is unlikely to be the sole explanation for the education variations in fruit and vegetable intake, and other factors may be contributing to these differences. Previous research has identified other possible mediators including: nutritional knowledge (Wardle et al., 2000), weight concerns (Glanz et al., 1998), and belief and concerns for health (Wardle & Steptoe, 2003). Furthermore, social and environmental factors such as accessibility and availability of fast-food (Block et al., 2004; Hemphill, Raine, Spence, & Smoyer-Tomic, 2008; Thornton et al., 2011), and exposure to food advertisements (Scully, Dixon, & Wakefield, 2009) may also influence socioeconomic inequalities in fruit and vegetable intake. Environmental factors, however, may not play as big role in dietary inequalities in Australia as in the US (Cummins & Macintyre, 2006). Most Australian studies have shown that there is little difference in the price and availability of healthy/less healthy foods and food stores across different socioeconomic areas (Giskes et al., 2007; Winkler, Turrell, & Patterson, 2006a, 2006b). Similarly, determinants of fast-food and take-out meal purchasing seem to have more individual characteristics rather than environmental (Thornton et al., 2011; Turrell & Giskes, 2008).

6.4.5 Limitations

The statistical mediation model assumes temporal direction of causal order (i.e. independent variable precedes mediator, and mediator precedes outcome variable) (MacKinnon, Fairchild, & Fritz, 2007). However, due to the cross-sectional study design causality cannot be attributed. All measures were self-reported, and self-reported dietary measures, in particular, are prone to bias. Furthermore, the lower educated groups were under-represented suggesting that the true education differences in take-out food consumption are likely to be underestimated. Lastly, this study employed education as a socioeconomic indicator. Results may differ if other indicators are used. Despite these limitations, this is the first known study to provide evidence for a mediating effect of take-out food consumption on education differences in fruit and vegetable intake.

6.5 CONCLUSIONS

"Less healthy" take-out food consumption appeared to partly explain education inequalities in fruit and vegetable intake. The results highlight potentially important points for interventions to educate the population about how to choose healthy take-out foods, especially among lower educated groups. This may increase fruit and vegetable intake and, subsequently, reduce the risks of developing diet-related chronic disease and socioeconomic differences in these. Further research is required to confirm the observed findings and investigate why take-out food consumption patterns were different across socioeconomic groups.

Chapter 7: Contributions of psychosocial factors to socioeconomic differences in takeaway food consumption

7.1 INTRODUCTION

The previous chapters showed that socioeconomically disadvantaged groups are more likely to consume takeaway food regularly and choose “less healthy” takeaway food options compared with advantaged groups. These differences may be contributing to the higher prevalence of diet-related chronic disease and related risk factors such as overweight and obesity among disadvantaged groups. However, why these socioeconomic differences in takeaway food consumption are observed is not known. This chapter examines whether psychosocial factors contribute to the association between SEP and takeaway food consumption. Chapter 2 of this thesis identified that dietary behaviours are influenced by a number of psychosocial factors and suggested that these factors may contribute to socioeconomic differences in takeaway food consumption. In addition, the socioeconomic variations in takeaway food choices observed may reflect psychosocial factors influencing the choice of “healthy” and “less healthy” takeaway food differently across different socioeconomic groups. For example, taste may be the most influential factor in the decision to consume “less healthy” takeaway food, whereas weight concern may discourage some from consuming “less healthy” choices. Additionally, the importance of taste may be more pronounced among low socioeconomic groups whereas weight concern may be more crucial among higher socioeconomic groups.

This chapter examines whether psychosocial factors contribute to the association between SEP and takeaway food consumption and the choice of takeaway food types. This chapter also examines the following research questions:

1. Are there socioeconomic differences in psychosocial factors related to food choice?

2. Are there associations between psychosocial factors and takeaway food consumption, and the choice of takeaway food types?
3. Whether and which psychosocial factors explain the association between SEP and takeaway food consumption, and choice of these foods?

A number of psychosocial factors were identified from the literature review, and were chosen based on literature that suggests these factors are likely to influence socioeconomic differences in takeaway food consumption. In this chapter, the following psychosocial factors were examined: nutritional knowledge, diet and health-related beliefs, financial situation, presence of children, following specific dietary regimes, perceived time factors, food preference, meal preparation behaviours and attitudes, reasons to eat takeaway food, social influence on takeaway food consumption, perceived value of takeaway food, and takeaway food as pleasure.

7.2 METHODS

7.2.1 Study participants

The study sampling and recruitment methods are described in Chapter 5. A brief overview of the methods used is provided here. This cross-sectional study was conducted in Brisbane, Australia in 2009. A total of 1500 adults aged between 25 and 64 years were randomly selected from the electoral roll of the Brisbane statistical sub-division. Data were collected by a self-administered postal survey (Dillman, 2000) that asked about usual takeaway food consumption, psychosocial and interpersonal factors that may affect dietary behaviours, and socio-demographic characteristics. A total of 903 participants returned the survey (response rate 63.7%).

7.2.2 Outcome measures

A detailed explanation of the outcome measures was provided in Chapter 6. A brief description is provided here.

Overall takeaway food consumption

Participants were asked "In the last 12 months, did you eat any takeaway food?". Eight response options ranged from "never" to "once per day" and these responses were recoded to create equivalised weekly overall takeaway food consumption: never = 0.0, rarely = 0.1, less than once a month = 0.2, one to three times per month = 0.5, once a week = 1.0, two to four times per week = 3.0, five to six times per week = 5.5, once per day = 7.0.

"Healthy" and "less healthy" takeaway food

Specific takeaway food consumption was examined on the basis of 22 takeaway items that were previously used in the study by Miura et al. (2012). Participants who reported consuming takeaway foods in the last 12 months were asked: "In the last 12 months, how often did you usually eat the following takeaway foods bought from a takeaway shop?". Similar to the question regarding overall takeaway food consumption, seven response options ranged from "never or rarely" to "once per day". Each of these 22 items was categorised as either "healthy" or "less healthy" choices based on the AGHE and nutritional characteristics (the list of 22 takeaway foods is presented in Table 7.1). A score was calculated to characterise each participant's takeaway food consumption as follows: never/rarely consumed the takeaway item = 0, consumed less than once a month = 1, one to three times per month = 2, four times per month = 3, two to four times per week = 4, five to six times per week = 5, and once a day or more = 6. "Healthy" and "less healthy" takeaway food indices were created by summing the items. Each respondent's score was rescaled to range from 0 to 100 with higher scores being indicative of consuming a wider variety or greater frequency of consumption in the last 12 months.

Table 7.1: A list of takeaway food items[a]

"Healthy" takeaway items	"Less healthy" takeaway items
Kebab	Potato chips, fries, or wedges
Sandwiches	Hamburger
Fried rice	Pizza
Pasta	Savoury pies, sausage rolls or pastries
Asian-style noodles	Fried fish or fried seafood
Sushi	Fried chicken
Salad (including fruit salad)	Curry
Soft drink, diet	Cakes, sweet buns, muffins or scones
Fruit or vegetable juice	Ice-cream, ice-confection, or frozen yoghurt
	Soft drink, non-diet
	Thick shake or milk shake
	Flavoured milk or smoothie

[a] The takeaway food list and takeaway food types have been previously used in the study by Miura, Giskes and Turrell (2012).

7.2.3 Psychosocial factors that may affect takeaway food consumption

Participants were asked a range of questions about factors that may affect takeaway food consumption and their choice of these foods. The questionnaire was formulated from previous studies that examined psychosocial factors that may affect the consumption of specific food groups (e.g. fruit and vegetables) and from survey questionnaires used in national surveys (McLennan & Podger, 1998; Melbourne Institute of Applied Economic and Social Research: The University of Melbourne, 2001). Each of the psychosocial factors is briefly described below.

Nutritional knowledge

To assess participant's nutritional knowledge, a 20-item questionnaire was adopted from a previous study (Turrell & Kavanagh, 2006) (Table 7.2).

These items cover knowledge about the nutrient content of various foods, the nutrition and health inter-relationship, and dietary recommendations. Participants had three response options: "true", "false", or "not sure" to each statement. A score was calculated to determine each participant's general nutritional knowledge according to their correct answers to the statements: a score of 1 was assigned when the response was correct, and if the response was incorrect or "not sure", the score was 0. A nutritional knowledge index was constructed by summing all the items and it ranged from 0 to 20 (mean 17.4, SD 2.8; median 18.0, minimum 0.0, maximum 20.0).

Table 7.2: Nutritional knowledge question items

Bread, cereal, fruit and vegetables should make up the smallest part of our diet.	It is recommended that adults have some milk, cheese or yogurt every day.
Milk and milk products such as cheese and yogurt are the best source of iron.	Choosing wholemeal bread provides no health benefits.
A high intake of plant food combined with a low salt intake may protect against high blood pressure.	Wholegrain breads are good sources of fibre.
Adequate calcium intake may reduce the risk of osteoporosis.	It is recommended that we eat fat and oil in limited amounts.
It is better for health to choose lean meat (with little visible fat).	Saturated fats are found in large quantities in butter, lard and dripping.
Choosing salt-reduced food provides no health benefits.	Adults should choose full cream milk instead of skim or trim milk.
Meat, poultry and fish are the best sources of calcium.	A high intake of saturated fat can protect against heart disease.
Fruit is a poor source of vitamin C.	Dark green and orange vegetables like spinach, broccoli, carrots and pumpkin are low in vitamin A.
It is better for health to limit those foods which contain high levels of sugar such as soft-drinks, cordial and biscuits.	Meat, fish, chicken, and eggs should make up the largest part of our diet.
Dietary fibre from wholemeal foods combined with an adequate intake of drinking water may prevent constipation.	Low sugar intake may decrease the risk of dental cavities.

a Adapted from Turrell & Kavanagh (2006).

Time factors

Two items adapted from the HILDA study (Melbourne Institute of Applied Economic and Social Research: The University of Melbourne, 2001) were included to collect information on respondents' perceived time factors. Participants were asked to what extent they agree or disagree with each statement: "In general, I often feel rushed or pressed for time", and "I often have spare time that I don't know what to do with". The response options for each item were: "strongly agree", "agree", "disagree", or "strongly disagree". These responses were subsequently categorised into "strongly agree/agree" and "strongly disagree/disagree".

Material and financial resources

For this aspect, two items were included that asked participants about their financial situation and motor vehicle availability. Each participant's financial situation was assessed via a question adopted from Sorensen et al. (2007). They were asked: "Thinking about your money situation, would you say your situation is...?"

with possible responses being: “can’t make ends meet”, “have just enough to make ends meet” or “are comfortable”. Subsequently, a dichotomised variable was created as “can’t make ends meet/have just enough to make ends meet” or “are comfortable”. For the motor vehicle availability, participants were asked: “Do you have a motor vehicle available for your personal use?” (Burton et al., 2009). The response options were “yes, always”, “yes, sometimes”, “no” or “don’t drive”. These responses were subsequently categorised into “yes always/sometimes” or “no/don’t drive”.

Food preference (general)

One question about general preference for healthy food was adopted from Lea et al. (2006) and was assessed by asking to what extent respondents agree or disagree with the statement “healthy food is tasty”. The response options were: “strongly agree”, “agree”, “disagree” or “strongly disagree”. These responses were recoded into “strongly agree/agree” and “strongly disagree/disagree”.

Barriers to consuming takeaway food

Two items were included to collect information on possible barriers to consuming takeaway food. First, participants were asked whether they were following a special dietary regimen, adapted from the 1995 NNS (ABS, 1998). Respondents were asked “Which one of the following diets best describes your usual way of eating?”. The seven response options were: “I don’t follow any diet”, “vegetarian”, “weight-reduction diet”, “diabetic diet”, “fat modified diet to lower blood cholesterol”, “organic” or “other”. These responses were dichotomised into “follow some kind of diet” or “not follow any diet”.

The second item adapted from a US Economic Research Service Study (Hartline-Grafton, Nyman, Briefel, Cohen, & Mathematica, 2004) to gauge participants concerns regarding weight gain as a result of takeaway food consumption. This item was assessed by asking participants to indicate whether they agree or disagree with the statement: “I try to avoid takeaway food because I don’t want to gain weight”. The response options were: “strongly agree”, “agree”, “unsure”, “disagree”, or “strongly disagree”. These responses were dichotomised into “strongly agree/agree” and “strongly disagree/disagree/unsure”.

Meal preparation behaviours and attitudes

Six questions asked participants to examine meal preparation behaviours and attitudes. To identify the main dinner preparers in the household, participants were asked: “Who is mainly responsible for preparing dinner in your household?” The eight response options were: “myself”, “partner”, “parents”, “roommates”, “friends”, “relatives”, “neighbours”, or “other”. These responses were subsequently categorised into “myself” or “others”.

Frequency of dinner preparation was examined by asking: “How often each week do you prepare dinner in your household?” (adapted from Crawford et al., 2007). The five response options were: “five times or more”, “three to four times”, “one to two times” “rarely”, or “never”. To characterise participants as frequent dinner preparers, their responses were dichotomised into “five times or more” or “four times or less”. This decision was made according to the distribution of the responses.

Among the participants who prepare dinner (i.e. those who answered “never” to the frequency of dinner preparation question were excluded), three additional questions were asked: “During the past 12 months, how often have you (on average)...”

- “cooked a meal from basic ingredients?” (adapted from Buckley et al., 2007).

  The five response options were: “five times or more per week”, “three to four times per week”, “one to two times per week”, “one to three times per month”, or “never or rarely”. Responses were subsequently dichotomised into “five times or more per week” or “four times or less per week” to characterise participants as frequent meal preparers using basic ingredients.

- “spent less than 15 minutes preparing dinner?” (adapted from Crawford et al., 2007)

- “felt cooking is a real chore?” (adapted from Crawford et al., 2007)

The above two questions also had the same five response options; however, responses were recoded into “three times or more per week” or “two times or less per week” to characterise participant’s behaviours and attitude toward cooking. Initially, all of these responses were categorised into two groups in the same manner (five times or more per week, or four times or more per week); however, approximately 6% of participants reported five times and more per week for these two questions. Therefore, the decision was made according to the sample distribution of the responses.

Reasons to consume takeaway foods (belief and attitude)

Among takeaway food consumers, three items relating to their reasons for eating takeaway foods were collected. These questions were adopted from Rydell et al. (2008). Respondents were asked to indicate their reasons for consuming takeaway food to the following statements:

- “I eat takeaway foods because I am too busy to cook”
- “Takeaway foods are tasty”
- “Takeaway food is nutritious”.

The four response options were: “strongly agree”, “agree”, “disagree” or “strongly disagree”. These responses were subsequently coded to “strongly agree/agree” or “strongly disagree/disagree”.

Social influence on takeaway food consumption

Among takeaway food consumers, four items about participants’ interpersonal influence on takeaway food consumption were asked using questions modified from Buckley et al. (2007) and Lea et al. (2006). Participants were asked to indicate to what extent they agree or disagree with each of the following statements:

- “My takeaway food choice is influenced by...”
  - my child/children
  - my partner
  - my friends
- “Eating takeaway food is a way of socialising with family and friends”.

The five response options were: “strongly agree”, “agree”, disagree”, “strongly disagree” or “not applicable”. The response “not applicable” was included as some participants may not have any children or partners. These responses were subsequently categorised into “strongly agree/agree” or “strongly disagree/disagree”. Participants who answered “not applicable” were excluded from these analyses.

Diet and health-related beliefs, perceived values of takeaway foods, and takeaway food as pleasure

Participants were asked a number of questions relating to their beliefs about diet and health, and beliefs about takeaway food. They were asked to indicate to what extent they agree or disagree with each statement:

- Eating a diet that is high in fat is a threat to my health
- What you eat can affect your chance of getting cancer or heart disease
- Being 10kg or more overweight is a threat to my health
- Takeaway foods are value for money
- Takeaway foods are inexpensive
- It is cheaper for me to buy takeaway foods than to cook for myself
- Takeaway food is fun and entertaining
- Takeaway food is a “treat” for myself.

The five response options were “strongly agree = 5”, “agree = 4”, “unsure = 3”, “disagree = 2”, or “strongly disagree = 1”. Using principal component analysis with Varimax rotation and eigenvalue criteria greater than 1.0, three components were identified and subsequently interpreted as “diet and health-related beliefs”, “perceived value of takeaway food” and “takeaway foods as pleasure” (Table 7.3). These three components had eigenvalues of 2.6, 2.0, and 1.1 respectively, they accounted for 33.0%, 24.6%, and 13.7% of the total variance respectively, and their cumulative contribution was 71.3%. Standardised scoring coefficients were calculated for the items forming the three components and these were used to derive factor scales for each of the constructs. Higher scores indicated a weaker belief or perceptions in each construct.

Table 7.3: Results from principal component analyses for diet and health-related beliefs, perceived value of takeaway food and takeaway foods as pleasure

	Retained components (loadings)		
	1	2	3
Diet and health-related beliefs			
Eating a diet that is high in fat is a threat to my health	**0.748**	–0.036	0.068
What you eat can affect your chance of getting cancer or heart disease	**0.827**	–0.029	–0.032
Being 10 kg or more overweight is a threat to my health	**0.848**	–0.088	0.019
Cronbach's Alpha	**0.738**		
Perceived value of takeaway food			
Takeaway foods are value for money	–0.018	**0.848**	0.191
Takeaway foods are inexpensive	–0.009	**0.869**	0.109
It is cheaper for me to buy takeaway foods than to cook for myself	–0.142	**0.815**	0.104
Cronbach's Alpha		**0.821**	
Takeaway foods as pleasure			
Takeaway food is fun and entertaining	0.018	0.271	**0.802**
Takeaway food is a "treat" for myself	0.036	0.071	**0.884**
Cronbach's Alpha			**0.655**

Table 7.4 presents the psychosocial factors that may affect takeaway food consumption and their distributions.

Table 7.4: Psychosocial factors and the distribution of responses

	%
All participants (N=863)	
Nutritional knowledge [Median (min, max)]	18.0 (0.0, 20.0)
Financial situation	
Are comfortable	65.5
Can't make ends meet/just enough to make ends meet	34.5
Presence of child(ren) in the household	
Yes	54.0
No	46.0
Follow some kind of diet	
Yes	68.6
No	31.4
Feel rushed or pressed for time	
Strongly agree/agree	65.2
Strongly disagree/disagree	34.8
Often have spare time that I don't know what to do with	
Strongly agree/agree	14.9
Strongly disagree/disagree	85.1
Motor vehicle availability	
Yes always/sometimes	94.4
No/don't drive	3.9
Try to avoid takeaway food because I don't want to gain weight	
Strongly agree/agree	62.9
Strongly disagree/disagree	37.1
Healthy food is tasty	
Strongly agree/agree	89.6
Strongly disagree/disagree	10.4
Main dinner preparer	
Myself	64.8
Other	35.2
Frequency of dinner preparation	
≥ 5 times/week	54.9
≤ 4 times/week	45.0
Among participants who prepare dinner (n=841)[a]	
Frequency of cooking a meal from basic ingredients	
≥ 5 times/week	38.9
≤ 4 times/week	61.1
Spent less than 15 min preparing dinner	
≥ 3 times/week	16.7
≤ 2 times/week	83.3
Felt cooking is a real chore	
≥ 3 times/week	20.0
≤ 2 times/week	80.0

Table 7.4: Psychosocial factors and the distribution of responses (continued)

	%
Among takeaway food consumers (n=835)	
Eat takeaway food because too busy to cook	
Strongly agree/agree	46.3
Strongly disagree/disagree	53.7
Takeaway foods are tasty	
Strongly agree/agree	74.8
Strongly disagree/disagree	25.2
Takeaway food is nutritious	
Strongly agree/agree	8.2
Strongly disagree/disagree	91.8
My takeaway food choice is influenced by my children (n=503)	
Strongly agree/agree	48.3
Strongly disagree/disagree/unsure	51.7
My takeaway food choice is influenced by my partner (n=697)	
Strongly agree/agree	58.9
Strongly disagree/disagree/unsure	41.1
My takeaway food choice is influenced by my friends (n=713)	
Strongly agree/agree	18.4
Strongly disagree/disagree/unsure	81.6
Eating takeaway food is a way of socialising with family and friends (n=782)	
Strongly agree/agree	38.9
Strongly disagree/disagree/unsure	61.1

[a] Participants who “never” prepare dinner were excluded.

7.2.4 Socioeconomic position (SEP) and covariates

SEP was ascertained by education and household income. The measurements, categorisation methods and rationale were described in Chapter 5. Briefly, participants were asked to provide information about the highest completed qualification and they were subsequently coded to 1) bachelor degree or higher, 2) diploma, 3) vocational, and 4) no post-school qualifications.

For household income, participants were asked to estimate their total pre-tax annual household income from pre-defined categories. Equivalised household income was calculated (Atkinson et al., 1995; OECD, 2009) and then categorised into quartiles: 1) $62000 or higher, 2) $46501–$61999, 3) $30001–46500, and 4) $30000 or lower.

Participant’s information on age and sex was also collected and participant’s age was entered as a continuous variable.

7.2.5 Exclusions and missing data imputation

Of the 903 questionnaires that were returned, missing or inadequate information were identified for age (n = 16, 1.8%), education (n = 19, 2.1%), household income (n = 111, 12.3%), overall takeaway food consumption (n = 25, 2.8%), and "healthy" and "less healthy" takeaway food indices (n=10, 1.1%). Participants with missing information on age, overall takeaway food consumption, "healthy" and "less healthy" takeaway food indices were excluded from all analyses (n = 40, 4.4%). A large proportion of participants did not report their income level; however, these participants were included in the analyses as "missing".

The proportion of missing information on psychosocial factors ranged from 0.9% to 4.5% (mean 2.0%, median 1.7%). In total, the proportion of the participants with complete data for all variables examined was 71.0% (n = 641). To avoid unnecessary loss of data and potential bias, missing values for psychosocial factors were estimated using a multiple imputation approach rather than analysing the complete cases only (He, 2010; Penn, 2007). This approach assumes data are missing at random (Rubin, 2004) which is defined as "the probability a variable is missing depends only on observed variables" (He, 2010, p.99). Demographic, outcome, and psychosocial variables were used as predictors in the imputation model. Five datasets with imputed values for missing variables were generated using the Multiple Imputation function in SPSS (version 18.0.3). These data sets are used for all analyses and the pooled results are presented in the Results section of this chapter as unimputed results were similar to the imputed pooled results. The final analytical sample was N = 863. However, when the analyses involved education, the analytical sample was reduced to n = 859 as n = 4 participants had missing information on education.

7.2.6 Statistical analysis

Bivariate analyses

To examine SEP and psychosocial factors at the bivariate level, three tests were employed: 1) ANOVA was used if the continuous psychosocial variable was normally distributed; 2) Kruskal-Wallis was used if the continuous variable was not normally distributed; and 3) Chi-square test was employed if the variable was categorical.

Multivariable analyses

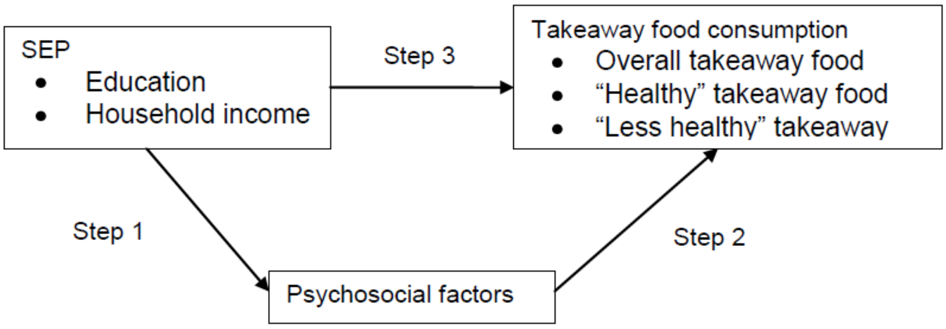
First (Step 1), the association between SEP and psychosocial factors was examined using general linear models if the psychosocial variable was continuous; and robust Poisson regression was used to calculate prevalence ratio (PR) and their 95% confidence intervals (95% CIs) if the variable was dichotomous (Deddens & Petersen, 2008).

Second (Step 2), associations between psychosocial factors and takeaway food consumption were examined using general linear models.

Third (Step 3), the contribution of psychosocial factors to the associations between SEP and takeaway food consumption were assessed by:

- general linear models using socioeconomic measures as the independent variable and each takeaway food consumption measure as the dependent variable (base model)
- measures for the psychosocial factors that are associated with both SEP and takeaway food consumption measures (intervening variables) were then added singularly to the base model.

The highest education and income groups were the referent categories in these analyses. Each model was adjusted for age and sex. All analyses were performed in SPSS (version 18.0.3, SPSS Inc., Chicago, Illinois). Statistical significance was considered at $p \leq 0.05$ (two tailed) for all tests, except significance for PR was considered when their 95% CI did not include 1.0.



Step 1

- Association between education and psychosocial factors adjusted for age and sex
- Association between household income and psychosocial factors adjusted for age and sex

Step 2

- Association between psychosocial factors and takeaway food consumption adjusted for education, age and sex
- Association between psychosocial factors and takeaway food consumption adjusted for household income, age and sex

Step 3

- Association between education and takeaway food consumption adjusted for age and sex (base model)
  - Adding potential intervening variable to the base model
- Association between household income and takeaway food consumption adjusted for age and sex (base model)
  - Adding potential intervening variable to the base model

Figure 7.1: Conceptual model: association between SEP and takeaway food consumption and the contribution of psychosocial factors; and the analytical steps for examining these associations

7.3 RESULTS

Table 7.5 summarises the psychosocial and interpersonal factors and their distributions by education and household income. In the bivariate analyses, there were significant associations between education and a number of psychosocial factors:

- Diet and health-related beliefs
- Nutritional knowledge
- Financial situation
- Agree with the statement "I often have spare time that I don't know what to do with"
- Spent less than 15 minutes preparing dinner frequently
- Agree with the statement "I eat takeaway food because I am too busy to cook"
- Agree with the statement "My takeaway food choice is influenced by my partner".

Lower educated groups tended to have: weaker diet and health-related beliefs, lower nutritional knowledge, more financial difficulties, perceived to have more spare time, spent less than 15 minutes preparing dinner more frequently, disagreed with the statement "eat takeaway food because they were too busy to cook", and agreed that their choice of takeaway food was influenced by their partner. There were no education differences for each of the other psychosocial factors.

Household income was significantly associated with the following psychosocial factors at the bivariate level:

- Nutritional knowledge
- Financial situation
- Presence of child(ren) in the household
- Motor vehicle availability for personal use
- Main dinner preparer

- Frequency of dinner preparation
- Frequency of meal preparation from basic ingredients
- Spent less than 15 minutes preparing dinner frequently
- Felt cooking is a chore frequently
- Agree with the statement “I eat takeaway food because I am too busy to cook”
- Agree with the statement “My takeaway food choice is influenced by my partner”.

Lower income groups tended to have: lower nutritional knowledge, more limited material resources (both financial situation and motor vehicle availability), more children present in the household, been the main dinner preparers, prepared dinner more frequently, the ability to cook a meal from basic ingredients, more frequently spent less than 15 minutes preparing dinner and felt cooking was a real chore, disagreed with the statements “I eat takeaway food because I am too busy to cook” and “My takeaway food choice is influenced by my partner”. There were no household income differences in other factors at the bivariate level.

Table 7.5: Bivariate associations between psychosocial factors and socioeconomic position

	Education (%) (n=859)				Household income (AUS $) (%) (n=863)				
	≥Bachelor degree	Diploma	Vocational	No post-school qualifications	≥62000	46501 to 61999	30001 to 46500	≤3000	Missing or don't want to report
All participants									
Diet and health-related beliefs[a]	0.17 (0.84)	0.08 (0.88)	–0.09 (1.03)	–0.14 (1.11)**	0.10 (0.86)	0.11 (0.94)	–0.01 (0.93)	–0.17 (1.12)	–0.05 (1.13)
Nutritional knowledge[b]	19.0 (0.0, 20.0)	18.0 (7.0, 20.0)	18.0 (4.0, 20.0)	17.0 (0.0, 20.0)***	18.5 (4.0, 20.0)	19.0 (1.0, 20.0)	18.0 (4.0, 20.0)	17.0 (0.0, 20.0)	18.0 (4, 20.0)***
Financial situation									
Are comfortable	79.2	65.6	56.3	56.5***	89.7	74.1	59.1	34.3	71.5***
Presence of child(ren) in the household									
Yes	54.4	59.6	53.6	51.7	23.5	72.3	56.8	64.4	53.3***
Follow some kind of diet									
Yes	33.2	28.7	35.0	27.9	29.1	29.6	31.3	33.8	34.7
Feel rushed or pressed for time									
Agree	67.4	66.0	66.7	60.9	66.8	72.3	63.0	58.0	66.1
Motor vehicle availability									
Yes always/sometimes	97.3	96.2	97.4	93.9	99.5	97.4	95.7	90.1	97.8***
Often have spare time that I don't know what to do with									
Agree	8.3	13.7	17.1	21.2***	14.2	13.6	14.0	18.8	13.1
Try to avoid takeaway food because I don't want to gain weight									
Agree	63.5	70.0	63.4	57.8	59.2	66.1	66.1	59.5	64.4
Healthy food is tasty									
Agree	91.4	90.7	89.6	87.2	91.9	89.5	87.0	89.5	89.9
Main dinner preparer									
Myself	64.1	57.7	63.4	68.3	59.7	60.0	61.7	71.8	76.2**
Frequency of dinner preparation									
≥ 5 times/week	53.4	50.0	51.5	59.7	41.3	53.3	57.3	60.1	70.3

Table 7.5: Bivariate associations between psychosocial factors and socioeconomic position (continued)

	Education (%) (n=859)				Household income (AUS $) (%) (n=863)				
	≥Bachelor degree	Diploma	Vocational	No post-school qualifications	≥62000	46501 to 61999	30001 to 46500	≤3000	Missing or don't want to report
Among participants who prepare dinner			n=837				n=841		
Prepare a meal from basic ingredients									
≥ 5 times/week	41.5	33.5	34.8	38.4	34.1	37.4	35.3	40.7	51.6*
Spent less than 15 min preparing dinner									
≥ 3 times/week	11.4	20.4	14.4	20.1*	14.0	14.3	11.5	23.4	17.6*
Felt cooking is a real chore									
≥ 3 times/week	14.7	17.6	20.9	23.3	12.5	20.9	15.9	21.9	29.4**
Among takeaway food consumers			n=832				n=835		
Perceived value of takeaway food[a]	0.08 (1.00)	–0.01 (0.87)	0.00 (0.99)	0.05 (0.98)	0.13 (1.03)	0.11 (1.00)	–0.04 (0.90)	–0.03 (0.97)	0.04 (0.86)
Takeaway food as pleasure[a]	0.10 (0.98)	0.15 (0.80)	0.05 (0.90)	0.01 (0.92)	–0.04 (0.93)	0.18 (0.89)	–0.01 (0.95)	0.15 (0.90)	–0.03 (0.95)
Eat takeaway food because too busy to cook									
Agree	53.7	41.7	46.0	40.5**	52.6	51.3	48.1	39.9	31.9**
Takeaway foods are tasty									
Agree	77.0	74.8	67.3	77.5	77.3	75.4	74.6	76.0	66.5
Takeaway food is nutritious									
Agree	11.2	7.7	8.6	5.2	12.0	6.6	7.1	9.4	4.2
My takeaway food choice is influenced by my children			n=500				n=503		
Agree	53.7	41.5	44.7	46.9	34.1	54.5	48.7	50.9	41.1
My takeaway food choice is influenced by my partner			n=695				n=697		
Agree	68.4	58.4	49.3	53.2***	68.0	66.3	56.5	47.5	48.8***
My takeaway food choice is influenced by my friends			n=710				n=713		
Agree	19.3	21.0	18.2	16.6	24.3	15.8	18.1	16.6	15.4
Eating takeaway food is a way of socialising with family and friends			n=780				n=782		
Agree	41.6	43.3	36.6	36.9	39.0	39.6	36.8	40.2	38.6

[a] Mean (SD); [b] Median (minimum, maximum); * p<0.05, ** p<0.01, *** p<0.001

Association between education and psychosocial factors that may influence takeaway food consumption

The results of the multivariable analyses showed some education differences in psychosocial factors (Table 7.6). Compared with those with a bachelor degree or higher, participants with no post-school qualifications were significantly more likely to:

- have weaker diet and health-related beliefs
- have lower nutritional knowledge
- have financial difficulties
- agree with the statement "I often have spare time that I don't know what to do with"
- spend less than 15 minutes preparing dinner frequently
- frequently feel that cooking is a real chore
- disagree with the statement "I eat takeaway foods because I am too busy to cook"
- disagree with the statement "Takeaway food is nutritious"
- disagree with the statement "My takeaway food choice is influenced by my partner".

Compared with participants with a bachelor degree or higher, those with a vocational level of education were significantly more likely to:

- have weaker diet and health-related beliefs
- have lower nutritional knowledge
- have financial difficulties
- agree with the statement "I often have spare time that I don't know what to do with"
- frequently feel that cooking is a real chore
- disagree with the statement "Takeaway foods are tasty"

- disagree with the statement “My takeaway food choice is influenced by my partner”.

Compared with participants with a bachelor degree or higher, those with a diploma level of education were more likely to:

- have financial difficulties
- spend less than 15 minutes preparing dinner frequently.

There were no other education differences in psychosocial factors.

Table 7.6: Education differences in psychosocial factors

	B	p-value
All participants n=859		
Diet and health-related beliefs		
Bachelor degree or higher	Reference	–
Diploma	–0.11	0.314
Vocational	–0.25	0.009
No post-school qualifications	–0.35	<0.001
Nutritional knowledge		
Bachelor degree or higher	Reference	–
Diploma	–0.47	0.13
Vocational	–0.93	<0.01
No post-school qualifications	–1.53	<0.01
Among takeaway food consumers n=832		
Perceived values of takeaway food		
Bachelor degree or higher	Reference	–
Diploma	–0.02	0.867
Vocational	–0.08	0.382
No post-school qualifications	0.09	0.255
Takeaway food as pleasure		
Bachelor degree or higher	Reference	–
Diploma	0.07	0.489
Vocational	–0.03	0.747
No post-school qualifications	–0.05	0.513

	PR (95% CI)
All participants n=859	
Financial situation: are comfortable	
Bachelor degree or higher	1.00
Diploma	0.92 (0.87, 0.98)
Vocational	0.87 (0.82, 0.93)
No post-school qualifications	0.87 (0.83, 0.91)
Presence of children: Yes	
Bachelor degree or higher	1.00
Diploma	1.10 (0.82, 1.47)
Vocational	0.99 (0.76, 1.29)
No post-school qualifications	0.94 (0.75, 1.18)
Follow some kind of diet: Yes	
Bachelor degree or higher	1.00
Diploma	0.96 (0.88, 1.04)
Vocational	1.01 (0.95, 1.09)
No post-school qualifications	0.95 (0.89, 1.00)
Often feel rushed: Agree	
Bachelor degree or higher	1.00
Diploma	1.00 (0.85, 1.17)
Vocational	1.02 (0.90, 1.17)
No post-school qualifications	0.94 (0.83, 1.07)

Table 7.6: Education differences in psychosocial factors (continued)

	PR (95% CI)
Often have spare time that I don't know what to do with: Agree	
Bachelor degree or higher	1.00
Diploma	1.64 (0.88, 3.04)
Vocational	1.92 (1.14, 3.22)
No post-school qualifications	2.61 (1.41, 4.11)
Motor vehicle availability: Yes, always/sometimes	
Bachelor degree or higher	1.00
Diploma	0.99 (0.78, 1.24)
Vocational	1.00 (0.82, 1.22)
No post-school qualifications	0.97 (0.82, 1.15)
Try to avoid takeaway food because I don't want to gain weight: Agree	
Bachelor degree or higher	1.00
Diploma	0.92 (0.79, 1.08)
Vocational	1.00 (0.86, 1.15)
No post-school qualifications	0.90 (0.79, 1.02)
Healthy food is tasty: Agree	
Bachelor degree or higher	1.00
Diploma	0.96 (0.78, 1.25)
Vocational	0.99 (0.80, 1.21)
No post-school qualifications	0.96 (0.81, 1.14)
Main meal preparer: Myself	
Bachelor degree or higher	1.00
Diploma	0.92 (0.79, 1.08)
Vocational	1.06 (0.94, 1.19)
No post-school qualifications	1.04 (0.94, 1.16)
Frequency of dinner preparation: ≥ 5 times/week	
Bachelor degree or higher	1.00
Diploma	1.10 (0.99, 1.21)
Vocational	1.02 (0.81, 1.15)
No post-school qualifications	1.04 (0.86, 1.02)
Among participants who prepare dinner n=837[a]	
Prepare a meal from basic ingredients: ≥5 times/week	
Bachelor degree or higher	1.00
Diploma	0.81 (0.62, 1.07)
Vocational	0.87 (0.68, 1.11)
No post-school qualifications	0.85 (0.70, 1.03)
Spent less than 15 minutes preparing dinner: ≥ 3times/week	
Bachelor degree or higher	1.00
Diploma	1.79 (1.07, 2.99)
Vocational	1.28 (0.77, 2.13)
No post-school qualifications	1.77 (1.17, 2.69)
Felt cooking is a real chore: ≥ 3times/week	
Bachelor degree or higher	1.00
Diploma	1.23 (0.73, 2.04)
Vocational	1.61 (1.06, 2.46)
No post-school qualifications	1.57 (1.09, 2.25)

Table 7.6: Education differences in psychosocial factors (continued)

	PR (95% CI)
Among takeaway food consumers n=832	
Eat takeaway food because too busy to cook: Agree	
Bachelor degree or higher	1.00
Diploma	0.80 (0.62, 1.04)
Vocational	0.89 (0.73, 1.08)
No post-school qualifications	0.80 (0.67, 0.96)
Takeaway food is tasty: Agree	
Bachelor degree or higher	1.00
Diploma	0.98 (0.85, 1.11)
Vocational	0.88 (0.78, 0.99)
No post-school qualifications	1.02(0.93, 1.12)
Takeaway food is nutritious: Agree	
Bachelor degree or higher	1.00
Diploma	0.58 (0.26, 1.25)
Vocational	0.73 (0.40, 1.32)
No post-school qualifications	0.44 (0.24, 0.80)
Takeaway food choice is influenced by children: Agree	n=500
Bachelor degree or higher	1.00
Diploma	0.77 (0.56, 1.06)
Vocational	0.86 (0.66, 1.12)
No post-school qualifications	0.88 (0.71, 1.09)
Takeaway choice is influenced by my partner: Agree	n=695
Bachelor degree or higher	1.00
Diploma	0.89 (0.74, 1.08)
Vocational	0.76 (0.62, 0.93)
No post-school qualifications	0.80 (0.69, 0.93)
Takeaway choice is influenced by friends: Agree	n=710
Bachelor degree or higher	1.00
Diploma	1.21 (0.76, 1.94)
Vocational	0.98 (0.63, 1.53)
No post-school qualifications	0.89 (0.61, 1.31)
Eating takeaway is a way of socialising with family & friends: Agree	n=780
Bachelor degree or higher	1.00
Diploma	1.07 (0.82, 1.40)
Vocational	0.87 (0.67, 1.12)
No post-school qualifications	0.89 (0.72, 1.10)

[a] Participants who “never” prepare dinner were excluded.
All analyses are adjusted for age and sex.

Association between household income and psychosocial factors

Table 7.7 shows the association between household income and psychosocial factors. Compared with the highest income group, the lowest income group was significantly more likely to:

- have weaker diet and health-related beliefs
- have low nutritional knowledge
- perceive takeaway food as pleasure
- have financial difficulties
- have children present at home
- prepare dinner frequently
- spend less than 15 minutes to prepare dinner frequently
- frequently feel that cooking is a real chore
- disagree with the statement “My takeaway food choice is influenced by my partner”.

Compared with the highest income group, the second lowest income group was more likely to:

- have low nutritional knowledge
- have financial difficulties
- have children present at home
- prepare dinner frequently.

Compared with the highest income group, the second highest income group was more likely to:

- perceive takeaway food as pleasure
- have financial difficulties
- have children present at home
- prepare dinner frequently

- frequently feel that cooking is a real chore
- agree with the statement “My takeaway food choice is influenced by my child/children”.

Compared with the highest income group, participants who did not report their income levels were more likely to:

- have weaker diet and health-related beliefs
- have low nutritional knowledge
- have financial difficulties
- have children present at home
- prepare dinner frequently
- frequently feel that cooking is a real chore
- disagree with the statement “I eat takeaway food because I am too busy to cook”
- disagree with the statement “My takeaway food choice is influenced by my partner”.

Table 7.7: Household income differences in psychosocial factors

	B	p-value
Among all participants N=863		
Diet and health-related beliefs		
≥ $62000	Reference	
$46501–$61999	–0.02	0.829
$30001–$46500	–0.16	0.120
≤ $30000	–0.35	0.001
Missing or did not want to report	–0.28	0.037
Nutritional knowledge		
≥ $62000	Reference	–
$46501–$61999	–0.09	0.752
$30001–$46500	–0.57	0.044
≤ $30000	–1.21	0.001
Missing or did not want to report	–1.04	0.002
Among takeaway food consumers n=835		
Perceived value of takeaway food		
≥ $62000	Reference	–
$46501–$61999	0.02	0.840
$30001–$46500	–0.11	0.286
≤ $30000	–0.05	0.585
Missing or did not want to report	0.03	0.816
Takeaway food as pleasure		
≥ $62000	Reference	–
$46501–$61999	0.24	0.009
$30001–$46500	0.06	0.533
≤ $30000	0.20	0.031
Missing or did not want to report	0.03	0.797

	PR (95% CI)
All participants N = 863	
Financial situation: are comfortable	
≥ $62000	1.00
$46501–$61999	0.92 (0.88, 0.96)
$30001–$46500	0.84 (0.66, 0.74)
≤ $30000	0.70 (0.66, 0.74)
Missing or did not want to report	0.90 (0.84, 0.95)
Presence of children: Yes	n=852
≥ $62000	1.00
$46501–$61999	3.09 (2.36, 4.03)
$30001–$46500	2.43 (1.83, 3.22)
≤ $30000	2.76 (2.09, 3.63)
Missing & did not want to report	2.28 (1.65, 3.14)
Follow some kind of diet: Yes	
≥ $62000	1.00
$46501–$61999	0.99 (0.92, 1.06)
$30001–$46500	1.00 (0.93, 1.07)
≤ $30000	1.01 (0.94, 1.07)
Missing or did not want to report	1.00 (0.92, 1.09)
Often feel rushed: Agree	
≥ $62000	1.00
$46501–$61999	1.09 (0.96, 1.25)
$30001–$46500	0.96 (0.82, 1.11)
≤ $30000	0.89 (0.76, 1.04)
Missing or did not want to report	1.00 (0.84, 1.19)

Table 7.7: Household income differences in psychosocial factors (continued)

	PR (95% CI)
Often have spare time that I don't know what to do with: Agree	
≥ $62000	1.00
$46501–$61999	0.99 (0.59, 1.67)
$30001–$46500	1.03 (0.63, 1.70)
≤ $30000	1.42 (0.90, 2.25)
Missing or did not want to report	1.07 (0.58, 1.98)
Motor vehicle availability: Yes, always/sometimes	
≥ $62000	1.00
$46501–$61999	0.98 (0.80, 1.20)
$30001–$46500	0.96 (0.78, 1.18)
≤ $30000	0.90 (0.73, 1.11)
Missing or did not want to report	1.00 (0.77, 1.29)
Try to avoid takeaway food because I don't want to gain weight: Agree	
≥ $62000	1.00
$46501–$61999	1.10 (0.94, 1.28)
$30001–$46500	1.09 (0.93, 1.27)
≤ $30000	0.96 (0.81, 1.14)
Missing & did not want to report	1.02 (0.84, 1.23)
Healthy food is tasty: Agree	
≥ $62000	1.00
$46501–$61999	0.97 (0.79, 1.19)
$30001–$46500	0.94 (0.76, 1.16)
≤ $30000	0.96 (0.78, 1.19)
Missing or did not want to report	0.96 (0.79, 1.23)
Main dinner preparer: Myself	
≥ $62000	1.00
$46501–$61999	0.96 (0.83, 1.11)
$30001–$46500	0.98 (0.84, 1.14)
≤ $30000	1.10 (0.96, 1.14)
Missing or did not want to report	1.07 (0.93, 1.24)
Frequency of dinner preparation: ≥ 5 times/week	
≥ $62000	1.00
$46501–$61999	1.20 (1.09, 1.33)
$30001–$46500	1.26 (1.04, 1.53)
≤ $30000	1.26 (1.14, 1.39)
Missing or did not want to report	1.33 (1.20, 1.47)
Among people who prepare dinner n=841[a]	
Prepare a meal from basic ingredients: ≥ 5 times/week	
≥ $62000	1.00
$46501–$61999	1.02 (0.79, 1.31)
$30001–$46500	0.93 (0.71, 1.22)
≤ $30000	1.01 (0.78, 1.31)
Missing or did not want to report	1.17 (0.90, 1.55)
Spent less than 15 minutes preparing dinner: ≥ 3times/week	
≥ $62000	1.00
$46501–$61999	1.02 (0.62, 1.69)
$30001–$46500	0.83 (0.48, 1.43)
≤ $30000	1.68 (1.06, 2.66)
Missing or did not want to report	1.25 (0.66, 2.35)
Felt cooking is a real chore: ≥ 3times/week	
≥ $62000	1.00
$46501–$61999	1.64 (1.02, 2.65)
$30001–$46500	1.24 (0.74, 2.09)
≤ $30000	1.72 (1.06, 2.80)
Missing or did not want to report	2.17 (1.31, 3.59)

Table 7.7: Household income differences in psychosocial factors (continued)

	PR (95% CI)
Among takeaway food consumers n=835	
Eat takeaway food because too busy to cook: Agree	
≥ $62000	1.00
$46501–$61999	1.03 (0.84, 1.25)
$30001–$46500	0.98 (0.80, 1.20)
≤ $30000	0.83 (0.66, 1.05)
Missing or did not want to report	0.63 (0.45, 0.88)
Takeaway food is tasty: Agree	
≥ $62000	1.00
$46501–$61999	0.99 (0.89, 1.11)
$30001–$46500	0.99 (0.80, 1.20)
≤ $30000	1.01 (0.90, 1.13)
Missing & did not want to report	0.90 (0.76, 1.07)
Takeaway food is nutritious: Agree	
≥ $62000	1.00
$46501–$61999	0.57 (0.30, 1.10)
$30001–$46500	0.60 (0.31, 1.17)
≤ $30000	0.75 (0.40, 1.41)
Missing or did not want to report	0.38 (0.13, 1.09)
Takeaway food choice is influenced by children: Agree	n=503
≥ $62000	1.00
$46501–$61999	1.55 (1.07, 2.25)
$30001–$46500	1.40 (0.96, 2.06)
≤ $30000	1.42 (0.98, 2.07)
Missing or did not want to report	1.12 (0.70, 1.96)
Takeaway choice is influenced by my partner: Agree	n=697
≥ $62000	1.00
$46501–$61999	0.99 (0.85, 1.16)
$30001–$46500	0.85 (0.71, 1.02)
≤ $30000	0.72 (0.59, 0.89)
Missing or did not want to report	0.75 (0.58, 0.97)
Takeaway choice is influenced by friends: Agree	n=713
≥ $62000	1.00
$46501–$61999	0.66 (0.42, 1.03)
$30001–$46500	0.80 (0.71, 1.02)
≤ $30000	0.76 (0.49, 1.20)
Missing or did not want to report	0.71 (0.39, 1.26)
Eating takeaway is a way of socialising with family & friends: Agree	n=782
≥ $62000	1.00
$46501–$61999	1.06 (0.77, 1.46)
$30001–$46500	0.98 (0.76, 1.28)
≤ $30000	1.07 (0.82, 1.38)
Missing or did not want to report	1.06 (0.77, 1.46)

a Participants who “never” prepare dinner were excluded.
All analyses adjusted by age and sex.

Association between psychosocial factors and takeaway food consumption

Table 7.8 presents the association between psychosocial factors and overall, “healthy” and “less healthy” takeaway food consumption adjusted for education, age and sex. Table 7.9 shows the association between psychosocial factors and overall, “healthy” and “less healthy” takeaway food consumption adjusted for household income, age and sex. Regardless of whether adjusting for education or income, almost exactly the same variables were associated with takeaway food consumption. The following psychosocial factors were associated with frequent overall takeaway food consumption:

- agree with the statement “In general, I often feel rushed or pressed for time” (education only)
- do not follow any diet
- disagree with the statement “I try to avoid takeaway food because I don’t want to gain weight”
- disagree with the statement “Healthy food is tasty” (education only)
- less frequently prepare dinner
- less frequently prepare a meal from basic ingredients
- frequently spend less than 15 minutes preparing dinner
- frequently felt cooking is a real chore
- perceive takeaway food is value for money
- agree with the statement “I eat takeaway food because I am too busy to cook”
- agree with the statement “Takeaway food is nutritious”
- agree with the statement “Eating takeaway food is a way of socialising with family and friends”.

The following psychosocial factors were significantly associated with a high level of “healthy” takeaway food consumption:

- low nutritional knowledge

- children were present at home (education only)
- the survey respondent was the main dinner preparer in the household (education only)
- less frequently prepare dinner
- less frequently prepare a meal from basic ingredients
- frequently spend less than 15 minutes preparing dinner
- perceive takeaway food as value for money
- agree with the statement "I eat takeaway food because I am too busy to cook"
- agree with the statement "My takeaway food choice is influenced by my friends"
- agree with the statement "Eating takeaway food is a way of socialising with family and friends".

The following psychosocial factors were significantly associated with a high level of "less healthy" takeaway food consumption:

- weaker diet and health-related beliefs
- low nutritional knowledge
- agree with the statement "In general, I often feel rushed or pressed for time" (household income only)
- do not follow any diets
- disagree with the statement "I try to avoid takeaway food because I don't want to gain weight"
- the survey respondent was the main dinner preparer in the household
- less frequently prepare dinner
- less frequently prepare a meal from basic ingredients
- frequently felt cooking is a real chore
- perceive takeaway food as value for money

- perceive takeaway as pleasure
- agree with the statement “I eat takeaway food because I am too busy to cook”
- agree with the statement “Takeaway foods are tasty”
- agree with the statement “Takeaway food is nutritious”
- agree with the statement “My takeaway food choice is influenced by my children” (household income only)
- agree with the statement “My takeaway food choice is influenced by my friends”
- agree with the statement “Eating takeaway food is a way of socialising with family and friends”.

Table 7.8: Associations between psychosocial factors and takeaway food consumption

	Overall takeaway food	Healthy takeaway food	Less healthy takeaway food
Diet and health-related beliefs	–0.03	–0.55	–1.29***
Nutritional knowledge	0.02	–0.46**	–0.37***
Presence of children: Yes	–0.12	–1.60*	–0.19
Often feel rushed: Agree	0.16*	0.43	1.22
Often have spare time: Agree	0.17	–1.23	–0.41
Motor vehicle availability: Yes always/sometimes	–0.27	2.30	1.38
Financial situation: Are comfortable	0.09	0.30	–0.81
Follow some kinds of diet: Yes	–0.23**	–0.44	–3.31***
Try to avoid takeaway food because I don't want to gain weight: Agree	–0.51***	–0.20	–3.26***
Healthy food is tasty: Agree	–0.35*	1.40	–1.38
Main dinner preparer: Myself	0.08	1.91*	1.63*
Frequency of dinner preparation: ≥5times/week	–0.42***	–2.15*	–2.40**
Among people who prepare dinner			
Prepare a meal from basic ingredients: ≥ 5 times/week	–0.30***	–3.23***	–3.51***
Spent <15 min preparing dinner: ≥ 3 times	0.22*	3.62**	1.04
Felt cooking is a real chore: ≥ 3 times	0.32**	1.58	2.71**
Among Takeaway food consumers			
Perceived value of takeaway food	0.28***	1.38**	1.75***
Takeaway food as pleasure	–0.04	0.01	1.10***
Eat takeaway food because too busy to cook: Agree	0.46***	2.16**	2.94***
Takeaway food is tasty: Agree	0.12	0.34	2.90***
Takeaway food is nutritious: Agree	0.76***	2.08	3.04**
Takeaway food choice is influenced by children: Agree	–0.02	0.79	1.60
Takeaway food choice is influenced by partner: Agree	0.07	–0.41	1.22
Takeaway food choice is influenced by friends: Agree	0.19	2.71*	2.68**
Eating takeaway food is a way of socialising with family & friends: Agree	0.21*	1.83*	2.02**

All analyses adjusted for *education*, age, sex.
* p<0.05, ** p<0.01, ***p<0.001

Table 7.9: Associations between psychosocial factors and takeaway food consumption

	Overall takeaway food	Healthy takeaway food	Less healthy takeaway food
Diet and health-related beliefs	–0.04	–0.64	–1.38***
Nutritional knowledge	0.01	–0.49**	–0.42***
Presence of children: Yes	–0.07	–1.11	–0.42
Often feel rushed: Agree	0.15	0.81	1.50*
Often have spare time: Agree	0.19	–1.06	0.07
Motor vehicle availability: Yes always/sometimes	–1.38	2.07	1.19
Financial situation: Are comfortable	0.12	–0.33	–0.60
Follow some kinds of diet: Yes	–0.24**	–0.39	–3.31***
Try to avoid takeaway food because I don't want to gain weight: Agree	–0.51***	0.13	–3.19***
Healthy food is tasty: Agree	–1.00	1.26	–1.48
Main dinner preparer: Myself	0.07	1.59	1.49*
Frequency of dinner preparation: ≥ 5times/week	–0.41***	–2.18*	–2.50***
Among people who prepare dinner			
Prepare a meal from basic ingredients: ≥ 5 times/week	–0.31***	–3.43***	–3.63***
Spent <15 min preparing dinner: ≥ 3 times	0.25*	3.68**	1.27
Felt cooking is a real chore ≤ twice/wk: ≥ 3 times	0.34***	1.70	2.85**
Among Takeaway food consumers			
Takeaway value factor	0.28***	1.39**	1.80***
Takeaway food as pleasure	–0.03	0.03	1.00**
Eat takeaway food because too busy to cook: Agree	0.44***	2.18**	2.87***
Takeaway food is tasty: Agree	0.12	0.10	2.77***
Takeaway food is nutritious: Agree	0.70***	1.41	2.48*
Takeaway food choice is influenced by children: Agree	–0.01	1.04	1.67*
Takeaway food choice is influenced by partner: Agree	0.05	–0.39	1.28
Takeaway food choice is influenced by friends: Agree	0.17	2.88**	2.80**
Eating takeaway food is a way of socialising with family & friends: Agree	0.22**	1.74*	1.87**

All analyses adjusted for *household income*, age and sex.
* p<0.05, ** p<0.01, ***p<0.001

Associations between education and takeaway food consumption and the contribution of psychosocial factors to these associations

Table 7.10 shows the education differences in overall takeaway food consumption and the contribution of psychosocial factors to these associations. Among takeaway food consumers, participants with a diploma level of education consumed takeaway food significantly more frequently compared with those with a bachelor degree or higher (B = 0.28, p=0.033) (base model). There were no other significant differences in overall takeaway food consumption. Adjustment for the perception that they were too busy to cook and takeaway food is nutritious increased the magnitude of the association between education and overall takeaway food consumption, and the differences became significant, except among those with vocational education level.

Among dinner preparers, the adjustment for spending less than 15 minutes preparing dinner attenuated the association between education and overall takeaway food consumption, and any differences observed were no longer statistically significant. Similarly, adjustment for the perception that cooking was a chore, attenuated the association between education and overall takeaway food consumption; however, the differences between those with a bachelor degree or higher and a diploma level of education became only marginally insignificant (B = 0.25, p=0.052).

Table 7.10: Contribution of psychosocial factor to education differences in overall takeaway food consumption

Among takeaway food consumers n=832	**Overall takeaway food (Base model)**		**Eat takeaway food because too busy to cook**		**Takeaway food is nutritious**	
	B	p-value	B	p-value	B	p-value
Bachelor degree or higher	Ref	–	Ref	–	Ref	–
Diploma	0.28	0.033	0.32	0.010	0.31	0.014
Vocational	0.06	0.575	0.09	0.411	0.08	0.429
No post-school qualifications	0.17	0.069	0.22	0.019	0.22	0.017
Among dinner preparers n=837	**Overall takeaway food (Base model)**		**Spent less than 15 minutes preparing dinner**		**Felt cooking is a real chore**	
	B	p-value	B	p-value	B	p-value
Bachelor degree or higher	Ref	–	Ref	–	Ref	–
Diploma	0.26	0.043	0.24	0.064	0.25	0.052
Vocational	0.03	0.890	0.03	0.813	0.01	0.961
No post-school qualifications	0.18	0.055	0.16	0.096	0.15	0.101

All analyses adjusted for age and sex.

Table 7.11 shows the associations between education and “healthy” takeaway food consumption and the contribution of psychosocial factors to these associations. Compared with the participants with a bachelor degree or higher, lower educated groups consumed a higher level of “healthy” takeaway foods; however, the difference reached statistical significance only among those with a diploma level of education (B = 3.29, p=0.010) (base model). Adjustment for nutritional knowledge slightly attenuated the magnitude of differences across all education levels; however, the differences between those with a bachelor degree or higher and a diploma level of education remained significant (B = 3.10, p = 0.016). On the other hand, adjustment for the perception that they were too busy to cook widened the education differences in “healthy” takeaway food consumption. Nevertheless, only participants with a diploma level of education reached significantly higher “healthy” takeaway food consumption compared with those with a bachelor degree or higher (B = 3.52, p=0.006).

Among dinner preparers, adjustment for spending less than 15 minutes preparing dinner attenuated the association between education and “healthy” takeaway food consumption; however, differences between participants with a bachelor degree or higher and those with a diploma level of education remained significant (B = 3.13, p = 0.016).

Table 7.11: Contribution of psychosocial factor to education differences in "healthy" takeaway food consumption

All takeaway food consumers n=832	**Healthy takeaway food (Base model)**		**Nutritional knowledge**		**Eat takeaway food because too busy to cook**	
	B	p-value	B	p-value	B	p-value
Bachelor degree or higher	Ref	–	Ref	–	Ref	–
Diploma	3.29	0.010	3.10	0.016	3.52	0.006
Vocational	1.31	0.236	0.89	0.430	1.44	0.191
No post-school qualifications	1.45	0.122	0.78	0.414	1.67	0.074
Among dinner preparers n=812	**Healthy takeaway food (Base model)**		**Spent less than 15 minutes preparing dinner**			
	B	p-value	B	p-value		
Bachelor degree or higher	Ref	–	Ref	–		
Diploma	3.48	0.007	3.13	0.016		
Vocational	1.47	0.190	1.34	0.230		
No post-school qualifications	1.48	0.119	1.17	0.216		

All analyses adjusted for age and sex.

Table 7.12 summarises the association between education and "less healthy" takeaway food consumption and the contribution of psychosocial factors to these associations. Compared with participants with a bachelor degree or higher, lower educated groups consumed a significantly higher level of "less healthy" takeaway foods (all p<0.05) (base model). Adjustment for diet and health-related beliefs and nutritional knowledge attenuated the magnitude of the difference across all education groups. However, the difference between participants with a bachelor degree or higher and those with a diploma level of education or no post-school qualifications remained significant. In contrast, adjustment for the perception that they were too busy to cook, and takeaway food is nutritious increased the magnitude of the education differences, and significantly higher consumption levels were observed among all other education groups compared with those with a bachelor degree or higher.

Among dinner preparers, adjustment for the perception that cooking was a chore slightly attenuated the association between education and “less healthy” takeaway food consumption. However, the observed differences remained significant among those with a diploma level of education or no post-school qualifications ($B = 2.35$, $p = 0.022$; $B = 2.76$, $p<0.001$, respectively) (marginally insignificant for those with vocational level of education $B = 1.73$, $p = 0.051$).

Table 7.12: Contribution of psychosocial factor to education differences in "less healthy" takeaway food consumption

All takeaway food consumers n = 832	**Less healthy takeaway food (Base model)**		**Diet and health-related beliefs**		**Nutritional knowledge**		**Eat takeaway food because too busy to cook**		**Takeaway food is nutritious**	
	B	p-value	B	p-value	B	p-value	B	p-value	B	p-value
Bachelor degree or higher	Ref	–	Ref	–	Ref	–	Ref	–	Ref	–
Diploma	2.16	0.033	2.06	0.041	2.01	0.047	2.48	0.014	2.31	0.023
Vocational	1.87	0.033	1.56	0.075	1.52	0.084	2.05	0.018	1.97	0.025
No post-school qualifications	2.86	<0.001	2.44	0.001	2.32	0.002	3.16	<0.001	3.06	<0.001

Among dinner preparers n = 812	**Less healthy takeaway food (Base model)**		**Felt cooking is a real chore**	
	B	p-value	B	p-value
Bachelor degree or higher	Ref	–	Ref	–
Diploma	2.43	0.018	2.35	0.022
Vocational	2.00	0.025	1.73	0.051
No post-school qualifications	2.98	<0.001	2.76	<0.001

All analyses adjusted for age and sex.

Associations between household income and takeaway food consumption and the contribution of psychosocial factors to these associations

Table 7.13 shows the association between household income and overall takeaway food consumption and the contribution of psychosocial factors to this association. Compared with the highest income group, the second highest (B = –0.22, p=0.047) and the second lowest income groups (B = –0.23, p=0.042) consumed overall takeaway food significantly less frequently (base model). The frequency of consumption was not significantly different between the highest and the lowest income groups or those who did not report their income levels. When the variable "frequency of dinner preparation" was added to the base model, the association was attenuated across all education level and none of the consumption differences were significant.

Among takeaway food consumers, adjustment for the perception that they were too busy to cook slightly widened the magnitude of the association between household income and overall takeaway food consumption. However, only the second highest income group reached a significantly less frequent consumption level compared with the highest income group (B = –0.23, p=0.039).

Among dinner preparers, after the inclusion of spending less than 15 minutes preparing dinner to the base model, the magnitude of differences slightly increased for all income groups except the second lowest income group. Nonetheless, only the second highest and the second lowest income groups had a significantly lower frequency of overall takeaway food consumption compared with the highest income group (B = –0.23, p=0.045; and B = –0.23, p=0.050 respectively). When regular feeling of cooking is a chore was added to the model, the magnitude of differences increased across all income groups compared with the highest income group, and significantly less frequent consumption was observed among all income groups except the lowest income group.

Table 7.13: Association between household income and overall takeaway food consumption and the contribution of psychosocial factor to its association

All participants N = 863	**Overall takeaway food (Base model)**		**Frequency of dinner preparation**	
	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–
$46501–$61999	–0.22	0.047	–0.19	0.090
$30001–$46500	–0.23	0.042	–0.19	0.099
≤ $30000	–0.15	0.194	–0.10	0.387
Missing or don't want to report	–0.26	0.063	–0.19	0.311

Among takeaway food consumers n = 835	**Overall takeaway food (Base model)**		**Eat takeaway food because too busy to cook**	
	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–
$46501–$61999	–0.23	0.047	–0.23	0.039
$30001–$46500	–0.23	0.051	–0.22	0.053
≤ $30000	–0.13	0.260	–0.09	0.413
Missing or don't want to report	–0.24	0.082	–0.17	0.232

Among dinner preparers n = 841	**Overall takeaway food (Base model)**		**Spent less than 15 minutes preparing dinner**		**Felt cooking is a real chore**	
	B	p-value	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–	Ref	–
$46501–$61999	–0.23	0.048	–0.23	0.045	–0.26	0.025
$30001–$46500	–0.23	0.046	–0.23	0.050	–0.24	0.036
≤ $30000	–0.16	0.177	–0.18	0.119	–0.19	0.099
Missing or don't want to report	–0.26	0.061	–0.28	0.051	–0.32	0.023

All analyses adjusted for age and sex.

Table 7.14 summarises the association between household income and "healthy" takeaway food consumption and the contribution of psychosocial factors to this association. The lowest level of "healthy" takeaway food consumption was observed among the second highest income group and they consumed significantly lower levels compared with the highest income group (B = –2.65, p=0.020) (base model). No other significant income differences were observed. When the base model was adjusted for nutritional knowledge, the magnitude of the income differences became wider, except for the lowest income group. Significantly lower consumption was observed only among the second highest income group compared with the highest income group (B = –2.69, p = 0.018). In contrast, adjustment for the frequency of dinner preparation slightly attenuated the differences in "healthy" takeaway food consumption, except for the lowest income group. However, the differences between the highest and the second highest income groups remained significant (B = –2.47, p = 0.030). Adjustment for the perception that they were too busy to cook slightly changed the magnitude of the income differences in both directions. Nevertheless, the only significant differences were observed between the highest and the second highest income groups (B = –2.67, p = 0.019).

Among dinner preparers, adjustment for spending less than 15 minutes preparing dinner changed the magnitude of differences in "healthy" takeaway food consumption in both directions. However, only significant difference was observed among the second highest income group (B = –2.58, p = 0.026). Similarly, adjustment for the perception that cooking was a chore widens the magnitude of income differences except for the lowest income group. Compared with the highest income group, significantly lower consumption levels were observed among the second highest income groups (B = –2.73, p = 0.019).

Table 7.14: Association between household income and "healthy" takeaway food consumption and the contribution of psychosocial factors to its association

All takeaway food consumers n=835	Healthy takeaway food (Base model)		Nutritional knowledge		Frequency of dinner preparation		Eat takeaway food because too busy to cook	
	B	p-value	B	p-value	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–	Ref	–	Ref	–
$46501–$61999	–2.65	0.020	–2.69	0.018	–2.47	0.030	–2.67	0.019
$30001–$46500	–1.90	0.103	–2.18	0.061	–1.67	0.153	–1.88	0.107
≤ $30000	0.62	0.600	0.09	0.938	0.87	0.458	0.80	0.493
Missing or don't want to report	–1.66	0.248	–2.05	0.153	–1.32	0.358	–1.26	0.381

Among dinner preparers n=815	Healthy takeaway food (Base model)		Spent less than 15 minutes preparing dinner		Felt cooking is a real chore	
	B	p-value	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–	Ref	–
$46501–$61999	–2.56	0.028	–2.58	0.026	–2.73	0.019
$30001–$46500	–2.06	0.083	–1.93	0.103	–2.13	0.073
≤ $30000	0.47	0.695	0.12	0.919	0.27	0.819
Missing or don't want to report	–1.83	0.208	–1.91	0.187	–2.11	0.151

All analyses adjusted for age and sex.

Table 7.15 presents the association between household income and "less healthy" takeaway food consumption and the contribution of psychosocial factors to this association. The lowest income group consumed the highest level of "less healthy" takeaway food across all income levels, and their consumption level was significantly higher than the highest income group (B = 2.67, p = 0.004) (base model). There were no significant differences for the other income groups. When the base model was adjusted for diet and health-related beliefs, nutritional knowledge, or the perception that takeaway food is pleasure, the magnitude of differences were attenuated across all income groups, except for the second highest income group. However, the difference between the highest and the lowest income groups remained significant. In contrast, adjustment for perception that they were too busy to cook or preparing dinner regularly widened the magnitude of differences between the highest income and most of other income groups. However, only the significant difference was observed among the lowest income group.

Among participants who prepare dinner, adjustment for the perception that cooking was a chore changed the magnitude and/or direction of the association. However, the difference between the highest and the lowest income groups remained significant (B = 2.25, p = 0.017).

Table 7.15: Association between household income and "less healthy" takeaway food consumption and the contribution of psychosocial factors to its association

All takeaway food consumers n = 835	**Less healthy takeaway food (Base model)**		**Diet and health-related beliefs**		**Nutritional knowledge**		**Takeaway food as pleasure**		**Eat takeaway food because too busy to cook**		**Frequency dinner preparation**	
	B	p-value	B	p-value	B	p-value	B	p-value	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–	Ref	–	Ref	–	Ref	–	Ref	–
$46501–$61999	–0.18	0.841	–0.21	0.817	–0.22	0.811	–0.43	0.638	–0.21	0.818	0.03	0.978
$30001–$46500	0.52	0.572	0.32	0.732	0.29	0.757	0.46	0.616	0.56	0.542	0.80	0.388
≤ $30000	2.67	0.004	2.24	0.016	2.22	0.017	2.46	0.008	2.92	0.002	2.96	0.001
Missing or don't want to report	0.18	0.873	–0.18	0.876	–0.15	0.896	0.18	0.872	0.71	0.529	0.57	0.632

Among dinner preparers n = 815	**Less healthy takeaway food (Base model)**		**Felt cooking is a real chore**	
	B	p-value	B	p-value
≥ $62000	Ref	–	Ref	–
$46501–$61999	–0.09	0.926	–0.34	0.713
$30001–$46500	0.47	0.621	0.37	0.697
≤ $30000	2.54	0.007	2.25	0.017
Missing or don't want to report	0.19	0.870	–0.22	0.850

All analyses adjusted for age and sex.

7.4 DISCUSSION

This chapter builds on the findings of previous chapters which described socioeconomic differences in takeaway food consumption and in the choices of takeaway food types. This study provides some insights into identifying psychosocial factors that contribute these associations.

Socioeconomic differences in psychosocial factors

Education and household income

A number of psychosocial factors were consistently associated with both education and household income. Lower socioeconomic groups had weaker diet and health-related beliefs, less weight concerns, and lower nutritional knowledge compared with their counterparts. These findings were similar to previous studies: lower educated groups have lower nutritional knowledge (Parmenter et al., 2000; Turrell & Kavanagh, 2006), lower health considerations (Ball et al., 2006), weaker concerns or beliefs about diet-health relationships (Girois et al., 2001; Kearney et al., 1998; Wardle & Steptoe, 2003), weaker weight concerns (Glanz et al., 1998), and lower concerns for weight control (Wardle & Griffith 2001). These findings may be due to more educated people having the ability to understand and interpret health information to gain knowledge and then apply this knowledge to practical behaviours (Galobardes et al., 2006). In addition, better educated groups may have the ability to search for health and nutrition-related information compared with lower educated groups (Winkleby, Jatulis, Frank, & Fortmann, 1992). In terms of income, lower household income groups may have restricted access to nutrition and health promotion information as they are more likely to have limited resources (Galobardes et al., 2007). Furthermore, income is also related to one’s education level; however, in this study, income was measured at the household level whereas education was measured at the individual level. Hence, participants who are in high household income groups are not necessarily highly educated. This is probably why education differences in diet and health-related beliefs and nutritional knowledge were stronger compared with those seen across household income.

This study also found that lower educated and lower income groups spent less than 15 minutes to prepare dinner and felt cooking is a real chore more frequently compared with highly educated and higher income groups. These results suggest that lower socioeconomic groups may have a negative attitude toward meal preparation-related activities. This may result from lower socioeconomic groups potentially having lower meal preparation skills (Short, 2003). Producing a meal or cooking is a complex task and it involves a number of skills which can be grouped into five types: mechanical, perceptual, conceptual, academic, and planning (Short, 2003). *Mechanical skills* include physical technique such as cutting and blanching; *perceptual skills* involve ability to judge optimal taste and texture; *conceptual skills* include ability to predict the outcome and being creative; *academic skills* include knowing about nutrition and food safety; and *planning skills* include the ability to judge or understand the timing of food-related activities, fitting of cooking activities around other tasks, and the ability to plan menus (Begley & Gallegos, 2010; Short, 2003). Therefore, individuals who possess meal preparation skills (e.g. planning skills and creativity) may perceive cooking as pleasurable (Kemmer, 2000) whereas those who do not possess appropriate meal preparation skills can only cook limited menu variations which may lead to meal preparation becoming a repetitive activity, and consequently, perceive cooking to be a chore. Higher educated groups may possess more developed meal preparation skills such as forward planning as they are likely to have greater knowledge and skills acquired through education. Furthermore, low income groups are less likely to own a range of cooking devices (e.g. blender) which can reduce the time, skills and effort required for meal preparation. Conversely, high income groups are more likely to own these devices. Consequently, lower income groups may perceive cooking as a chore and spend less time cooking meals.

Education

There are some differences in the associations observed between SEP and psychosocial factors depending on which socioeconomic measure was used. Lack of time has been reported as a barrier for healthy eating among higher socioeconomic groups (López-Azpiazu et al., 1999; Welch et al., 2009) and the results of this study found that highly educated groups were more likely to report time constraints as the reason for consuming takeaway foods. In general, people who are highly educated work longer hours compared with their counterparts (ABS, 2007). Therefore, highly educated groups may perceive they have more time constraints than lower educated groups. However, no education differences in perceived time pressure were observed in this study.

The majority of participants agreed that takeaway foods are tasty; however, participants with a vocational education level were slightly less likely to agree with this statement and there were no household income differences in taste preferences for takeaway food. Previous studies have found no associations between SEP and taste as an important influence on food choice (Kearney et al., 2000). However, more detailed examinations of socioeconomic differences in food preference revealed that lower household income groups were more likely to report they disliked a number of healthy foods (e.g. low fat yoghurt) (Turrell, 1998b). Similarly, although the majority of participants disagreed that takeaway food is nutritious, those with no post-school qualifications were less likely to have the perception that takeaway food is nutritious compared with highly educated counterparts. Reasons for the observed differences were unknown; however, people may conceptualise takeaway foods differently as takeaway food is a very broad category. For example, some people may have referred to the takeaway food that they usually consume (which may be healthy options) whereas some people may have referred to popular takeaway foods in general (e.g. pizzas and French fries). Questions addressing more specific foods rather than general food groups may have been useful to examine socioeconomic differences in food preferences or in the perception of takeaway food.

Household income

Lower income groups perceived takeaway foods as pleasure more than higher income groups. Eating out as a source of pleasure has been reported as it enables people to deviate from their domestic routine (Ashley, Hollows, Jones, & Taylor, 2004). While consuming takeaway food is not eating out, this explanation is plausible as this chapter found lower income groups feel cooking is a chore more frequently compared with the highest income group. However, there were no education differences in the perception of takeaway food as pleasure.

Similarly, whilst no education differences in frequency of dinner preparation were observed, there were marked household income differences for this factor, with the highest income group preparing dinner less frequently (four times or less per week) compared with lower income groups. Although a British study failed to find income or social class differences in frequency of cooking a meal, they reported the most affluent group was more likely to purchase a main meal within the previous week compared with the least affluent group (Caraher, Dixon, Lang, & Carr-Hill, 1999). This result is likely to be due to high income groups more frequently eating out as they are likely to have more disposable income compared with lower income groups.

Association between psychosocial factors and takeaway food consumption and types of takeaway food choice

A number of psychosocial factors were consistently associated with all takeaway food consumption measures. A stronger perception of takeaway food as value for money was associated with higher takeaway food consumption. When individuals choose food, they prioritise and trade-off a number of food choice values including taste, cost, and convenience (Sobal et al., 2006). Participants who consume a high level of any type of takeaway food may put a higher priority on convenience than other values including cost as this chapter found no associations between financial situation and any takeaway food consumption measures. The convenience aspect of fast-food has been shown to be associated with frequent fast-food consumption (once a week or more) (Dave et al., 2009). Convenience is comprised of three components: saving in time, physical energy and mental energy (Buckley et al., 2007), and also is a type of value (Sobal, et al., 2006). Purchasing and consuming takeaway food can save time and effort to plan, prepare meals/snacks and to clean-up. A qualitative interview identified the preference for consuming takeaway food as a way of eliminating the allocation of time and energy for shopping and cooking (Costa, Schoolmeester, Dekker, & Jongen, 2007). People who reported that cooking required more mental effort, consumed takeaway food more regularly than those who did not (van der Horst et al., 2011a). Similarly, time constraints are the reason participants consume any type of takeaway food. Lack of time and time pressures have been identified as a barrier to healthy eating (Blaylock et al., 1999; Furst et al., 1996; Harnack et al., 1997; Kearney & McElhone, 1999; Welch et al., 2009) and fruit and vegetable intake (Pollard, et al., 2002). However, an Australian study found that frequency of fast-food consumption was no different between women who perceived time pressure as a barrier to healthy eating and those who did not (Welch et al., 2009). This study also found general time factors (perceived time pressure and available spare time) were not associated with most takeaway food consumption measures.

A range of negative meal preparation behaviours and attitudes were associated with increased takeaway food consumption. Swiss adults who spent less time cooking meals consumed fast-food more regularly compared with those who spent more time cooking meals (van der Horst et al., 2011a). A US study also found that a dislike of cooking was associated with frequent fast-food consumption among randomly selected adults (Dave et al., 2009). These findings suggest that participants who consume takeaway food more regularly may dislike cooking.

Diet and health-related knowledge and beliefs, and weight concern are likely to be important determinants of takeaway food consumption and the choice of takeaway food types. These findings are similar to previous studies reporting that those with weaker beliefs in the diet and cancer relationship were associated with frequent consumption of fast-food (Satia et al., 2004) and a less healthy diet (Harnack et al., 1997). Likewise, low nutritional knowledge was associated with a higher intake of fat and a lower fruit and vegetable intake (Wardle et al., 2000) and a lower diet quality (Beydoun et al., 2008b). Interestingly, diet and health-related beliefs, weight concerns, and following specific dietary regimes were not associated with "healthy" takeaway food consumption; however, these factors were significantly associated with "less healthy" takeaway food consumption. This means that increases in diet and health-related beliefs and weight concerns may decrease consumption of "less healthy" takeaway items. However, the results of this study suggest that the decision to consume "less healthy" takeaway food is driven by taste, whereas the decision to consume overall and "healthy" takeaway foods is not. Tuoria and Pangborn (1988) found that although health concerns influence food choice, food preference (liking) was a predominant predictor of food consumption among women. Ensuring the availability of tasty "healthy" takeaway food and the provision of nutritional information for takeaway food (e.g. fat and energy contents) may encourage people to replace the consumption of "less healthy" takeaway food with "healthy" takeaway options.

Special eating occasions with family and friends may change individuals' usual eating behaviours (Vue, Degeneffe, & Reicks, 2008). Eating takeaway food as a way of socialising with family and friends was associated with consuming a high level of any type of takeaway food. In addition, participants who perceive eating takeaway food as a pleasure was associated with higher "less healthy" takeaway food consumption but not with overall or "healthy" takeaway food consumption. These findings may be a reflection of the notion that, in general, eating at social occasions changes a person's emotional state and this leads people to choose more "indulgent" or "less healthy" food types (Vue et al., 2008) rather than continuing to put in the effort to eating healthily.

In addition, eating at social occasions often takes place in the presence of other people and that may influence food types eaten (Nestle et al., 1998; Pollard et al., 2002; Vue et al., 2008). This study found that participants who reported that their choice of takeaway food was influenced by friends consumed higher levels of "less healthy" takeaway food. Previous studies reported that a friend's support or the presence of friends can have both positive and negative influences (Harnack et al., 1997). While increased support from friends for healthy eating has been found to be associated with higher fruit intake (Ball et al., 2006), the presence of friends also influenced the consumption of high energy food (Meiselman, 2006). These influences may be the result of peer group pressure, social norms or the desire of many people to not stand out from the crowd (Ball, Jeffery, Abbott, McNaughton, & Crawford, 2010). People are more likely to consume "healthy" or "less healthy" options in accordance with the choices considered as normative or socially desirable.

The contribution of psychosocial factors to socioeconomic differences in takeaway food consumption

Meal preparation behaviours and attitude consistently contributed to education and household income differences in takeaway food consumption and choice of takeaway food types. Frequently spending a short amount of time preparing dinner and feeling that cooking is a chore among low socioeconomic groups may be the result of their low meal preparation skills or confidence. Lower skills or lack of cooking confidence may predict unhealthy dietary behaviours (Caraher et al., 1999). For the latter concept, a previous Australian study found that lower socioeconomic groups lack confidence to cook, and those who lack confidence to cook purchased a reduced variety of vegetables (Winkler & Turrell, 2009). Therefore, interventions to increase cooking confidence, tailored to low socioeconomic groups may be crucial to decreasing takeaway food consumption. Current attempts to increase cooking skills have involved a range of interventions such as the provision of cooking classes and recipe books. However, merely addressing one or few aspects of meal preparation skills may not be sufficient to increase an individuals' overall range of meal preparation-related skills as they need to include a diverse range of skills as discussed previously. Increasing these skills among disadvantaged groups may reduce their negative attitudes towards cooking, and increase the frequency of preparing meals at home; subsequently this may reduce takeaway food consumption.

Health and nutrition-related beliefs and knowledge were important contributing factors for both education and household income differences in the choice of takeaway food types. In particular, nutritional knowledge showed a strong attenuation in the differences between the least educated or lowest income and the highly educated or highest income groups for the consumption of "less healthy" takeaway food. A number of cross-sectional and longitudinal studies (including intervention studies) have reported knowledge as a strong predictor for fruit and vegetable intake (Campbell et al., 2008; Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008; Van Duyn et al., 2001) and an Australian study found nutritional knowledge and health belief as mediators between SEP and vegetable intake among women (Ball et al., 2006).

On the other hand, time constraints as a reason for consuming takeaway food, increased the magnitude of the education and income differences in all takeaway food consumption measures (most cases). Higher socioeconomic groups were more likely to perceive lack of time as a reason for consuming takeaway food compared with lower socioeconomic groups and also this perception was associated with a higher level of takeaway food consumption. Reasons for higher socioeconomic groups perceiving lack of time are unknown; however, long working hours, family and other commitments are likely to be the cause (Baxter, 2009). Increasing their time management skills may reduce the feeling of having a lack of time and in turn reduce their takeaway food consumption.

Perceiving takeaway food as a pleasure had a marginal effect on the association between household income and “less healthy” takeaway food consumption. Higher income groups may consume takeaway food because they perceive it as necessary (e.g. impossible to prepare meals due to other commitments or consume takeaway food for business purposes), whereas lower income groups may choose to consume takeaway food because it is a special occasion. On special occasions, people make different choices than they would normally (Glanz & Mullis, 1988), such as choosing food they like the taste of rather than as a result of other aspects such as health considerations. It will prove to be a great challenge to encourage lower income groups to choose “healthy” takeaway options if they only have a positive attitude towards “less healthy” takeaway food. Initially changing their attitude toward “healthy” takeaway options may be needed by creating widely available, affordable and tasty “healthy” takeaway food options.

Limitations and strengths

The limitations of this study should be recognised. An individual’s food choice is influenced by numerous factors. Although this study examined a range of individual-related psychosocial factors, it did not consider other factors such as non-conscious responding to contextual cues, or habit (Verplanken, 2006). Likewise, environmental factors, such as accessibility, availability and media advertisements, have also been reported to have some influence on food choice (Shepherd, 1999). In addition, this study examined takeaway food consumption but not other dietary behaviours. The findings of lower socioeconomic groups consuming more “less healthy” takeaway foods does not necessarily reflect that these groups have a lower overall quality of diet. However, the results from Chapter 4 and 6, other studies (Pereira et al., 2005; Thornton et al., 2011) and association between takeaway food and diet quality (Bowman & Vinyard, 2004; Guthrie et al., 2002; Paeratakul et al., 2003) suggest that lower socioeconomic groups are likely to have less healthy dietary patterns.

Another limitation is that all data were collected by self-report and therefore, misreporting or social desirability bias for some measures, such as takeaway food consumption and cooking behaviours may be present. Similarly, some measures such as interpersonal influence of takeaway food choice may be operating unconsciously

(McFerran, Dahl, & Fitzsimons, 2010). Lastly, the cross-sectional design of this study cannot ascertain temporality.

There are a number of strengths of this study in addition to those outlined in Chapters 5 and 6. This is the first known study that has examined why there are socioeconomic differences in takeaway food consumption and in the types of takeaway food consumed using a range of psychosocial factors. In addition, this study used multiple socioeconomic measures to examine these associations. Furthermore, this study adds important knowledge to the understanding of socioeconomic variations in dietary behaviours and provides useful evidence for developing policies and effective intervention programs.

7.5 CONCLUSIONS

There were marked socioeconomic differences in a number of psychosocial factors. Socioeconomic differences in takeaway food consumption appeared to be explained by meal preparation behaviours and attitudes. These factors along with health and nutrition-related beliefs and knowledge contributed to the choice of takeaway food types. Since the least educated and the lowest household income groups consumed the highest levels of “less healthy” takeaway food, intervention programs that address all meal preparation skills such as forward planning, efficient grocery shopping, and nutritional knowledge that are targeted at lower socioeconomic groups may increase their enjoyment of, and in turn, their perceived value of cooking. In addition, as a result of takeaway food becoming an important part of our diet, encouraging meal preparation at home and discouraging the purchase of takeaway food may be difficult. Ensuring the availability of healthy takeaway foods that are affordable and tasty while reducing less healthy options will also be important to reduce the consumption of “less healthy” takeaway food, particularly among lower socioeconomic groups.

Chapter 8: General discussion

8.1 INTRODUCTION

Socioeconomic inequalities in health have been well documented in the literature and diet is believed to be one contributing factor to the observed health inequalities (Davey Smith & Brunner, 1997). A number of studies reported lower socioeconomic groups are more likely to have diets that are inconsistent with dietary recommendations for the prevention of diet-related chronic diseases and associated risk factors. Although healthy eating has been and continues to be promoted, the prevalence of these diet-related chronic conditions has been steadily increasing over the last two decades (AIHW, 2010). This trend coincides with rapid dietary change that has seen a shift in popularity towards food prepared outside of the home, in particular, takeaway and fast-food. These foods are generally energy dense and low in essential nutrients, fruit and vegetables. These nutritional characteristics are associated with development of diet-related chronic disease and associated risk factors. Therefore, one reason for the observed socioeconomic variations in dietary behaviours and subsequent diet-related chronic disease and associated risk factors, it is thought to be the higher consumption of takeaway food by lower socioeconomic groups.

This final chapter draws together the main findings from each of the four preceding papers (Chapter 4 to 7), followed by a discussion of the strengths and limitation of the research. Then the theoretical, methodological, and practical contribution of this thesis is presented. Recommendations for future work (both research and practical) are also discussed.

8.2 GENERAL DISCUSSION

8.2.1 Socioeconomic differences in takeaway food consumption

Education differences in takeaway food consumption

Comparison of the findings presented in this thesis

Findings from the NNS (Chapter 4) showed that lower educated groups were less likely to consume overall takeaway food and “healthy” takeaway choices whereas these groups were more likely to consume “less healthy” takeaway options in the last 24-hours compared with more educated participants. By contrast, findings from the FLS (Chapter 6) showed that low educated groups were more likely to consume overall takeaway food and consume “less healthy” takeaway choices; however, there were no significant differences in consuming “healthy” takeaway food between the highest and lowest educated groups.

The variation between the findings of the NNS and the FLS may be attributable to a number of factors. First, the observed differences may be a reflection of the changed takeaway food consumption behaviours across different socioeconomic groups over a period of more than 10 years, as the NNS data were collected in 1995. During the past 15 years, the number and variety of takeaway and fast-food outlets have significantly increased in Australia (BIS Shrapnel, 2008), hence the availability of such food has also increased (Stewart et al., 2004), and these broader trends may have affected socioeconomic groups differently.

Second, the studies assessed and categorised education differently. The NNS ascertained education as age when first leaving school whereas the FLS measured the highest completed educational qualification. The latter method may better reflect one’s educational attainment as some individuals return to school or start tertiary education well after they first left school. However, unlike the NNS, the results from the FLS did not show socioeconomic gradients in takeaway food consumption. As the level of education increases (e.g. Vocational to Diploma level of education), it is assumed that people acquire more knowledge and skills such as the ability to comprehend and understand concepts and principles, and to collect and evaluate information (ABS, 2001). It was expected that these acquired skills and knowledge would affect the choice of whether or not to consume takeaway food, and give people the ability to identify and choose healthy takeaway options rather than less healthy ones. Indeed, the socioeconomic profile of different education groups in the FLS sample differed markedly. For example, those with a bachelor degree or higher were more likely to be in professional/managerial occupations (72.6%) and be in high income households (highest income 33.4%; lowest income 13.0%) compared to those with no post-school qualifications (professional/managerial occupations

18.7%; highest income 15.4%; lowest income 31.1%). Participants who had diploma level of education consumed a significantly higher level of overall takeaway and "healthy" takeaway choices (professional/managerial occupations 38.4%; highest income 15.2%; lowest income 22.9%). The reasons why we did not find the expected associations are unknown: the participants included a similar proportion of males/females in each education level (approximately 60% females), and were adjusted for age and sex. Other published studies used the same measure for education (examined highest achieved level of education) and also used the same categorisation of education (Thornton et al. 2011; Turrell & Giskes, 2008).

Third, the two surveys employed different dietary intake methods: the NNS used a 24-hour dietary recall and the FLS used a FFQ. Both dietary methods are appropriate when describing and comparing the diets of different groups; however, each method has different strengths and limitations which may influence the direction and magnitude of the association between SEP and takeaway food consumption. While the 24-hour recall method provides quantitative estimates of dietary intake, this method is designed to measure short-term intakes and underreporting is often an issue (Kipnis et al., 2003; Thompson & Subar, 2008). In addition, the 24-hour recall method relies heavily on participant's memory and also on their ability to describe the type and amount of food they consumed (Rutishauser, 2005). Lower socioeconomic groups have been reported to have lower cognitive function, such as recall ability (Kaplan et al., 2001; Lee et al., 2003), which may contribute to an overall underestimation of their takeaway food consumption. On the other hand, FFQs provide an estimate of long-term usual intake rather than short-term (Thompson & Byers, 1994; Willett, 1998). The major issue of the FFQs is the information collected by this method contains substantial measurement errors (both systematic and random) (Thompson & Byers, 1994): estimated intake can be both under- or over reported. These errors can lead to biased estimate of the association; in particular, if the FFQ contains a large random error, the true association cannot be detected (Baranowski, Klesges, Cullen, & Himes, 2004). These measurement errors may be partly due to the nature of cognitive tasks that are required for the completion of the FFQ, such as respondents' long-term recall and estimation of the frequency of consumption (Smith, 1991), which may possibly be influenced by socioeconomic factors. The key methodological differences between the NNS and FLS are outlined in Figure 8.1

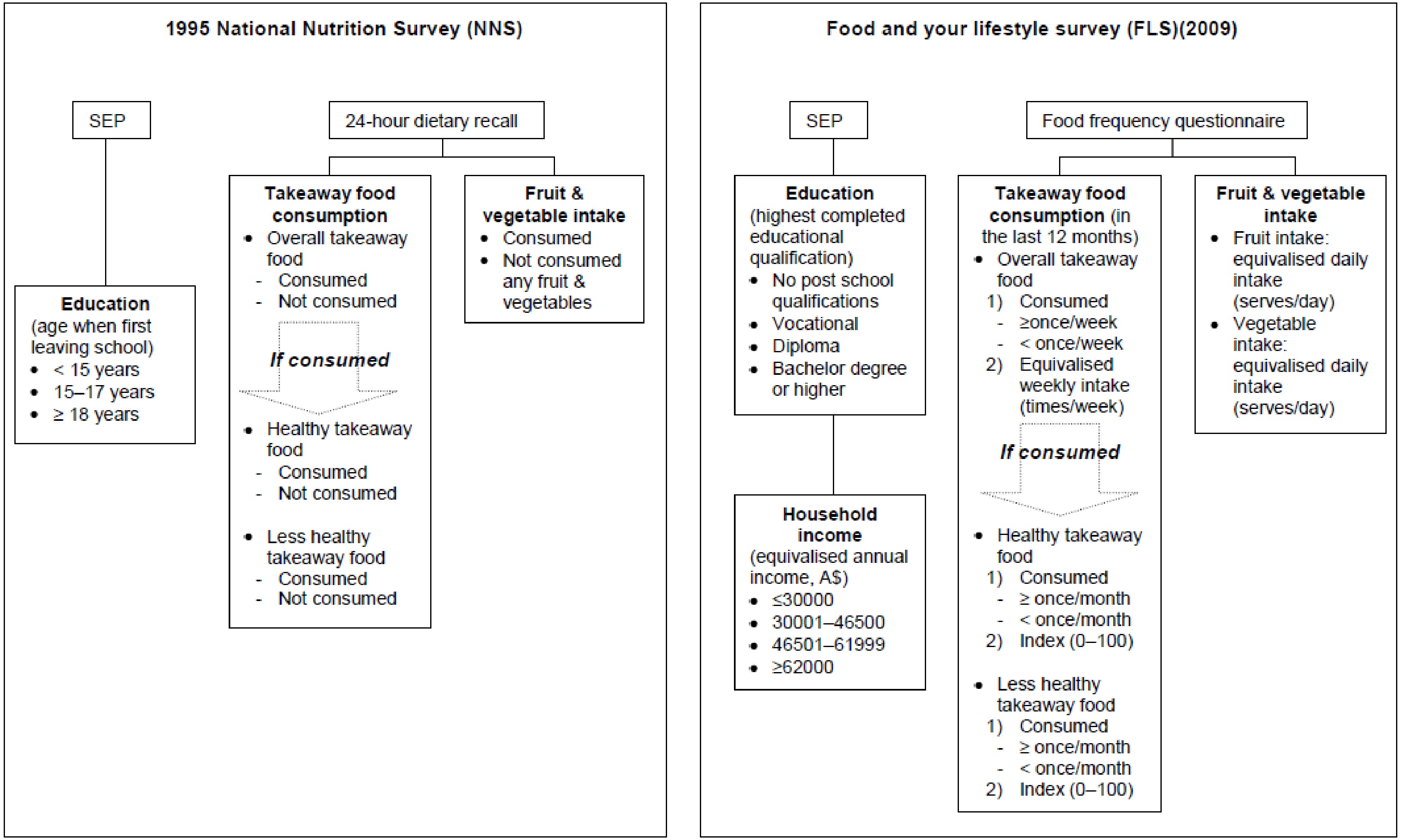


Figure 8.1: Comparison of the methods used in the NNS and FLS

Comparison of the findings of this research and other studies

Unlike this present study, previous research has focused on limited types of takeaway and fast-food items (with one exception), and no known studies have assessed the choice of takeaway food consumed in terms of their relative "healthiness" (i.e. "healthy" or "less healthy"); therefore, direct comparisons of the findings of previous studies with that of the current study are difficult. Nevertheless, similar to the results of the FLS, another Australian study reported the low educated groups purchased fast-food more regularly (once a week or more) compared with their highly educated counterparts (Thornton et al., 2011). Although they examined the purchase of fast-food, the majority of these foods were "less healthy" choices. In contrast, another study reported associations that were opposite in direction to that found in the FLS: highly educated groups purchased takeaway foods more frequently (once a month or more) compared with the least educated (Turrell & Giskes, 2008). However, most other Australian studies that examined takeaway/fast-food consumption by SEP have reported no association between education and takeaway/fast-food consumption.

The differences in the direction of the associations reported between studies may be due to variations in the methods and statistical approaches used, specifically in the sampling, definition, collection and measurements of both the SEP and takeaway food variables. For example, the study conducted by Turrell and Giskes (2008) collected information by face-to-face interview and participants were the major grocery purchasers in a household (resulting in a high proportion of female participants) whereas the FLS employed a postal-survey method and did not purposefully sample participants based on their role in the provision or purchasing of food for the household. As noted in previous chapters, some studies used 24-hour recall method whereas others used FFQs to assess takeaway food consumption behaviours. Similarly, while some studies defined "frequent" takeaway/fast-food consumption as consuming these foods once a week or more, others used different cut-offs to define "frequent", such as twice a week or more.

In addition to these issues, the socio-demographic characteristics of participants included in different studies may have contributed to the mixed findings. Smith et al. (2009) used participants that were considerably younger (26–36 years of age) than other studies and therefore, possibly more homogeneous in terms of frequency of takeaway food consumption as younger people consume takeaway/fast-food more frequently (Mohr et al., 2007; Paeratakul et al., 2003; Schröder et al., 2007; van der Horst et al., 2011a).

All US and European studies assessed fast-food consumption (except one European study), rather than look at a broader and more inclusive measure of takeaway food consumption. The majority of studies reported no association between education and fast-food consumption. The inconsistent results between these studies and the present study may be due to both variations in methods and food culture. In general, US adults consume takeaway/fast-food more frequently, while European countries consume these foods less frequently than in Australia (ACNielsen, 2005). Therefore, in the US, takeaway and fast-food may be commonly and equally consumed regardless of education level. Among two European studies, a study conducted by Schröder et al. (2007) was not adjusted for known confounding factors (e.g. age and sex) (Turrell, 1996) which may have resulted in null findings. Similarly, the lack of associations reported from a Swiss study may be due to their low response rate (44%) (van der Horst et al., 2011a). Lower educated groups are usually under-represented in a study, and those who do not participate are also more likely to have less healthy dietary behaviours, (Turrell & Najman, 1995) and this may result in the "true" education differences in takeaway and fast-food consumption being underestimated in many studies.

Household income differences in takeaway food consumption

Comparison of the findings presented in this thesis

The analyses of the FLS in Chapter 5 found no clear associations between household income, overall takeaway food consumption, and the types of takeaway foods consumed. However, Chapter 7 showed different associations: the highest income group consumed overall takeaway food more regularly compared with other income groups, and a high level of "healthy" takeaway food consumption was observed among the highest and the lowest income groups. In addition, the highest level of "less healthy" takeaway food consumption was observed among the lowest income group. These differences are likely due to variations in how the takeaway food variables were assessed: ether as continuous or dichotomous variables. In Chapter 5, all takeaway food measures were treated as dichotomous, and this may have resulted in the reduction of the statistical power to detect a relationship between SEP and the takeaway food variables. Additionally, while Chapter 5 examined individual takeaway items, in Chapter 7 indices were created that summarised “healthy” and “less healthy” takeaway food consumption. While both approaches have provided valuable information, summary measures may better characterise and describe the association between household income and nature of takeaway food choice. Hence, it can be concluded that overall takeaway foods are more likely to be consumed by high household income groups whereas “healthy” takeaway foods are more likely to be consumed by both high and low household income groups. Additionally, “less healthy” takeaway foods are more likely to be consumed by low household income groups.

Comparison of the findings of this research and other studies

Previous Australian and international research that has assessed the association between income and takeaway or fast-food consumption/purchasing has also shown mixed findings (Glanz et al., 1998; Inglis et al., 2008; Mohr et al., 2007; Paeratakul et al., 2003; Thornton et al., 2011; Turrell & Giskes, 2008; van der Horst et al., 2011a). As higher income groups have greater economic and material resources (Galobardes et al., 2007) and time pressures (Baxter, 2009), it is plausible that they consume overall takeaway food more frequently. As noted previously, to date, there have been no known studies that have examined socioeconomic differences in the nature of takeaway food choices. However, the findings that lower socioeconomic groups consumed a higher level of “less healthy” takeaway food were generally consistent with the previous findings of disadvantaged groups having dietary patterns that were less consistent with recommendations (Hulshof et al., 2003; Martikainen et al., 2003) and higher rates of overweight/obesity (Hulshof et al., 2003; Paeratakul et al., 2002) and diet-related chronic disease (Davey Smith & Brunner, 1997; Paeratakul et al., 2002) compared with their more advantaged counterparts. However, an unclear pattern of “healthy” takeaway food consumption was observed. Both the highest and the lowest income groups consumed the highest level of “healthy” takeaway items. The reasons for this finding are unknown; however, it suggests that there may be no actual or perceived price differences between “healthy” and “less healthy" takeaway foods as lower income groups generally have more cost concerns for food which may preclude them from making "healthy" takeaway choices.

8.2.2 The contribution of takeaway food consumption to socioeconomic differences in fruit and vegetable intake

While the findings of Chapter 4 suggested that takeaway consumption and the type of takeaway choices did not markedly contribute to education inequalities in fruit and vegetable consumption, Chapter 6 found some evidence that "less healthy" takeaway items partly explained education differences in fruit and vegetable intake. These inconsistencies in the study findings may be explained by differences in the way the outcome and mediating variables were measured. Chapter 4 used all dichotomous measures to characterise consumption (consumed or not consumed), whereas Chapter 6 used quantitative measures for usual daily servings of fruit or vegetables, frequency of consumption of overall takeaway food, and consumption of each type of takeaway food. On one hand, it is important to identify groups who are more (or less) likely to not consume any fruit and vegetables, that is groups whose intakes are at the extreme end (i.e. do not consume at all or consume too much) are of most concern. However, by creating one dichotomous variable splitting consumers and non-consumers, much quantitative information is lost. Additionally, using dichotomous variables in logistic regression may result in loss of effect size and power, or overestimation of effect size and false statistical significance (Altman & Royston, 2006; Austin & Brunner, 2004; MacCallum, Zhang, Preacher, & Rucker, 2002). Further, the cut-point of fruit and vegetable intake or takeaway food consumption measures may have contributed to the findings of negligible attenuation of education differences in fruit and vegetable intake in Chapter 4. Therefore, it can be concluded that "less healthy" takeaway food consumption partly explained the association between education and fruit and vegetable intake.

The mixed findings may also be due to the changed perceived cost of fruit, vegetables and takeaway foods over the time period covered by the NNS and FLS. In Brisbane, between June 1995 and June 2009 the price of fruit and vegetables increased more rapidly than the price of takeaway foods (fruit +84.0%, vegetables +94.4%, and takeaway foods +73.6%) (ABS, 2009). Additionally, while the price increase of takeaway/fast-food was relatively constant (approximately 3 to 4 %

increase in each year, except between 2000–2001), the changes in the price of fruits and vegetables have been inconsistent and at times have been much larger than that of takeaway/fast-food. For example, between June 2005 and June 2006, the price of fruit increased by 65.5% (ABS, 2009). This disproportional change in price of fruit and vegetables compared with takeaway foods may have influenced the perceived costs of these foods which, in turn, may have changed the consumption patterns of these foods by different socioeconomic groups.

The findings that "less healthy" takeaway food but not "healthy" takeaway food consumption partly explained education differences in fruit and vegetable intake may be a reflection of the nutritional characteristics of each type of takeaway food. "Less healthy" takeaway foods contain high energy and fat, and are low in fruit and vegetables, whereas "healthy" takeaway items are likely to have the opposite characteristics. The findings suggest that switching from "less healthy" takeaway items to "healthy" items may reduce the socioeconomic gradients in fruit and vegetable intake. However, solely focusing on takeaway food consumption is likely to only have a limited influence on increasing in fruit and vegetable intake among disadvantaged groups. To increase the consumption of fruit and vegetables among Australians, a nationwide campaign of *Go for 2 & 5* has been implemented (Australian Government Department of Health and Ageing, 2008). Similarly, the AGHE recommends to consume a minimum of two serves of fruit and five serves of vegetables daily among adults, and also to limit the consumption of "extra" foods that do not provide many essential nutrients, such as "less healthy" takeaway choices. There is some evidence to suggest that the *Go for 2 & 5* campaign raised awareness of the recommended level of fruit and vegetable intake and also increased actual consumption of fruit and vegetables (Elliot & Walker, 2007; Pollard et al., 2008). However, media campaigns are less likely to reach disadvantaged groups compared with their more advantaged counterparts (de Walle et al., 1999). In addition, while intervention programs aimed at increasing fruit and vegetable intake have shown some success among the general population (Pomerleau, Lock, Knai & McKee, 2005), dietary behaviour change is likely to be less effective among lower socioeconomic groups (Oldroyd, Burns, Lucas, Haikerwal, & Waters, 2008). Furthermore, disadvantaged groups are more difficult to recruit (Eakin et al., 2008) and retain in programs (Yancey, Ortega, & Kumanyika, 2006). In order to eliminate or reduce socioeconomic inequalities in fruit and vegetable intake, intervention programs that are more tailored to disadvantaged groups are needed as their barriers to healthy dietary behaviours, such as level of literacy and available resources are likely to be different from more advantaged groups (Capewell & Graham, 2010).

8.2.3 The contribution of psychosocial factors to socioeconomic differences in takeaway food consumption and the choices of takeaway food types

The results of Chapter 7 showed complex patterns in the influence of psychosocial factors on socioeconomic differences in takeaway food consumption. Nonetheless, the findings suggest that meal preparation behaviours and attitudes appeared to have contributed to socioeconomic variations in overall takeaway food consumption. These factors along with health and nutrition-related beliefs and knowledge partly explained choice of takeaway food by SEP.

Chapter 7 mainly focused on individual psychosocial factors that may influence the association between SEP and takeaway food consumption. Published literature suggests that a number of other factors are likely to influence socioeconomic variations in dietary behaviours such as environmental factors. For example, the availability and accessibility of food outlets may make healthier (or unhealthier) food choices easier. Previous studies have found disadvantaged areas have better access to major fast-food outlets in Australia (Burns & Inglis, 2007; Reidpath et al., 2002; Thornton et al., 2011), USA (Block et al., 2004), Canada (Hemphill et al., 2008; Smoyer-Tomic et al., 2008), UK (Macdonald, Cummins, & Macintyre, 2007), and New Zealand (Pearce, Blakely, Witten & Bartie, 2007). These findings suggest that easier access to takeaway or fast-food outlets may partly explains why disadvantaged groups make “less healthy” takeaway choices. Despite this plausible explanation of the role of the environment, recent studies found the physical environment does not strongly influence socioeconomic differences in takeaway or fast-food consumption in Australia (Thornton et al., 2011; Turrell & Giskes, 2008). However, these studies focused on the environment around the home, which only reflects one element of our living environment. The availability or variety of takeaway or fast-food at the worksite may be more important than access to takeaway or fast-food outlets around the home. In addition, more far-reaching environmental factors such as media advertising are also potentially strong influencing factors for takeaway food consumption, the choice of these foods, and socioeconomic variations in these. There is evidence to suggest that higher exposure to TV commercials is associated with frequent fast-food consumption among Australian adults (Scully et al., 2009). The level of exposure to or influence from advertisements may be socioeconomically patterned and it may, therefore, have an important role in takeaway food consumption and in the choices of takeaway food that different socioeconomic groups make. Further research is needed to establish what other factors contribute to socioeconomic variations in takeaway food consumption.

8.2.4 The role of takeaway food consumption in socioeconomic differences in diet-related chronic diseases and health conditions

While a direct examination of takeaway food consumption and socioeconomic inequalities in health status cannot be drawn from this study, it is plausible that a high level of takeaway food consumption has a role in socioeconomic differences in diet and biological risk factors for chronic disease (e.g. overweight and obesity). For the prevention of diet-related chronic diseases and associated risk factors, dietary guidelines recommend the consumption of a limited amount of fat (especially saturated fat), added sugar, sodium, and the consumption of a diet high in fibre and anti-oxidants along with plenty of fruit, vegetables, legumes and less-processed cereal (e.g. whole grains) (NHMRC, 2003a; The Commonwealth Department of Health and Family Services, 1998). However, takeaway food and especially "less healthy" takeaway options, have the opposite nutritional characteristics for the prevention of diet-related chronic diseases. High consumption of takeaway food is repeatedly reported to be associated with low diet quality including reduced fruit and vegetable intake (Bowman & Vinyard, 2004; Inglis et al., 2008; Paeratakul et al., 2003; Schröder et al., 2007; Smith et al., 2009), overweight and obesity (Binkley et al., 2000; Bowman & Vinyard, 2004; Duffey et al., 2007; Pereira et al., 2005; Rosenheck, 2008; Schröder et al., 2007) and other health conditions (Duffey et al., 2009; Pereira et al., 2005).

The results from the NNS and the FLS showed inconsistent direction and magnitude of the association between SEP and overall takeaway food consumption, and consumption of "healthy" takeaway choices; however, one consistent finding was that lower socioeconomic groups are more likely to consume "less healthy" takeaway foods compared with their more advantaged counterparts. High levels of "less healthy" takeaway food consumption may make a significant contribution to excessive intakes of energy, total fat, saturated fat, added sugar, sodium, and to the development of overweight/obesity and other health conditions (e.g. insulin resistance, and hypertension) among lower socioeconomic groups, resulting in marked socioeconomic differences in diet-related chronic diseases.

The above findings alone are plausible explanations for the socioeconomic variations in diet-related chronic diseases and related factors; however, Chapter 6 also showed that: lower socioeconomic groups consume less fruit and vegetables, that consumption of "less healthy" takeaway items is associated with lower fruit and vegetable intake, and that consumption of "less healthy" items partly explains socioeconomic variations in fruit and vegetable intake. These findings are an additional concern as fruit and vegetables are a key food groups for the prevention of diet-related chronic diseases. Lower intakes of essential nutrients, antioxidants and non-nutrient factors from low fruit and vegetable intake among socioeconomically disadvantaged groups may also be contributing to the development of diet-related chronic diseases and related risk factors.

These findings are generally consistent with the epidemiological evidence of disadvantaged groups following less healthy diets, the association between less healthy dietary patterns and health conditions such as overweight/obesity, and resultant development of chronic disease. Therefore, the choice and frequency of takeaway food consumption may have important role in socioeconomic differences in diet, in the subsequent development of (or prevention of) overweight/obesity and other health conditions, and resultant diet-related chronic diseases.

8.3 STRENGTHS AND LIMITATIONS

8.3.1 Strengths

This research presented in this thesis has several strengths. Firstly, this is the first known study to examine broadly defined takeaway food consumption by different socioeconomic groups. Additionally, takeaway food was further categorised into "healthy" and "less healthy" foods to characterise their consumption patterns.

Therefore, the findings of this thesis add to a more complete knowledge of socioeconomic differences in takeaway food consumption. The findings in Chapter 4 were based on the NNS which provided quantitative dietary intake estimates for a large nationally representative sample. Similarly, the FLS achieved a moderately-high response rate, and the socio-demographic characteristics of participants were comparable to adults living in Brisbane.

Further strengths of the FLS were that all outcome measures used demonstrated reasonably high reproducibility, as shown by the test-retest study. Additionally, fruit and vegetable intake measures used in the FLS have been widely used and previously shown to be valid measures for usual daily fruit and vegetable intake. These factors support the use of these dietary intake measures for population-based research among adults.

8.3.2 Limitations

There are also some limitations that need to be discussed and taken into consideration in interpretation of the findings of the research presented in this thesis. First, all data used for this thesis were cross-sectional. Cross-sectional data are limited in terms of temporality and therefore, causality cannot be attributed to any of the associations found. In addition, all data were collected by self-report and are subject to social acceptability or social desirability bias.

Second, this research employed only two indicators of SEP (education and household income). Although all socioeconomic indicators are inter-related, each indicator reflects different pathways to dietary behaviours. Among a range of socioeconomic indicators, education and household income are typically used in the epidemiological studies (Geyer et al., 2006). However, using different measures of SEP may change the direction and magnitude of findings which may also explain different pathways to dietary behaviours (Galobardes et al., 2007). Information on occupation was also collected in the FLS; however, 20% (n = 182) of participants were not in the workforce, and this proportion was higher among women. These groups therefore, cannot be readily categorised into occupational class. Similarly, generic occupation-based indicators may not effectively classify women and racial/ethnic minorities into occupational class. For these reasons, occupation was not used as socioeconomic indicator in this thesis.

Third, socioeconomic differences reported in this thesis may be under-estimates of the “real” magnitude of the socioeconomic differences in the community. In the NNS, the unemployed and those earning high incomes were the least likely to participate (McLennan & Podger, 1998). Likewise, compared with the 2006 census data the FLS participants were over-represented by women, highly educated and slightly older individuals which meant that selected participants were under-represented by socially disadvantaged groups and these non-respondents were likely to have less healthy food behaviours (Turrell & Najman, 1995).

Another limitation is that all takeaway food consumption measures did not use portion size or number of items consumed at each occasion. Extra quantitative information on takeaway food consumption may be valuable to provide a more complete description of takeaway food consumption by SEP. For example Beydoun et al. (2008a) employed two measures of fast-food consumption: whether or not consumed any fast-food in the period of 48 hours, and number of fast-food items consumed in the same period. The results showed association in opposite directions; higher income groups being more likely to consume fast-food; however, the poorest income group consumed a greater number of fast-food items.

8.4 CONTRIBUTIONS OF THIS THESIS

The findings of this thesis contribute to three areas.

Theoretical contributions

- Enhanced the understanding of socioeconomic differences in dietary behaviours and the potential pathways by describing takeaway food consumption patterns by SEP and identifying the influencing psychosocial factors to socioeconomic differences in takeaway food consumption and the choice of takeaway food.

Methodological contributions

- Assessed the reproducibility of the consumption of takeaway food, specific takeaway items, and fruit and vegetables that are measured using a test-retest study
- Formally examined the mediated effects of takeaway food consumption to the association between SEP and fruit and vegetable intake
- Quantitatively examined the contribution of psychosocial factors to socioeconomic differences in takeaway food and the choices of takeaway food.

Practical contributions

- Provide important evidence for developing policies and effective intervention programs to improve diet quality of population, especially of lower socioeconomic groups.

8.5 RECOMMENDATIONS

8.5.1 Recommendations for future research

In Australia and other countries, takeaway food has become an important part of our diet. The findings from the research presented in this thesis showed that the majority of participants consumed takeaway food. Among them, a high proportion of people consumed takeaway food multiple times a week. Frequent consumption of takeaway food, especially “less healthy” options are likely to have negative implications on dietary intakes and subsequent biological risk factors for chronic disease. Therefore, how takeaway food consumption influences all aspects of diet should be investigated in order to better understand the role of takeaway food in our diet. Additionally, in Australia, the sales of takeaway food have grown significantly and the variety of these foods available has also increased (BIS Sharpnel, 2008). These trends suggest that the frequency and types of takeaway food consumed would have changed over the years. However, there is no national level data that allows for the trends on takeaway food consumption to be monitored in Australia. A more frequent national survey is clearly needed as it will allow for the examination of the impact of takeaway food on dietary intake and possible health outcomes (e.g. obesity and dyslipidemia), and also enable the trends of takeaway food consumption patterns to be monitored.

The majority of earlier studies did not define or have examined a narrow range of takeaway foods with takeaway/fast-food consumption typically being assessed by asking one question “how often do you usually consume takeaway/fast-food?”. However, not all takeaway foods are unhealthy; rather these foods are heterogeneous types that encompass both healthy and less healthy foods. In addition, the research presented in this thesis showed there were socioeconomic differences in the nature of takeaway food choices. In order to better understand socioeconomic inequalities in dietary intake, it is important to assess how different socioeconomic groups make varied takeaway food choices. Further studies should define and examine a wider scope of takeaway food and focus on the choice of takeaway food by different socioeconomic groups. Furthermore, as I stated in the previous chapters, not all items in the “healthy” or “less healthy” choices are actually healthy or less healthy respectively as there are variations in nutrient content within each food group (Dunford et al., 2010). Therefore, the appropriateness of the classification used in the FLS needs to be evaluated by future research.

There is no one indicator which best describes individuals’ SEP (Galobardes et al., 2007). Different measures of SEP present different dimensions of socioeconomic circumstance, and also reflect different causal pathways between SEP and dietary behaviours, and consequently health status. In this present study, limited socioeconomic measures were used. To comprehensively describe and understand how SEP is related to dietary behaviours, multiple measures of SEP should be used.

Measuring SEP at multiple levels can also provide a better understanding of socioeconomic variations in dietary behaviours. This thesis only employed socioeconomic measures at the individual and household levels. However, measuring at the individual, household, and neighbourhood or area levels has been recommended (Krieger et al., 1997). Including an area-based measure may provide further insights into how different exposures to “healthy” or “less healthy” takeaway food outlets may influences socioeconomic variations in choice of takeaway food. Furthermore, a longitudinal study should be conducted examining SEP at different time points, dietary behaviour development and health outcomes. Cross-sectional data collects information at one point in time which cannot assess the temporality of the relationship, or causality of the observed associations. Longitudinal studies will provide a pathway that explains how individuals shape their dietary behaviours over time through different lifetime socioeconomic conditions (Galobardes et al., 2007).

The measures for psychosocial factors considered in the current study were adopted from previous studies, with some measures not being validated previously. Therefore, developing highly valid and reliable psychosocial measurements are important as using invalid or unreliable measures can result in spurious findings (Baranowski, Cullen, & Baranowski, 1999). In addition, standardisation of these psychosocial measures may facilitate easier comparison of studies (Baranowski et al., 1999).

The use of limited dietary intake methods to account for the consumption of takeaway food and fruit and vegetable intake, as per this thesis, is also an area that can be improved in future work. In cross-sectional studies, 24-hour dietary recall, FFQs, and brief dietary questionnaires have been widely used with often each study employing one dietary intake method to assess dietary behaviours. However, each dietary intake method has different advantages and limitations with varying accuracy and precision, and no one method can collect information without error (Rutishauser, 2005). In order to better understand dietary behaviours among target populations, it has been suggested that a combination of methods be used to maximise the strength of the dietary intake data collected (Thompson & Subar, 2008). The use of combinations of methods along with the appropriate analytical technique to account for various sources of error may greatly improve the accuracy of the dietary assessment (Thompson & Subar, 2008) which subsequently will improve the ability to predict true associations.

Studies often do not report on the quality of questionnaire used. For example, an evaluation of the reproducibility using a test-retest study is a useful first step to estimate questionnaire performance (Parr, Veierod, Laake, Lund & Hjartaker, 2006) and can provide information about the quality of data used which will help with the interpretation of the results reported. Future studies should, therefore, evaluate and present the quality of the various measures used (Cade, Burley, Warm, Thompson, & Margetts, 2004).

8.5.2 Recommendations for policies and intervention programs to improve dietary behaviours

As previously stated, takeaway foods are commonly and frequently consumed among a large proportion of the population. The popularity of takeaway food is likely to continue as current lifestyle patterns such as long working hours and increased demand for convenience (Buckley et al., 2007; Warde, 1999) favour the consumption of takeaway food. Although these foods contribute to lower fruit and vegetable intake, and therefore, are likely to influence diet quality, national policies and dietary recommendations that are solely focused on takeaway food are absent in Australia. In early 2011, the Review of Food and Policy was presented to the Australian Government in order to increase the availability of healthy products (Blewett, Goddard, Pettigrew, Reynolds, & Yeatman, 2011); and one important outcome from the Review is that fast-food chains will have to display energy content of food on their menu boards (Australian Government Department of Health & Ageing, 2011). In the US, the mandatory provision of energy content information on the menus at the point of purchase in chain restaurants has been introduced (Dumanovsky et al., 2011) and has been shown to have a positive influence on food choice (Bassett et al., 2008; Bollinger, Leslie, & Sorensen, 2010; Roberto, Larsen, Agnew, Baik, & Brownell, 2010). However, this recommendation may also have limited effectiveness in bringing about change in lower socioeconomic groups, despite their effectiveness in the wider population: lower socioeconomic groups are less likely to correctly interpret the nutritional information provided compared with higher socioeconomic groups (Gorton, Ni Mhurchu, Chen, & Dixon, 2009).

The front-of-pack traffic light labelling, on the other hand, is the most effective way for consumers to identify and classify food products as being healthy (Kelly et al., 2008) regardless of different socioeconomic circumstance (Gorton et al., 2009). The front-of-pack traffic light labelling, which was one of the key recommendations from the Review (Blewett et al., 2011), uses green, amber, and red colours to inform the consumer about the healthiness of the items, and is the preferred format by Australian consumers compared with other types of food labelling (e.g. nutrition information panel on the back of the food products) (Cancer Council Victoria, 2010). Despite the support of consumers and health professionals for the provision of traffic light labelling and the potential for large health benefits across the whole population from using this approach (Australian Medical Association, 2011; Kelly et al., 2008), front-of-pack traffic light labelling has recently been rejected by the government (Australian Government Health & Ageing, 2011). It would appear that pressure from food manufacturers who strongly disagree with traffic light labelling has largely influenced the government's decision (White, Thomson, & Signal, 2010). Similar movement has been seen in Europe: the European parliament rejected traffic light labelling after intensive lobbying by food industries (Corporate Europe Observatory, 2010). However, as the current trend of the population towards overweight and obesity is set to continue, we need to overcome the resistance through continued lobbying and ultimately implement mandatory use of traffic light labelling that will save governments the health and economic cost of diet-related chronic disease in the long-term rather than submit to the commercial pressures of the food industry.

The findings that "less healthy" takeaway food partly mediated socioeconomic differences in fruit and vegetable intake suggest that it is important to decrease the consumption of "less healthy" items and promote a higher fruit and vegetable intake. Decreasing the consumption of "less healthy" takeaway items and increasing the fruit and vegetable intake among populations may be achieved by changing the price of food. The food price is one of the most influential factors when people purchase food (Darmon et al., 2002; Glanz et al., 1998) especially among low income groups (Kearney et al., 2000). Studies on the taxing of unhealthy food and reducing the price of healthy food through incentives (e.g. coupons) or subsidising these foods showed positive changes in food choice (French et al., 2001; Glanz & Hoelscher, 2004; Ni Mhurchu, Blakely, Jiang, Eyles, & Rodgers, 2010; Thow, Jan, Leeder, & Swinburn, 2010).

Meal preparation behaviours and attitudes partly explained lower socioeconomic groups consuming "less healthy" takeaway food proposing that improving meal preparation-related knowledge and skills may increase perception towards cooking. Lower socioeconomic groups appeared to have low confidence in their ability to cook (Winkler & Turrell, 2009). People who have confidence to cook, or have adequate cooking skills are likely to enjoy cooking and use pre-prepared food less regularly (Martine et al., 2004). Although there is some evidence of the association between lack of cooking skills and increased pre-prepared meal consumption (van der Horst et al., 2011b) having adequate cooking skills or having confidence to cook may not necessarily lead to cooking healthy meals and using pre-prepared meals less regularly. Attitudes towards cooking may be a more important influencing factor for the consumption of takeaway food rather than having adequate meal preparation skills or having the confidence to cook. Preparing a meal involves more complex tasks as other skills and knowledge are needed: mechanical, perceptual, conceptual, academic, and planning (Short, 2003). Additionally, to use and apply these skills and knowledge, motivation and opportunities are also needed (Block et al., 2011). This food-related domain is called food literacy which may be a key for healthy eating. Therefore, intervention programs should use a holistic approach to improve all areas within the food-related domain or food literacy rather than just trying to address one aspect of it. This may lead to an improvement in the knowledge, skills and also attitudes towards all food-related activities. Furthermore, improving food literacy may also overcome some barriers for healthy eating. In Chapter 7, higher socioeconomic groups reported a lack of time as the reason to consume takeaway food. By improving food literacy, they may have better time management skills and gain skills to prepare meals efficiently which may lead to the elimination of the perceived lack of time as a barrier for healthy eating and subsequently more individuals may prepare meals at home. As foods prepared at home generally have better nutritional quality compared with typical takeaway food, their diet quality may also improve. Therefore, improving food literacy among the whole population, especially among disadvantaged groups may lead to a reduction in takeaway food consumption, increased healthy food choices and may help decrease the prevalence of overweight/obesity and diet-related chronic disease.

To address these diverse issues, comprehensive approaches that involve all sectors of government, the community, non-profit organisations and industry are needed. Such approaches have shown some success in the UK (Sustain, 2011). An alliance called Sustain has been formed by a large number of organisations which "advocates food and agriculture policies and practices that enhance the health and welfare of people and animals, improve the working and living environment, enrich society and culture and promote equity" (Sustain, 2011). The alliance has had a number of achievements in advocating, developing, and disseminating a wide range of projects, policies, and campaigns. Their successes include increased fruit and vegetable consumption among children and improved access and availability of healthy food among disadvantaged communities. These efforts are made via partnerships with public and private sectors, organisations, professionals, and industries with a range of approaches. Australia also recognises the need for urgent action to address the issue of diet, chronic diseases, and socioeconomic inequalities in these; and also the need for partnership with all sectors (National Preventative Health Taskforce, 2008b); however, their actions have not yet been realised (Swinburn et al., 2011).

Although this research did not focus on children, childhood is an important period for developing dietary behaviours (NHMRC, 2003b). Developing food literature targeted at children is essential and schools have a crucial role (Pendergast, Garvis, & Kanasa, 2011). Results of a survey among UK adults indicated that cookery classes at school play an important part in learning to cook (Caraher et al., 1999). Learning about food at school can also promote food knowledge, encourage proper attitudes to healthy eating, develop culinary skills, acquire healthy eating habits and the ability to control their diet (Lichtenstein & Ludwig, 2010; Stitt, 1996) which are all essential life skills (Seeley, Wu, & Caraher, 2010; Stitt, 1996). Despite this importance, Australia and other countries no longer consider learning about food at school a significant part of the school curriculum (Burke, 2002; Lichtenstein & Ludwig, 2010). School-based food and nutrition education will significantly benefit students throughout their lifetimes which in turn will benefit the whole community (Home Economics Institute of Australia Inc., 2010).

8.6 CONCLUSIONS

In the broader context of understanding factors contributing to socioeconomic inequalities in diet and resultant diet-related disease, this thesis examined socioeconomic differences in takeaway food consumption, and the role of takeaway foods in contributing to fruit and vegetable intake. While the direction of the association between SEP and consumption of takeaway food is not well established, lower socioeconomic groups are likely to consume a high level of “less healthy” takeaway food. As “less healthy” takeaway items have nutritional characteristics that are inconsistent with dietary recommendations for good health, higher consumption of these foods by lower socioeconomic groups may be contributing to socioeconomic variations in diet-related chronic diseases and related risk factors such as overweight/obesity. Additionally, “less healthy” takeaway items partly explain socioeconomic variations in fruit and vegetable intake which suggests that strategies to reduce consumption of “less healthy” types are needed. While relationships between SEP, psychosocial factors and takeaway food consumption were complex, improving health and nutrition-related beliefs and knowledge, and meal preparation behaviours and attitudes are likely to reduce the high level of “less healthy” takeaway food consumed by low socioeconomic groups. Developing food literacy among populations with a specific focus on lower socioeconomic groups, may lead to great improvements in dietary quality. Effective collaboration across all levels of government, public health agencies, food and health industries, professionals and communities is needed to realise a reduction of socioeconomic differences in diet and subsequent health inequalities.

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Appendices

Appendix A: Statements in the Food and your Lifestyle Survey questionnaire and their source

Table A: Statements in the Food and your Lifestyle Survey (FLS) questionnaire and their source

Item No	Statements	Source
1.1 1.2	• Usual daily fruit intake • Usual daily vegetable intake	• (Australian Bureau of Statistics, 2009; Australian Bureau of Statistics., 1998)
1.4	• Which one of the following diet best describes your usual way of eating?	• (Australian Bureau of Statistics., 1998)
1.5	To what extent do you agree or disagree with the following statements?	
	• I often feel rushed or pressed for time	• (Melbourne Institute of Applied Economic and Social Research: The University of Melbourne, 2001)
	• I often feel I have spare time that I don't know	• (Buckley, Cowan, & McCarthy, 2007; Melbourne Institute of Applied Economic and Social Research: The University of Melbourne, 2001)
	• I think healthy food is tasty [it would not be tasty enough – about plant based diet; strongly disagree to strongly agree in 5 point scale]	• (Lea, Crawford, & Worsley, 2006)
1.6	To what extent do you agree or disagree with the following statements?	
	• Eating a diet that is high fat is a threat to my health [eat a diet that is high in fat (more than 40% of energy from fat)]	• (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998)
	• What you eat can affect your chance of getting cancer or heart disease	• (Satia-Abouta, Patterson, Kristal, Teh, & Tu, 2002; Satia, Galanko, & Siega-Riz, 2004)
	• Being 10 kg or more overweight is a threat to my health [how much harm do you believe is likely occur to a person's health in long run if they do the following things: Are 20lb or more over wt]	• (Glanz, et al., 1998)
	• I try to avoid takeaway food because I don't want to gain weight	• (Wardle & Griffith 2001)
1.7	• Do you think you have appropriate cooking appliances to cook meals for you and your family? • Do you think your cooking equipment is in good working order? • Do you think your cooking equipment is of sufficient size to cook meals for you and your family? • Do you think you have sufficient cooking utensils to cook meals for you and your family? • Do you think you have enough space to sore your food?	• (Kearney & McElhone, 1999)
1.8	• Nutritional knowledge questions	• (Turrell & Kavanagh, 2006)

Appendix A: Statements in the Food and your Lifestyle Survey (FLS) questionnaire and their source (continued)

Item No	Statements	Source
2.1	• Who is responsible for preparing main meals in your household?	• Original
2.2	Can you prepare and cook a dinner from basic ingredients?	• (Buckley, et al., 2007)
2.3	How often do you prepare main meals in your household?	• (Crawford, Ball, Mishra, Salmon, & Timperio, 2007)
2.4	During the past 12 months, how often have you	
	• Cooked from basic ingredients	• (Buckley, et al., 2007)
	• Spent less than 15mins preparing dinner [I don't like spending too much time on cooking]	• (Crawford, et al., 2007)
	• Felt cooking is a real chore	• (Crawford, et al., 2007)
3.1	• In the last 12 months, did you eat any takeaway food?	• (Southern Area Population Health Services, 2006)
3.2	To what extent do you agree or disagree with each statement?	
	• I eat takeaway foods because I am too busy to cook	• (Rydell et al., 2008)
	• Takeaway foods are tasty	• (Rydell, et al., 2008)
3.3	To what extent do you agree or disagree with each statement?	
	• My takeaway food choice is influenced by my child(ren)	• (Satia-Abouta, et al., 2002)
	• My takeaway food choice is influenced by my partner	• (Satia-Abouta, et al., 2002)
	• My takeaway food choice is influenced by my friends	• (Lea, et al., 2006)
	• Eating takeaway food is a way of socialising with family and friends	• (Buckley, et al., 2007; Rydell, et al., 2008)
3.4	• In the last 12 months, how often did you usually eat the following "takeaway" foods bought from a takeaway shop?	• Original
3.5	To what extent do you agree or disagree with each statement?	
	• Takeaway foods are value for money	• (Bryant & Dundes, 2008; Rydell, et al., 2008)
	• Takeaway foods are inexpensive [fast-foods are inexpensive]	• (Rydell, et al., 2008)
	• It is cheaper for me to buy takeaway than to cook for myself	• (Lea, et al., 2006)
	• Takeaway food is fun & entertaining	• (Rydell, et al., 2008)
	• Takeaway food is a treat for myself	• (Rydell, et al., 2008)
	• Takeaway food is nutritious	• (Rydell, et al., 2008)
3.6	• Which food do you think is more expensive for you?	• Original
3.7	• Which food do you think is healthier for you?	• Original
3.8	• Which food do you think is tastier for you?	• Original
3.9	• Which food do you think is more convenient for you?	• Original

Appendix A: Statements in the Food and your Lifestyle Survey (FLS) questionnaire and their source (continued)

Item No	Statements	Source
3.10	• Takeaway foods are value for money • Takeaway foods are expensive • It is cheaper for me to cook for myself than buying takeaway food • Takeaway food is nutritious • Takeaway food is tasty • I don't eat takeaway foods because of my health problems • I don't eat takeaway because of my family don't eat them	• (Rydell, et al., 2008) • (Rydell, et al., 2008) • (Lea, et al., 2006) • (Rydell, et al., 2008) • (Rydell, et al., 2008) • (Kearney, Kearney, Dunne, & Gibney, 2000) • (Kearney & McElhone, 1999)
3.11	• In the last 12 months, how often did you eat the following foods bought from a shop?	• Original
4.1	• Are you male or female	• (Queensland University of Technology., 2007)
4.2	• How old are you?	
4.3	• In which country were you born?	• (Queensland University of Technology., 2007)
4.4	• What is the highest educational qualification you have completed?	• (Queensland University of Technology., 2007)
4.5	• Which one of the following best describes your employment situation?	• (Queensland University of Technology., 2007)
4.6	• What is your current occupation?	• (Queensland University of Technology., 2007)
4.7	• In usual week, how many hours per week do you work?	• (Queensland University of Technology., 2007)
4.8	During the past 12 months, how often have you • brought your lunch to work? • purchased your lunch at work?	• Original
4.9	To what extent do you agree or disagree with each statement? • near my work, takeaway shops are easy to access • I have access to many different takeaway shops at my work • I can buy many different types of takeaway foods at my work • At my work, there are appropriate kitchen and dining facilities to prepare lunch	• Original
4.10	• How tall are you without shoes?	• (Queensland University of Technology., 2007)
4.11	• How much do you weight without clothes and shoes?	• (Queensland University of Technology., 2007)
4.12	• Which one of the following best describes your household structure? (possible answers are the same)	• (Queensland University of Technology., 2007)
4.13	• How many people live in your household?	• (Queensland University of Technology., 2007)
4.14	• How many children in the following age groups do you currently have living in your care [none; number aged 0 to 12 months; number aged 1 to 5 years; number aged 6 to 12 years; number aged 13 to 17 years; number aged 18 years or more]	• (Queensland University of Technology., 2007)
4.15	• Thinking about your money situation, would you say: can't make ends meet;	• (Sorensen et al., 2007)

Appendix A: Statements in the Food and your Lifestyle Survey (FLS) questionnaire and their source (continued)

Item No	Statements	Source
4.16	• Do you have a current health conditions such as diabetes, asthma, heart problems or a bowel complaint which affects the type of food you eat?	• (Turrell, 1996)
4.17	• Do you have a motor vehicle available for your personal use?	• (Queensland University of Technology., 2007)
4.18	• What is the total income (in Australian dollars) for your household before tax	• (Queensland University of Technology., 2007)

Appendix B: The piloting questionnaire

Questionnaire pilot

Pilot number: ____________

Length of time to complete questionnaire: ______

1) Where there any parts of the questionnaire that you found difficult? If yes:

   a) Explain which parts, and describe how or why they were difficult?
   b) Did we include all response categories?
   c) Did we miss anything?

1

2) Item-by-item analysis: did you find this question difficult? If yes:

a) Describe how or why they were difficult?
b) Did we include all response categories?
c) Did we miss anything?

2

3) Overall, what did you think of the questionnaire? How did you find it to fill out?

4) Have we missed any questions or anything else in this questionnaire?

5) Finally, we intend to send this questionnaire out via mail to residents of Brisbane. How do you think we can improve the questionnaire to get the best response rate possible? Or what can we do to encourage people to complete the questionnaire?

3

Appendix C: Feedback from the piloting survey and summary of changes

Table C-1: Items/parts perceived difficult by participants

Pilot No	Comments
1	• Sometimes page(s) or questions needed to be skipped. This made me a little confused.
2	• On page 8, it says “skip page 9 and go page 10”. It was not clear why the person did not need to answer questions on page 9.
3	• The questionnaire was too long. It was confusing to skip page 9 • The person did not know own height, weight, and income but needed to write/choose a category. The person felt this difficult.
4	• Q1.1 & 1.2 were difficult as these question items involved the fruit and vegetable intake estimations. • The person also did not feel comfortable to fill in Q4.18 (household income).
6	• It was confusing why the end of page 8 says “go to page 10”. • Please clarify why the page needed to skip.
7	• Q1.1 & 1.2 were difficult. The person needed to read the questions a few times then needed to estimate usual intake of fruit and vegetables. • On page 8, it states “please go to question 4.1 on page 10”; however, the person did not see this statement. As a result, the person filled in all of the questions on page 9. The statement on page 8 should be emphasised (larger font) and the similar statement should be on the top of page 9.
9	• Q3.6 was difficult. The person needed to read twice. However, after reading the question and explanation, the person understood what was being asked
10	• Q1.4 was difficult to answer as the question did not specify whether in general or any specific time. • How relevant is Q1.6? People now have cooking equipment and enough space. • The statement on page 8 was missed and did not notice the person can skip page 9.

Table C-2: Participant's impression of the questionnaire (overall)

Pilot No	Comments
1	• Good, easy to answer, questions are factual, no needed to guess to answer the questions.
2	• Very good. Easy to read and fill-in. question items are straight forward.
3	• OK
4	• Very easy to read and answer. Layout is good and looks simple.
5	• Good. Covered a range of questions, easy to fill-out and sensible.
6	• Easy to follow and fill-in.
7	• Straight forward and easy.
8	• Good, interesting, a range of questions, and easy to fill-out.
9	• Easy to fill-out
10	• Good. Most of question items were easy to follow.

Table C-3: Other comments from participants

Pilot No	Comments
2	• Describe what is/are the aim(s) of this questionnaire within the questionnaire.
5	• Specify whether using a pen or pencil, and what ink of pen is preferable. • Q1.1 to 1.3 did not say whether “tick” or “cross”.
6	• Q3.5 “takeaway” is too general to answer these questions. Price, nutritious etc. are depending on the type of takeaway foods. The answers to Q3.5 need to refer what the person usually eat (i.e. when look at the answers of Q3.5, the answers to Q3.4 also need to be considered) • Q4.9 asks to people who are employed but it may be better to ask all people about availability and accessibility of takeaway foods.
7	• It would be more appropriate to include “rarely” in some response categories.
8	• Q3.5 “takeaway food is nutritious” depends on the takeaway foods. Therefore, more people may choose “unsure” for the answer.
9	• Q3.4 & Q3.11 are almost the same. Why these questions are repeated? (i.e. the person didn't read the instruction).
10	• It may be good to ask participants about their general shopping behaviour to characterise habit/requirement. • It was not sure whether “tick” or “cross” to the responses at the beginning of the questionnaire.

Table C-4: Summary of changes to the questionnaire

Item No.	Pilot No.	Comments	Action
1.4	2, 10	Specify specific time (e.g. when preparing food)	No action
1.6	10	Relevance of questions	No action
1.7	1	Too lengthy and negative statement is confusing.	No action
	5	In the 10th statement, "may" should be added.	Change from "Dietary fibre…prevents constipation" to "Dietary fibre…may prevent constipation".
	7	As each statement goes far away from the top, which boxes represent "true", "false", or "not sure" are getting confused. Could split this section into two pages.	Space between each statement and boxes was increased.
3.2	4	Add occasions to the statement (e.g. at movies, leisure time) because takeaway foods are consumed at such occasions.	No action
3.4	1	Too lengthy.	Space between each takeaway item was increased.
	6	Join the response category "rarely" and "less than once a month", and separate category "never or rarely" to "never" and "rarely".	No action
	2	Add where to obtain from	No action.
3.5	2, 6, 8	Statement is not clear. Answer would be depending on the type of takeaway food.	"In general" was added to the statement.
3.6	1, 9	Emphasise the word "expensive" because Q3.6 to 3.9 look the same.	The word "expensive" was capitalised.
3.7	1, 9	Emphasise the word "healthier" because Q3.6 to 3.9 look the same.	The word "healthier" was capitalised.
3.8	1, 9	Emphasise the word "tastier" because Q3.6 to 3.9 look the same.	The word "tastier" was capitalised.
3.9	1, 9	Emphasise the word "convenient" because Q3.6 to 3.9 look the same.	The word "convenient" was capitalised.
4.4	1	Emphasise the word "completed" as not clear.	The words "highest" and "completed" were capitalised
4.6	6	Better to rephrase to "what do you do" rather than asking "full title of occupation.	No action
4.8	4, 10	Add one more response category "rarely" or "seldom".	Changed from "never" into "never or rarely".
4.9	6	Ask to all people rather than just employed.	No action.
4.17	6	Add one more response category "often".	No action
Other changes			
Page No	Pilot No.		
0	5, 10	State "cross" or "tick" to the responses.	At the beginning of the page (next to the cover page), a statement "Tick or cross the response box" was added.
	5	Specify whether using a pen or pencil, and what ink of pen is preferable.	No action.
8	1, 2, 3, 9	Emphasise the bottom of the statement on page 8.	The statement's font size was increased.
9	2, 6, 7	Add a statement to clarify who may need to fill-in this page.	The statement "these next questions are for people who never eat takeaway foods" was added on top of the page.

Appendix D: Ethical approval certificate

University Human Research Ethics Committee

HUMAN ETHICS APPROVAL CERTIFICATE

NHMRC Registered Committee Number EC00171

Date of Issue: 4/6/09 (supersedes all previously issued certificates)

Dear Ms Kyoko Miura

A UHREC should clearly communicate its decisions about a research proposal to the researcher and the final decision to approve or reject a proposal should be communicated to the researcher in writing. This Approval Certificate serves as your written notice that the proposal has met the requirements of the *National Statement on Research involving Human Participation* and has been approved on that basis. You are therefore authorised to commence activities as outlined in your proposal application, subject to any specific and standard conditions detailed in this document.

Within this Approval Certificate are:

* Project Details
* Participant Details
* Conditions of Approval (Specific and Standard)

Researchers should report to the UHREC, via the Research Ethics Coordinator, events that might affect continued ethical acceptability of the project, including, but not limited to:

(a) serious or unexpected adverse effects on participants; and
(b) proposed significant changes in the conduct, the participant profile or the risks of the proposed research.

Further information regarding your ongoing obligations regarding human based research can be found via the Research Ethics website http://www.research.qut.edu.au/ethics/ or by contacting the Research Ethics Coordinator on 07 3138 2091 or ethicscontact@qut.edu.au

If any details within this Approval Certificate are incorrect please advise the Research Ethics Unit within 10 days of receipt of this certificate.

Project Details

Category of Approval: Human non-HREC

Approved From: 4/06/2009 **Approved Until:** 4/06/2012 (subject to annual reports)

Approval Number: 0900000445

Project Title: A study of food and lifestyle among Brisbane adults: takeaway food consumption and its relation to fruit and vegetable intake

Chief Investigator: Ms Kyoko Miura

Other Staff/Students: Dr Katrina Giskes , A/Prof Gavin Turrell

Experiment Summary:
Develop strategies and policies so that more healthy foods will be available to Brisbane residents.

Participant Details

Participants:
Brisbane residents

Location/s of the Work:
QUT

Conditions of Approval

Specific Conditions of Approval:
No special conditions placed on approval by the UHREC. Standard conditions apply.

RM Report No. E801 Version 3

Page 1 of 2

University Human Research Ethics Committee

HUMAN ETHICS APPROVAL CERTIFICATE

NHMRC Registered Committee Number EC00171

Date of Issue: 4/6/09 (supersedes all previously issued certificates)

Standard Conditions of Approval:
The University's standard conditions of approval require the research team to:

1. Conduct the project in accordance with University policy, NHMRC / AVCC guidelines and regulations, and the provisions of any relevant State / Territory or Commonwealth regulations or legislation;

2. Respond to the requests and instructions of the University Human Research Ethics Committee (UHREC);

3. Advise the Research Ethics Coordinator immediately if any complaints are made, or expressions of concern are raised, in relation to the project;

4. Suspend or modify the project if the risks to participants are found to be disproportionate to the benefits, and immediately advise the Research Ethics Coordinator of this action;

5. Stop any involvement of any participant if continuation of the research may be harmful to that person, and immediately advise the Research Ethics Coordinator of this action;

6. Advise the Research Ethics Coordinator of any unforeseen development or events that might affect the continued ethical acceptability of the project;

7. Report on the progress of the approved project at least annually, or at intervals determined by the Committee;

8. (Where the research is publicly or privately funded) publish the results of the project is such a way to permit scrutiny and contribute to public knowledge; and

9. Ensure that the results of the research are made available to the participants.

Modifying your Ethical Clearance:
Requests for variations must be made via submission of a Request for Variation to Existing Clearance Form (http://www.research.qut.edu.au/ethics/forms/hum/var/var.jsp) to the Research Ethics Coordinator. Minor changes will be assessed on a case by case basis.

It generally takes 7-14 days to process and notify the Chief Investigator of the outcome of a request for a variation.

Major changes, depending upon the nature of your request, may require submission of a new application.

Audits:
All active ethical clearances are subject to random audit by the UHREC, which will include the review of the signed consent forms for participants, whether any modifications / variations to the project have been approved, and the data storage arrangements.

End of Document

Appendix E: The Food and your Lifestyle Survey

Food and your Lifestyle

A survey by Queensland University of Technology

QUT ihbi
Institute of Health and Biomedical Innovation

Food and your Lifestyle

We greatly appreciate your help with this survey.
Your answers are very important to us.

Please remember:

- Tick ☑ or cross ☒ the response box
- There are no right or wrong answers: we just want to know what YOU think
- Your answers will be treated as strictly **PRIVATE AND CONFIDENTIAL.**

If you have any questions:
Please call Kyoko on 3138 8292 or email to k.miura@qut.edu.au

Once you have completed the survey, please return it in the enclosed reply paid envelope (no stamps necessary).

Section 1 What you eat and your thoughts about food

1.1 How many serves of fruit do you usually eat each day?
(For example, 1 serving = 1 medium apple or banana, OR 2 apricots, OR ½ cup of tinned fruit, OR 1 cup fresh fruit, berries, grapes OR 1/3 cup dried fruit OR ½ cup juice).

(Count all types – fresh, frozen, dried, tinned or juice)

☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Don't eat fruit	1 serve or less per day	2 to 3 serves per day	4 to 5 serves per day	6 serves or more per day

1.2 How many serves of vegetables (excluding potatoes) do you usually eat each day?
(For example, 1 serving = ½ cup cooked vegetables OR ½ cup cooked dried beans, peas, or lentils OR 1 cup fresh/salad vegetables)

(Count all types – fresh, frozen, dried or tinned)

☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Don't eat vegetables	1 serve or less per day	2 to 3 serves per day	4 to 5 serves per day	6 serves or more per day

1.3 How many serves of potatoes do you usually eat each day?
(For example, 1 serving = 1 small potato OR 12 hot chips)

(Count all types – fresh, frozen, dried or tinned)

☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Don't eat potatoes	1 serve or less per day	2 to 3 serves per day	4 to 5 serves per day	6 serves or more per day

1.4 Which one of the following best describes your USUAL way of eating?

Please select one option

- ☐ 1 I don't follow any diet
- ☐ 2 Vegetarian
- ☐ 3 Weight-reduction diet
- ☐ 4 Diabetic diet
- ☐ 5 Fat modified diet to lower blood cholesterol
- ☐ 6 Organic
- ☐ 7 Other (please specify) ______________________

1

1.5 To what extent do you agree or disagree with each statement?				
Please select the answer closest to the way you feel				
	Strongly agree	Agree	Disagree	Strongly disagree
In general, I often feel rushed or pressed for time	☐1	☐2	☐3	☐4
I often have spare time that I don't know what to do with	☐1	☐2	☐3	☐4
I think healthy food is tasty	☐1	☐2	☐3	☐4

1.6 To what extent do you agree or disagree with the following statements?					
Please select the answer closest to the way you feel					
	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Eating a diet that is high in fat is a threat to my health	☐1	☐2	☐3	☐4	☐5
What you eat can affect your chance of getting cancer or heart disease	☐1	☐2	☐3	☐4	☐5
Being 10kg or more overweight is a threat to my health	☐1	☐2	☐3	☐4	☐5
I try to avoid takeaway food because I don't want to gain weight	☐1	☐2	☐3	☐4	☐5

1.7 The following questions are about the cooking equipment in your household			
Please select the answer that comes closest to your situation	Yes	No	Don't know
Do you think you have appropriate cooking appliances to cook meals for you and your family? (for example, stove, microwave, dishwasher, and blender)	☐1	☐2	☐3
Do you think your cooking equipment is in good working order?	☐1	☐2	☐3
Do you think your cooking equipment is of sufficient size to cook meals for you and your family?	☐1	☐2	☐3
Do you think you have sufficient cooking utensils to cook meals for you and your family? (for example, pots, pans, and measuring cups)	☐1	☐2	☐3
Do you think you have enough space to store your food? (e.g. fridge/freezer space, cupboards)	☐1	☐2	☐3

2

1.8 The next question deals with some statements about food and nutrition. How true do you think they are?

Please select one option

	True	False	Not sure
Bread, cereal, fruit and vegetables should make up the smallest part of our diet	☐1	☐2	☐3
Milk and milk products such as cheese and yogurt are the best source of iron	☐1	☐2	☐3
A high intake of plant food combined with a low salt intake may protect against high blood pressure	☐1	☐2	☐3
Adequate calcium intake may reduce the risk of osteoporosis	☐1	☐2	☐3
It is better for health to choose lean meat (with little visible fat)	☐1	☐2	☐3
Choosing salt-reduced food provides no health benefits	☐1	☐2	☐3
Meat, poultry and fish are the best sources of calcium	☐1	☐2	☐3
Fruit is a poor source of vitamin C	☐1	☐2	☐3
It is better for health to limit those foods which contain high levels of sugar such as soft-drinks, cordial and biscuits	☐1	☐2	☐3
Dietary fibre from wholemeal foods combined with an adequate intake of drinking water may prevent constipation	☐1	☐2	☐3
It is recommended that adults have some milk, cheese or yogurt every day	☐1	☐2	☐3
Choosing wholemeal bread provides no health benefits	☐1	☐2	☐3
Wholegrain breads are good sources of fibre	☐1	☐2	☐3
It is recommended that we eat fat and oil in limited amount	☐1	☐2	☐3
Saturated fats are found in large quantities in butter, lard and dripping	☐1	☐2	☐3
Adults should choose full cream milk instead of skim or trim milk	☐1	☐2	☐3
A high intake of saturated fat can protect against heart disease	☐1	☐2	☐3
Dark green and orange vegetables like spinach, broccoli, carrots and pumpkin are low in vitamin A	☐1	☐2	☐3
Meat, fish, chicken and eggs should make up the largest part of our diet	☐1	☐2	☐3
Low sugar intake may decrease the risk of dental cavities	☐1	☐2	☐3

Section 2 About meals in your household

2.1 Who is mainly responsible for preparing dinner in your household?

Please tick one box

☐ 1 Myself	☐ 5 Friends
☐ 2 Partner	☐ 6 Relatives
☐ 3 Parents	☐ 7 Neighbours
☐ 4 Roommates	☐ 8 Other (Please describe) ______

2.2 Can you prepare and cook a dinner from basic ingredients?

Please tick one box only

☐ 1 Yes ☐ 2 No

2.3 How often each week do you prepare dinner in your household?

Please tick one box only

- ☐ 1 5 or more times
- ☐ 2 3-4 times
- ☐ 3 1-2 times
- ☐ 4 Rarely

→ PLEASE GO TO QUESTION 2.4 BELOW

- ☐ 5 Never

→ PLEASE GO TO QUESTION 3.1 ON PAGE 5

2.4 During the past 12 months, how often have you (on average):

Please tick one box only	Never or rarely	1-3 times per month	1-2 times per week	3-4 times per week	5 or more times per week
Cooked a meal from basic ingredients	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Spent less than 15 minutes preparing dinner	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Felt cooking is a real chore	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

4

Section 3 Your thoughts and beliefs about your food choices

3.1 In the last 12 months, did you eat any takeaway food?

Please tick one box only

☐ 1 Never	PLEASE GO TO QUESTION 3.10 ON PAGE 9
☐ 2 Rarely	PLEASE GO TO QUESTION 3.2 BELOW
☐ 3 Less than once a month	
☐ 4 1–3 times per month	
☐ 5 Once per week	
☐ 6 2–4 times per week	
☐ 7 5–6 times per week	
☐ 8 Once per day	

3.2 To what extent do you agree or disagree with each statement?

Please select the answer closest to the way you feel

	Strongly agree	Agree	Disagree	Strongly disagree
I eat takeaway foods because I am too busy to cook	☐ 1	☐ 2	☐ 3	☐ 4
Takeaway foods are tasty	☐ 1	☐ 2	☐ 3	☐ 4

3.3 To what extent do you agree or disagree with each statement?

Please select the answer closest to the way you feel

	Strongly agree	Agree	Disagree	Strongly disagree	Not applicable
My takeaway food choice is influenced by my child(ren)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My takeaway food choice is influenced by my partner	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My takeaway food choice is influenced by my friends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Eating takeaway food is a way of socialising with family and friends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3.4 In the last 12 months, how often did you usually eat the following "take-away" foods bought from a takeaway shop:

Please tick one box per item

	Never or rarely	Less than once a month	1-3 times per month	Once per week	2-4 times per week	5-6 times per week	Once per day or more
Potato chips, fries or wedges	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Hamburger	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Pizza	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Savoury pies, sausage rolls or pastries	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Fried fish or fried seafood	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Fried chicken	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Fried spring roll, dim sim, or wonton	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Curry	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Kebab	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Sandwiches (e.g. salad sandwiches, subway)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Fried rice	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Pasta	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Asian-style noodles (e.g. Hokkien noodle, Chow mein) from Red Box, Wok Me, or similar places	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Sushi	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Cakes, sweet buns, muffins or scones	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Salad (including fruit salad)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Soft drink, non-diet	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Soft drink, diet	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Fruit or vegetable juice	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Thick shake or milk shake	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Flavoured milk or smoothie	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Ice-cream, ice-confection, or frozen yoghurt	☐1	☐2	☐3	☐4	☐5	☐6	☐7

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3.5 To what extent do you agree or disagree with each statement about takeaway food in general?

Please select the answer closest to the way you feel

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Takeaway foods are value for money	☐1	☐2	☐3	☐4	☐5
Takeaway foods are inexpensive	☐1	☐2	☐3	☐4	☐5
It is cheaper for me to buy takeaway foods than to cook for myself	☐1	☐2	☐3	☐4	☐5
Takeaway food is fun and entertaining	☐1	☐2	☐3	☐4	☐5
Takeaway food is a "treat" for myself	☐1	☐2	☐3	☐4	☐5
Takeaway food is nutritious	☐1	☐2	☐3	☐4	☐5

3.6 Which food do you think is more EXPENSIVE for you?

On each line, please tick the food which you think costs more. If you think the foods cost about the same, or are not sure, tick one of these boxes instead.

THIS ONE?	OR THIS ONE?	OR	
☐1 Hamburgers	☐2 Sandwiches	☐3 About the same	☐4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐1 Potato chips, fries or wedges	☐2 Sushi	☐3 About the same	☐4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐1 Soft drink, non-diet	☐2 Fruit or vegetable juice	☐3 About the same	☐4 Not sure

3.7 Which food do you think is HEALTHIER for you?

On each line, please tick the food which you think is healthier. If you think the foods are of the same healthiness, or are not sure, tick one of these boxes instead.

THIS ONE?	OR THIS ONE?	OR	
☐1 Hamburgers	☐2 Sandwiches	☐3 About the same	☐4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐1 Potato chips, fries or wedges	☐2 Sushi	☐3 About the same	☐4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐1 Soft drink, non-diet	☐2 Fruit or vegetable juice	☐3 About the same	☐4 Not sure

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3.8 Which food do you think is TASTIER for you?

On each line, please tick the food which you think tastier. If you think the foods taste about the same, or are not sure, tick one of these boxes instead.

THIS ONE?	OR THIS ONE?	OR	
☐ 1 Hamburgers	☐ 2 Sandwiches	☐ 3 About the same	☐ 4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐ 1 Potato chips, fries or wedges	☐ 2 Sushi	☐ 3 About the same	☐ 4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐ 1 Soft drink, non-diet	☐ 2 Fruit or vegetable juice	☐ 3 About the same	☐ 4 Not sure

3.9 Which food do you think is more CONVENIENT for you?

On each line, please tick the food which you think is more convenient. If you think their convenience is about the same, or are not sure, tick one of these boxes instead.

THIS ONE?	OR THIS ONE?	OR	
☐ 1 Hamburgers	☐ 2 Sandwiches	☐ 3 About the same	☐ 4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐ 1 Potato chips, fries or wedges	☐ 2 Sushi	☐ 3 About the same	☐ 4 Not sure
THIS ONE?	**OR THIS ONE?**	**OR**	
☐ 1 Soft drink, non-diet	☐ 2 Fruit or vegetable juice	☐ 3 About the same	☐ 4 Not sure

Please go to question 4.1 on page 10.

These next questions are for people who never eat takeaway foods.

3.10 To what extent do you agree or disagree with each statement?

Please select the answer closest to the way you feel

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Takeaway foods are value for money	☐1	☐2	☐3	☐4	☐5
Takeaway foods are expensive	☐1	☐2	☐3	☐4	☐5
It is cheaper for me to cook for myself than buying takeaway food	☐1	☐2	☐3	☐4	☐5
Takeaway food is nutritious	☐1	☐2	☐3	☐4	☐5
Takeaway food is tasty	☐1	☐2	☐3	☐4	☐5
I don't eat takeaway foods because I don't want to gain weight	☐1	☐2	☐3	☐4	☐5
I don't eat takeaway foods because of my health problems	☐1	☐2	☐3	☐4	☐5
I don't eat takeaway foods because my family doesn't eat them	☐1	☐2	☐3	☐4	☐5

3.11 In the last 12 months, how often did you eat the following foods bought from a shop:

Please tick one box per item

	Never or rarely	Less than once a month	1-3 times per month	Once per week	2-4 times per week	5-6 times per week	Once per day or more
Sushi	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Cakes, sweet buns, muffins or scones	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Salad (include fruit salad)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Soft drink, non-diet	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Soft drink, diet	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Fruit or vegetable juice	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Thick shake or milk shake	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Flavoured milk or smoothie	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Ice-cream, ice-confection, or frozen yoghurt	☐1	☐2	☐3	☐4	☐5	☐6	☐7

Section 4 About you and your household

4.1 Are you:

☐1 Male ☐2 Female

4.2 How old are you?

[ ] years

4.3 In which country were you born?

Please tick one box only

☐ Australia ☐ Other (please specify) ____________

4.4 What is the HIGHEST educational qualification you have COMPLETED?

Please tick one box only

☐1 Year 9 or less	☐6 Diploma or Associate Degree
☐2 Year 10 (Junior/ 4th form)	☐7 Bachelor Degree (Pass or Honours)
☐3 Year 11 (Senior/ 5th form)	☐8 Graduate Diploma or Graduate Certificate
☐4 Year 12 (Senior/ 6th form)	☐9 Postgraduate degree (Masters degree or Doctorate)
☐5 Certificate (trade or business)	☐10 Other (Please describe) ____________

4.5 Which ONE of the following best describes your current employment situation?

Please tick one box only

☐1 Full-time paid work
☐2 Part-time paid work
☐3 Casual paid work
☐4 Self-employed
☐5 Work without pay in a family or other business

PLEASE GO TO QUESTION 4.6 ON PAGE 11

☐6 Home duties
☐7 Unemployed looking for work
☐8 Retired
☐9 Permanently unable to work
☐10 Student
☐11 Other (please specify) ____________

PLEASE GO TO QUESTION 4.10 ON PAGE 12

4.6 What is your current occupation? (If you have more than one job, we are interested in your main job).	
Please give full title (for example: childcare aide, maths teacher, pastry cook, commercial airline pilot, apprentice toolmaker, etc). For **Public Servants**, state official designation and occupation. For **armed services personnel**, state rank and occupation.	
Full title of occupation:	

4.7 In a usual week, how many hours do you work?	
	hours per week

4.8 During the past 12 months, how often have you:

Please tick one box only	Never or rarely	Once per week	Twice per week	3 times per week	4 times per week	5 or more times per week
Brought your own lunch to work	☐1	☐2	☐3	☐4	☐5	☐6
Purchased your lunch at work	☐1	☐2	☐3	☐4	☐5	☐6

4.9 To what extent do you agree or disagree with each statement?

Please select the answer that comes closest to the way you have been feeling

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Near my work, takeaway shops are easy to access	☐1	☐2	☐3	☐4	☐5
I have access to many different takeaway shops near my work (e.g. snack bar, chain takeaway store, McDonald's, KFC)	☐1	☐2	☐3	☐4	☐5
I can buy many different types of takeaway foods near my work (e.g. sandwiches, chips, kebabs, pizzas, noodles, hamburgers)	☐1	☐2	☐3	☐4	☐5
At my work, there are appropriate kitchen and dining facilities to prepare lunch (e.g. microwave oven and fridge)	☐1	☐2	☐3	☐4	☐5

4.10 How tall are you without shoes? (please tell us in either centimetres or feet and inches)

Please check using your driver's licence if you have one

Centimetres		Feet	Inches
	OR		

4.11 How much do you weigh without clothes and shoes? (please tell us in either kilograms or stone and pounds).

Please check using a set of scales if you have them

Kilograms		Stone	Pounds
	OR		

4.12 Which one of the following best describes your household structure?

Please tick one box only

- ☐1 Living alone with no children
- ☐2 Single parent living with one or more children
- ☐3 Single and living with friends or relatives
- ☐4 Couple (married or defacto) living with no children
- ☐5 Couple (married or defacto) living with one or more children
- ☐6 Other (please specify)

4.13 How many people in total live in your household?

Include yourself, partner, children or anyone else living with you

☐ People

4.14 How many children do you currently have living in your household?

*Please provide the **number** for each age group*

None	0 to 12 months	1 to 5 years	6 to 12 years	13 to 17 years	18 years or more
☐					

4.15 Thinking about your money situation, would you say you:

Please tick one box only

☐1	☐2	☐3	☐4
Can't make ends meet	Have just enough to make ends meet	Are comfortable	Don't know

4.16 Do you have a current health condition such as diabetes, asthma, heart problems or a bowel complaint that affects the type of food you eat?

☐ No ☐ Yes → what food(s) can't you eat, or what food(s) do you try to avoid? ______________________

4.17 Do you have a motor vehicle available for your personal use?

Please tick one box only

☐1	☐2	☐3	☐4
Yes, always	Yes, sometimes	No	I don't drive

We would be grateful if you could provide us with an estimate of your total household income.

People may feel uncomfortable providing information about their income. To make this easier we have grouped the incomes into categories so that your actual income can't be identified.

By answering this question you will help us to achieve our aim of ensuring that all Brisbane residents, regardless of income, have equal access to food.

4.18 What is the total income for your household before tax (i.e. the combined income of each person in the household)?

Please tick one box only

Per year	OR	Per fortnight	OR	Per week
☐1 Less than $15,599		☐1 Less than $600		☐1 Less than $300
☐2 $15,600 – $20,799		☐2 $600 - $799		☐2 $300 – $399
☐3 $20,800 – $25,999		☐3 $800 – $999		☐3 $400 – $499
☐4 $26,000 – $31,199		☐4 $1,000 – $1,199		☐4 $500 – $599
☐5 $31,200 – $36,399		☐5 $1,200 – $1,399		☐5 $600 – $699
☐6 $36,400 – $41,599		☐6 $1,400 – $1,599		☐6 $700 – $799
☐7 $41,600 – $51,999		☐7 $1,600 – $1,999		☐7 $800 – $999
☐8 $52,000 – $72,799		☐8 $2,000 – $2,799		☐8 $1,000 – $1,399
☐9 $72,800 – $93,599		☐9 $2,800 – $3,599		☐9 $1,400 – $1,799
☐10 $93,600 – $129,999		☐10 $3,600 – $4,999		☐10 $1,800 – $2,499
☐11 More than $130,000		☐11 $5,000 or more		☐11 $2,500 or more
☐12 Don't know				
☐13 Don't want to answer				

You have finished the survey!

THANK YOU

Thank you for the time and effort you have put into completing this survey for us. It is very much appreciated. The information you have provided will be important to make food available for all residents of Brisbane.