Eating behaviours and the workplace: The role of socioeconomic and sociodemographic characteristics

By

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Abstract

The overall aim of the research described in this thesis is to explore the role of socioeconomic status (SES) (defined in terms of education, salary, and job grade) and demographic and personal factors (including age, weight, number of dependants, and gender) in relation to the eating behaviours of employees, and to explore barriers and facilitators to healthy eating in the workplace. The purpose of examining these issues in the workplace is to better enable practitioners to develop interventions designed to assist workers in the adoption of healthy eating behaviours. The thesis opens, in **Chapter 1,** with an introduction to these concepts and consideration of their role in providing a focus for targeted workplace interventions to promote healthy food-related behavioural choices.

Chapter 2 shows that the vast majority of academic research on relations between SES and eating behaviours is based on community samples. Little is known about such relations in occupational samples. This is an important knowledge gap, because with many people spending more than half of their daily waking hours at work, the workplace represents an ideal location for the promotion of healthy eating choices. In response to the knowledge gap identified above, the overall aim of this investigation is to examine relations between three indices of SES (education, salary band, and grade), plus demographic and personal factors (age, gender, number of dependants, and Body Mass Index (BMI)) and eating behaviours in a large public sector employee sample. Five specific eating behaviours are considered: Consumption of a healthy, well-balanced diet, fruit consumption, vegetable consumption, eating past the point of being full, and cost of food influencing

purchasing behaviour. Analyses were carried out on data from the Stormont Study, an organisation-wide health-focused employee survey conducted in 2012 (Time 1) and 2014 (Time 2) in the Northern Ireland Civil Service (NICS). The Stormont Study methodology is presented in **Chapter 3**.

A descriptive epidemiology based on cross-sectional analyses of data collected at T1 and T2 is presented in **Chapter 4**. These analyses identified the importance of demographic factors, in addition to the measures of SES in relation to eating behaviours. To explore relations between SES and eating behaviours, cross-sectional, prospective, and longitudinal analysis was carried out in **Chapter 5**. Relations between SES and eating behaviours were observed in all three analyses – however only grade and education reached significance in the longitudinal analysis. The demographic variables significantly contributed to the statistical model in all three analyses; age and BMI produced consistently significant relationships with nearly all eating behaviours across all three sets of analysis.

Chapter 6 explores the extent to which eating behaviours differed between age groups and BMI categories, to understand if interventions may benefit from demographic tailoring for high risk groups. In light of findings from the quantitative studies, and to better inform interventions to improve eating behaviours in the workplace, a qualitative study, in **Chapter 7**, was conducted in 2017, within a higher SES management group, in a large organisation that had recently been privatised after many decades in public ownership. The findings of the quantitative studies were explored with participants, in addition to asking them to consider the barriers and facilitators to eating a healthy, well-balanced diet, and their perceptions of the role of the

employer in promoting healthy eating. Thematic saturation was reached upon completion of 15 interviews. Five main themes were identified, each containing multiple sub-themes: (1) knowledge, (2) behaviour, (3) access, (4) workplace culture and (5) responsibility (government and organisational responsibilities). Workplace culture was seen as a barrier to healthy eating, and therefore initiatives designed to modify work culture may prove effective as a means by which to promote healthy eating in the organisational setting.

      Chapter 8 considers the research as a whole and the application of findings to workplace health promotion practice. Strengths and limitations of the investigation are discussed and recommendations made for future study.

Dedication

       I dedicate this thesis to my family – Mum, Dad, and Ian – who set the example and taught me anything can be achieved with perseverance and hard work. They have listened to me talk about the subjects contained in this thesis for more than 4 years and have given me nothing but enthusiasm and encouragement, even if the subject may have interested me rather more than them!

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Thank you to Dr Robert Kerr, from the University of Ulster, and his company 'Employee Wellbeing Solutions' for funding my studies and affording me the scholarship, without which I probably would not have considered studying to PhD level.

Thank you too to Professor Ken Addley for access to the Northern Ireland Civil Service (NICS) Stormont Study and for allowing the addition of questions into the project as a result of the literature review in this thesis. Thanks also to Dr Shaun Davis at the Royal Mail for the support in carrying out the qualitative section of this thesis study. To the organisations NICS and Royal Mail Group (RMG), a big thanks for their support in allowing access to their workforces.

Most thanks must go to the numerous employees of the NICS who took part in the wellbeing surveys in 2012 and 2014, without which there would have been no study to carry out. Thanks also to the employees at RMG who gave up their time to take part in the interviews.

A special thank you must go to my friends and colleagues over the last 4 years who have seen me bow out of countless social engagements and must,

at times, have found me quite boring as I spoke of little else and buried myself

away each evening and weekend to complete this PhD. Without their support

and humour I would not have made it this far.

Table of Contents

Preface

Background to the Study

As a health and wellbeing professional working in corporate health, I have long been interested in the impact of obesity on workforce health. Having lost six stone myself, in my late teens and early twenties, I was keenly aware of both the physiological and psychological impact of obesity, but also the sheer hard work required to lose weight. This weight loss changed my career path (I dropped out of my first undergraduate degree in economics) and it sparked a desire to spend my career helping others to improve their health and wellbeing. Having implemented many interventions in workplaces designed to improve health behaviours, I have seen the challenges faced by health and wellbeing professionals in designing and implementing robust interventions and often wondered how, as practitioners, we can move away from a one-size fits all approach to behaviour change to one that is tailored to the needs of specific groups.

On completion of my MSc in Workplace Health and Wellbeing at the University of Nottingham, I was offered a scholarship at the University of Nottingham to join a team of researchers exploring health behaviours in the Northern Ireland Civil Service (NICS). The 'Stormont Study' was a survey-based investigation led within NICS by Professor Ken Addley, and managed by a cross-university collaboration of researchers including Dr Jonathan Houdmont (University of Nottingham), Dr Robert Kerr (University of Ulster), and Dr Fehmidah Munir and Dr Ray Randall (Loughborough University), in addition to other post-graduate researchers. A range of health-related research has been produced from the Stormont Study including analysis of relations

between economic recession and psychosocial factors at work (Houdmont, Kerr, & Addley, 2012), occupational sitting time and its correlates (Clemes et al., 2016; Munir et al., 2015), and psychosocial working conditions and leisure-time physical activity (Houdmont, Clemes, Wilson, Munir, & Addley, 2015). My contribution to the Stormont Study research was to investigate eating behaviours and their relationship with key metrics included in the survey.

Publications and Conference Presentations

The following presentations have been produced (or are forthcoming) from the work within this thesis:

2016 (April) Grant, J. *The Grand Doctoral Plan: Cross-sectional and Prospective Contribution of Socioeconomic and Demographic and Personal Factors, to the Eating Behaviours of Employees of the Civil Service.* Oral presentation delivered at the 12th European Academy of Occupational Health Psychology, Athens.

2018 (May) Grant, J., Houdmont, J., Munir, F., Kerr, R & Addley, K. *Healthy eating choices: Employee perceptions of the role of the employer.* Oral presentation accepted for delivery at The 32nd International Congress on Occupational Health, Dublin.

2018 (May) Grant, J., Houdmont, J., Munir, F., Kerr, R. & Addley, K. *Socioeconomic status, demographic and personal factors, and the eating behaviours of Civil Service employees: A cross-sectional study.* Poster accepted for presentation at The 32nd International Congress on Occupational Health, Dublin.

Aims and Focus of the Thesis

The overall aim of the current research is to explore the role of socioeconomic status (SES) (as measured by education, salary, and job grade) and demographic and personal factors (including age, weight, number of dependants, and gender) in the eating behaviours of employees, and to explore barriers and facilitators to healthy eating in the workplace. The studies presented in this thesis were conducted in two organisations: The Northern Ireland Civil Service (NICS), a public sector organisation that employs circa 27,000 employees, and Royal Mail Group (RMG), the UK postal service, privatised from public ownership in 2013 with an employee base of circa 135,000. While RMG is now a private company listed in the FTSE 250 it was once one of the largest public sector employers in the UK, second only to the National Health Service. Comparisons can be made between the two organisations as their structures and job profiles are broadly similar, as are the demographics of the workforce they employ.

A mixed-methods approach has been employed for the current study. The qualitative study using semi-structured interviews among higher SES RMG employees enables the exploration of key findings that emerged from the initial quantitative investigation involving NICS employees, in addition to the exploration of barriers and facilitators to healthy eating in the workplace. Five measures of eating behaviour were used in the current investigation to offer a breadth of data often not explored in research – very often just one measure of eating behaviour is included offering potentially limited insights. Self-reported measurement of healthy eating can often be contradictory when coupled with additional measures such as fruit and vegetable intake. An individual may

believe they consume a healthy diet, but report that they have a low consumption of fruits and vegetables. Likewise, they may believe what they eat is healthy, however the portions that they eat far exceed that which is considered healthy. An individual's definition of healthy eating is also important, as this can be influenced by education, upbringing, environment, and knowledge. So too can the differences between what, and how, an individual reports what they eat and what is actually consumed – whether consciously or unconsciously. These paradoxes make the study of eating behaviours challenging and warrant the use of multiple measures to improve the validity of the findings. Therefore, the aim of the current research is to offer a broader view of eating behaviours that extends beyond one self-reported measure of healthy eating.

The current research also aims to explore the influence of multiple measures of SES (education, income, and job grade), on eating behaviours. This acknowledges that all three measures are related and complementary and should be analysed concurrently. An individual's education may influence the job that they get, and therefore the earnings they receive. This, in turn, may influence the food they buy (or can afford) and the eating behaviours they develop. However, an individual's SES may not wholly define their behaviour. The environment an individual lives in, and who they live with, may have a strong influence, such as access and choice of foods in the local area. The influence of dependants may be to increase the cost of household food (and perhaps reduce quality as resources are spread more thinly), to introduce conflicting tastes and preferences in the household, and maybe add 'pester power' where children strongly influence purchasing behaviour. Age or gender

will also likely influence tastes and preferences, and so too may health. While the current study does not explore the pre-existing health conditions of individuals, other than weight status, this may exert a strong influence of the foods consumed and their pattern of consumption. An individual's weight may be the cause, or the result, of their eating behaviours or even their socioeconomic or demographic characteristics. The current thesis will explore the influence of weight status on eating behaviours and suggest ways the workplace may be able to use these findings to improve health.

The primary aim of this research is to understand the relationships, discussed above, in a workplace setting. The findings from quantitative analysis of workplace settings, particularly those of a cross-sectional nature, offer interesting insights into relationships, but cannot permit definite conclusions on causation. Therefore, to complement the quantitative data collection in the current research, a qualitative study was also carried out to explore the quantitative findings and better understand the facilitators and barriers to healthy eating in a workplace setting. Just as an individual's socioeconomic and demographic characteristics may influence their eating behaviours, the context of their work may too be a factor. For many individuals, working in an organisation is not a solitary experience and therefore the birthday cakes their colleagues bring in to share or the food served in the canteen may be of influence. Likewise, the stressors the individual encounters – such as back-to-back meetings, time pressures, work travel, and the demands of superiors – may also have an impact. Therefore, the aim of the qualitative study in this thesis is to explore some of these factors

with employees and gather their suggestions of the ways employers, and governments, may successfully improve individual health behaviours.

Structure of the Thesis

The central focus of this thesis concerns the relationship between SES, sociodemographic characteristics, and eating behaviours in working populations, an introduction to these constructs is given in Chapter 1 and a review of the literature on SES and demographic factors in relation to obesity and eating behaviours is given in Chapter 2. Chapter 3 details the methodology for data collection and analysis.

Chapter 4 draws on data from the 2012 and 2014 NICS employee surveys to present a descriptive profile for five indices of eating behaviour, stratified by three indices of SES. Eating behaviours significantly differed across socioeconomic groups.

Chapter 5 presents a cross-sectional, prospective, and longitudinal examination of the relationships between demographic and personal factors (age, gender, number of dependants, and BMI) and SES (education, salary band, and grade) on five eating behaviours – cost of food influencing purchasing behaviour, eating past the point of feeling full, the perception of a healthy, well-balanced diet, and fruit and vegetable consumption. Regression analysis revealed that all three measures of SES had a significant influence on the cost of food influencing purchasing behaviours and vegetable consumption. Age, gender, and BMI all significantly influenced the eating behaviours. Longitudinal analysis was applied to three of the eating behaviours examined in both the 2012 and 2014 surveys; fruit consumption, vegetable consumption, and the consumption of a healthy, well-balanced diet. Hierarchical linear

regression was carried out, while controlling for demographic factors (age, gender, and number of dependants), BMI, and the eating behaviour at T1, to explain the variance in consumption of the eating behaviour at T2.

The regression analyses reported and discussed in Chapter 5 highlighted the contribution of age and BMI to explaining the five eating behaviours considered in the current thesis. In response, Chapter 6 further examines the role of these demographic and personal characteristics in relation to eating behaviour. Specifically, differences in eating behaviour by age and BMI are examined via a set of one-way ANOVA analyses. Findings indicate a host of significant differences on each index of eating behaviour by age and BMI. The results point to the scope for targeted interventions within the organisational setting. Such interventions are discussed in the context of the extant literature on tailored and targeted workplace health promotion activities.

While analysis of data from employees of the NICS offers insights into the relationships between socioeconomic and demographic factors and eating behaviours it does not enable an understanding of why these relationships may exist. Chapter 7, therefore, represents a qualitative follow-up study to the main quantitative investigation of the thesis. In the light of findings from the quantitative studies, 15 interviews with workers from a large, recently privatised organisation, RMG, (with similar structures and employee demographics to those in the quantitative study) were carried out to explore barriers and facilitators to healthy eating choices within, and outside of, the workplace and perceptions of the role of the employer in promoting healthy eating. Five main themes were identified through thematic analysis: (1) knowledge, (2) behaviour, (3) access, (4) workplace culture and (5)

responsibility. The findings are discussed in the context of existing qualitative, and quantitative, studies from both community and workplace contexts.

The thesis concludes with a summary of the findings of both the quantitative and qualitative research and recommendations for future study. The strengths and limitations of the research design and analysis are discussed, along with the application to the research area. Finally, there is a reflection on theory-based interventions discussing the links between academic research and professional practice and the need for more consistent approaches to, and measurement of, workplace interventions designed to improve health.

The current thesis adds to a growing body of literature demonstrating the complexity of eating behaviours and the role of the workplace in promoting healthy eating choices. The findings indicate that a one-size-fits-all approach to health behaviour modification may not be as effective as a targeted approach based on individual characteristics including SES (education, income, and job grade) and demographic factors such as age, gender, BMI, and number of dependants. Further study including the design and evaluation of workplace health programmes is recommended to further the findings of this thesis.

Author Contribution

Parts of this thesis have developed from my own work resulting from the Stormont Study. While the initial question set, administration, and organisation of data collection at the NICS, were not managed by me, my literature review resulting from the first round of data collection (T1: 2012) led to the development of additional questions added to the second round of data collection (T2: 2014). Therefore, the data analysis and discussions presented in Chapters 3, 4, 5, and 6 are my own work and were my sole responsibility. The

same applies to the theoretical and methodological arguments presented.

Chapter 7 presents a qualitative study that was conceived and executed by me

under the guidance of my supervisors.

Chapter 1: Introduction

This thesis adds to the understanding of relationships between SES, demographic factors, and employee eating behaviours. The thesis uses both quantitative and qualitative analysis to identify the relationships between individual SES and demographic and personal characteristics and eating behaviours, and explores the facilitators and barriers to healthy eating in the workplace. The purpose of the thesis is to inform interventions designed by practitioners and academics alike to identify and improve eating behaviours at work.

Socioeconomic inequalities in health behaviours have been extensively reported. Since the 1950s, hundreds of studies have examined the relationship between SES and obesity (McLaren, 2007; Sobal & Stunkard, 1989), while differences in diet and fruit and vegetable intake between SES groups have also been observed (Lallukka, Laaksonen, Rahkonen, Roos, & Lahelma, 2007; Timmins, Hulme, & Cade, 2013). The vast majority of this research is based on community samples. Little is known about such relations in occupational samples. This is an important knowledge gap, because with many people spending a quarter of their lives at work, the workplace represents an ideal location for the promotion of healthy eating choices (Schulte et al., 2007). Research on relations between SES and eating behaviours in occupational samples could, therefore, usefully facilitate the targeting of interventions designed to promote healthy eating choices in specific 'at risk' employee groups.

In response to the knowledge gap identified above, the overall aim of this doctoral investigation is to examine relationships between SES,

demographic, and personal factors, and eating behaviours of employees in a large public sector organisation, NICS. This thesis will explore the cross-sectional, prospective, and longitudinal relations between three indices of SES (education, salary, and grade), plus demographic and personal factors (age, gender, number of dependants, and BMI), which will collectively be referred to in this thesis as demographic factors in relation to eating behaviours. Five specific eating behaviours are considered: Eating a healthy, well-balanced diet, fruit consumption, vegetable consumption, eating past the point of being full, and cost of food influencing purchasing behaviour. This introductory chapter will provide an overview of the concepts and the aims of the current research. It will also outline why this area of research is important in the study of workplace health and will conclude with an overview of the thesis.

1.1 Introduction to Concepts

1.1.1 Overweight and obesity defined

Obesity is defined as having a BMI greater than 30kg/m² and overweight as having a BMI of greater than 25kg/m² (Schulte et al., 2007). In the UK, 36% of adults are classed as obese and a further 27% are classed as overweight (Baker, 2017). This is, however, likely to be a conservative estimate, as BMI is often self-reported and biased downwards (Ng et al., 2014). It has been observed that women often under-report their weight, while men may over-report their height (Ng et al., 2014). While life expectancy and health are improving across the world, statistics show that the differences in mortality and health between socioeconomic groups are not improving with this trend and the differentials are widening (Ball & Crawford, 2005).

1.1.2 Costs of overweight and obesity

It is predicted that by the year 2020, 7 out of 10 people in Britain will be overweight or obese, putting a strain on health services and increasing costs to the economy (Wang, McPherson, Gortmaker, & Brown, 2011). In 2014, 39% of adults worldwide (38% of men and 40% of women) were overweight and the worldwide prevalence of obesity nearly doubled between 1980 and 2014, with 11% of men and 15% of women (more than half a billion adults) classified as obese (World Health Organisation, 2015). Changes in lifestyles and diets over the last 30 years around the world have led to a significant rise in overweight and obesity (Health and Safety Executive (HSE), 2006). Overweight and obesity caused an estimated 3.4 million deaths, 3.8% of disability adjusted life-years (DALYs), and 3.9% of years of life lost in 2010 (Ng et al., 2014). Excess weight can lead to diabetes, respiratory complaints, musculoskeletal disorders, eyesight problems, cancers, strokes, cardiovascular disorders, sleep apnoea and infertility in addition to psychological disorders such as low self-esteem, social exclusion, depression, stigmatism, and stress (HSE, 2006).

Obesity is estimated to cost the UK economy £1 billion in the treatment of disease in obese adults, £1.4 billion in the costs of sickness absence and an estimated £1 billion to £6 billion on state benefits (HSE, 2006). The Department of Health estimated lost earnings as a result of obesity to cost the UK between £2.35 billion to £2.6 billion each year (2011). The costs of overweight and obesity to the economy and society were an estimated £16 billion in 2007 (more than 1% of Gross Domestic Product, GDP), with research suggesting this has the potential to rise to just under £50bn in 2050 if

obesity continues to rise at the current rate (Department of Health, 2011). The economic impact of obesity is one that impacts both the UK economy and the workplaces that operate within it.

1.1.3 Overweight, obesity, and work

Obesity in its simplest form is caused by excess calories being consumed and too little energy being expelled through activity; the workplace is likely to exert some influence on our waistlines, whether directly or indirectly, and studies on work shifts and occupational types show a propensity for weight gain in certain occupational circumstances (Schulte et al., 2007). Health behaviours, such as food habits, physical activity, smoking and drinking, in addition to obesity, are often influenced by psychological, cultural, social, and economic factors (Lahelma et al., 2009). Social deprivation, ethnicity, parental obesity, and income can all increase the likelihood of an individual becoming obese (Department of Health, 2011). The global rise in obesity may also be influenced by economic growth; more cars, abundant food supplies, access to cheap manufactured foods, and busier and more sedentary lifestyles can all lead to weight gain (Howard, 2012). There is also research in twins that suggests that genetic predisposition also plays a part in determining a predisposition for weight gain and obesity (Schneider et al., 2017).

A quarter of the lives of employed adults are spent at work, and demands and pressures from work can impact eating and activity habits which can lead to overweight and obesity (Schulte et al., 2007). Obesity can impact both opportunity and performance at work, as well as both resulting in an increase in exposure to risks (hazardous exposures and psychosocial risks) and magnifying the impact of certain risks in the workplace (Schulte et al., 2007).

4

It has been argued that "obesity is an economic issue" (Drewnowski, 2009, p.S36); some parts of the population with limited resources may not be able to afford to eat a nutritious, healthy diet leading to poor health and obesity. Governments in the US and the UK believe that 'nudge tactics' are the most effective for addressing social problems, providing "small impulses so that health becomes the obvious choice" (Howard, 2012, p. 13). One of the difficulties of understanding the true impact of obesity on the workplace is the lack of consistency or completeness in its measurement (Wang, McPherson, Marsh, Gotmaker, & Brown, 2011). Many studies try to quantify the future costs of obesity in terms of health and financial costs using obesity-related diseases, however there are likely to be many other factors not included that impact obesity and the workplace (Wang et al., 2011).

1.1.4 Overweight, obesity, and socioeconomic status

It was suggested more than a century ago in 1889 by Thorstein Veblen in 'The theory of the leisure class' that SES might be related to body weight when it was observed that thinness was a status symbol of the emerging leisure class (Sobal & Stunkard, 1989). Since the 1950s, hundreds of studies have examined the relationship between SES and obesity (Sobal & Stunkard, 1989; McLaren, 2007). The influence of SES on diet and obesity differs between countries, perhaps influenced by the presence of obesogenic environments or other biopsychosocial factors (McLaren, 2007; Kearney, 2010). An obesogenic environment is one that includes "physical (i.e. geographic and technological), as well as economic, political, socio-cultural (i.e. normative and attitude-specific) contextual characteristics that may influence eating habits and physical activity" (Schneider et al., 2017, p. 2). In addition to observed

differences in obesity and SES, there are also differences in diet and fruit and vegetable intake between SES groups (Lallukka, Laaksonen, Rahkonen, Roos, & Lahelma, 2007; Nagler, Viswanath, Ebbeling, Stoddard & Sorensen, 2013; Timmins, Hulme & Cade, 2013).

It has been found that "while those that are well educated can choose to adopt a healthy lifestyle, the poor have fewer choices and more limited access to nutritional education" (Kearney, 2010, p. 2802). As countries develop, and are exposed to the globalisation of food systems, diets that have been traditionally eaten for centuries are changing to reflect the trends for fast-food and calorie rich diets associated with more developed countries (Kearney, 2010). This trend is contributing to the development of obesity and consumption of poorer diets across the world and not just in countries more associated with obesity, such as the US and UK. This rising tide of obesity will lead to increasing health risks and is already a major challenge to global health (Ng et al., 2014).

Health inequalities may develop from "the conditions in which people are born, grow, live, work, and age and inequalities in power, money, and resources that give rise to the conditions of daily life" (Marmot, Allen, Bell, Bloomer, & Goldblatt, 2012, p. 1012). SES (or position) is widely used in health research and demonstrates the far-reaching implications on the importance of SES on a wide range of health outcomes (Braveman et al., 2005). SES is a multi-dimensional construct influenced by diverse factors such as, most commonly, education, income (salary band), and occupational class (job grade), in addition to poverty level, parental education, childhood deprivation, household income, neighbourhood deprivation, and economic

difficulty or satisfaction (Braveman et al., 2005; Laaksonen, Sarlio-Lähteenkorva, & Lahelma, 2004). It has been argued that "stemming the obesity epidemic cannot be separated from stemming the tide of poverty" (Drewnowski & Darmon, 2005, p. 271S). Both employment and the quality of the work are important for health and health inequalities across the population (Marmot et al., 2012). People in work have greater opportunity to experience good health and wellbeing through an income, positive social status, and social interaction (Marmot et al., 2012). It is worth noting too that employees who are hungry and/or in poor health may have increased sickness-related absence from work, may make more errors in their work, and be less productive, so campaigns to improve health at work can have a positive impact in the under- and over-consumption of calories (International Labour Organisation; cited in Allan, Querstret, Banas, & de Bruin, 2017). The current study will focus more on the consumption of food in obese and overweight individuals rather than those who are underweight.

"Obesity is an economic issue" (Drewnowski, 2009, p. S36). Lower income groups have less money to spend on food, so may therefore choose lower cost options (often higher in fats and sugars) and may also be limited in the availability of good quality food, perhaps dictated by where they live and their access to shops and what is available to purchase (Drewnowski, 2009). In 1936, George Orwell embarked on a tour of the northern industrial heartlands of Britain to understand what life was like for the poor which he recorded in 'The Road to Wigan Pier' (1937). He recorded every aspect of life for both the working and unemployed poor, looking at both living and working conditions (Orwell, 1937). His analysis of diet suggests that little has changed in the

complexity of food purchasing behaviours in 1936 to the present day (Darmon & Drewnowski, 2007; Orwell, 1937). Orwell suggested that "the less money you have, the less inclined you feel to spend it on wholesome food – you want something a little bit 'tasty'. There is always some cheaply pleasant thing to tempt you." (Orwell, 1937, p. 88). Darmon and Drewnowski (2007), 70 years following Orwell's observations, concur, suggesting that 'palatability' may be an explanation of the overconsumption of energy dense foods, especially those high in fats and sugars. Added to that, lean meats, fish, fresh vegetables, and fruit are costlier per calorie than those item higher in fats and sugars. Having more money to spend on food does not necessarily mean that the money will be spent on healthy foods; however, having less than a certain threshold of money to spend on food will guarantee that the food consumed will have fewer nutrients and be more energy dense (Drewnowski, 2009).

Added to the complexity of diet cost, the tendency to overeat, or eat past the point of feeling full, is another challenge to the development of obesity. As Orwell found, people craved something 'tasty' to help them cope with the challenges they faced in life (Orwell, 1937). With scarcity of food the norm, at times when food was plentiful there would be a tendency to eat more than needed with no knowledge of when the next meal would be available. In an age of plentiful food supply, at least in most developed countries, a balance must be struck between the pleasure of the consumption of food and its ready availability and restraint from eating too much (Johnson, Pratt, & Wardle, 2012). The marketing of foods –most often those high in fats and sugars – the convenience of fast food, societal changes in food portion size, and environmental cues have all played a part in the development of obesity over

time (Wansink, 2010). While both physiology and psychology play a part in overeating, the workplace may too facilitate the tendency to overeat. Understanding this tendency in the workforce may enable the development of interventions, or the redesign of workplace eating facilities, to facilitate healthy eating at work.

1.2 Policy Imperative

The next two sections will consider approaches to the promotion of healthy eating advanced by the United Kingdom Government and authoritative organisations. First, it is important to recognise the policies and climate in which these organisational observations and interventions operate. The World Health Organisation (WHO) adopted the *WHO Global Strategy on Diet, Physical Activity and Health* in 2004 at the 57th World Health Assembly (World Health Organisation, 2004). The strategy outlines the actions needed to support healthy diets and regular physical activity. It argues that action is needed by stakeholders at global, regional, and local levels to improve diets and physical activity patterns at the population level. The *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020* also sets out the WHO commitment to tackling ill-health, halting the rise in obesity, and addressing childhood obesity (World Health Organisation, 2013).

In 2007, the Government Office for Science released a foresight report called *Tackling Obesities: Future Choices* which outlined a stark warning on the rising costs, both in financial terms and impact to health, of the rising levels of obesity in the UK; it predicted that by 2050 most people in Britain would be obese (Butland et al., 2007). The authors argued that obesity was a natural consequence of the rise in technology and convenience and that modern

lifestyles, and not just personal responsibility, were leading to overweight becoming the norm and obesity increasing. The report called for behavioural change, a change to the environment we live in (for example tackling obesogenic environments), understanding how technology can be used to address the rising obesity rates, and *a paradigm shift* in policy (Butland et al., 2007).

In response, the UK Government (a Conservative and Liberal Democrat coalition) released a policy paper setting out their intentions for tackling obesity. *Healthy Lives, Healthy People: A Call to Action on Obesity in England* outlined a number of focus areas for the Government: Promoting the importance of personal responsibility, both the Government and businesses have a role to play in helping people to lose weight, a goal for reducing the calories consumed by the nation and the importance of tackling obesity in children and adults (Department of Health, 2011). As a result, a range of initiatives have been introduced, such as the *Responsibility Deal* (pledges for businesses to sign for various areas of health) (Department of Health, 2015), *Change4Life* (a healthy eating campaign for families) (NHS, 2017), and the reinvigoration of the *5-a-day* fruit and vegetable campaign, the *Eatwell Plate* and other local and national campaigns (Department of Health, n.d.).

Much of the UK public health guidance for promoting healthier lifestyles and preventing ill-health comes from the National Institute for Health and Care Excellence (NICE). NICE develops guidance for the National Health Service (including both hospital, general practitioner and social care), Department of Health, local authorities and businesses. Much of the guidance aimed at nutrition, weight management, and tackling obesity in England, was

developed following the *Healthy Lives, Healthy People* (Department of Health, 2011) report. Since 2015 a renewed focus on workplace health, and its importance in promoting good health has been developed (NICE, n.d.). Governments and organisations recognise the importance of wellbeing programmes that are pro-active rather than reactive (Department for Work and Pensions and the Department of Health, 2008). The Luxembourg Declaration on Workplace Health in the European Union (2007) argues that "a healthy, motivated and well-qualified workforce is fundamental to the future social and economic wellbeing of the European Union" (European Network for Health Promotion, 2007, p. 2). UK health legislation, policy, and guidance reflect European and international guidance, and there is a drive for organisations to look after employee wellbeing. "Ensuring fitness for work can lead to increased quality and quantity of production, decreased absenteeism and turnover, lowered medical costs, improved personal lifestyle and reduced incidence of industrial injury" (Rayson, 2000, p. 434). The renewed focus by NICE on workplace health in recent years may reflect a greater focus in organisations of reducing the costs of sickness absence, but also in their drive for improving public perception through corporate responsibility programmes (PriceWaterhouseCooper, 2007).

1.3 Importance of Research to Workplace Health

The WHO suggests that globally "60% of deaths may be attributed to chronic diseases, a situation that we know may be improved through physical activity, diet and smoking cessation. Globally 60% of the world's population is accessible directly or indirectly through the workplace and 60% of our waking hours are spent in the workplace" (Batt, 2009). It could be argued, therefore,

that the workplace is an ideal place for developing and promoting health and wellness (Batt, 2009).

The current research adds to the literature on eating behaviours in the workplace. Much of the research examining SES and obesity or eating behaviours has been carried out in community settings (McLaren, 2007; Sobal & Stunkard, 1989). Yet many adults spend a third of their lives at work, and the workplace can exert a significant influence on eating behaviours whether directly (for example through working long hours in a stressful role) or indirectly (through the selection of food offered for sale in the workplace canteen) (Schulte et al., 2007). While targeted healthy eating campaigns by the current UK Government – for example its 'One You' campaign – may have an influence on working adults, these are more likely to be effective for those who watch television and therefore may see adverts promoting the campaign, or visit doctors' surgeries where they may be able to pick up promotional leaflets (NHS, 2017). Very often, weight loss programmes or interventions run by local authorities are held during the working day, and are therefore not easily available to working adults. A range of weight loss programmes are available to adults, some offering evening classes where the individual can go for their weekly weigh in, but for employees who work long hours, work away from home, or have family commitments, these too may be inaccessible. Therefore, the provision of support through the workplace may facilitate the take up of healthy lifestyles by employees. Promoting a culture at work where healthy lifestyles are promoted and encouraged, and making healthy choices in the canteen or going for a lunchtime walk are the norm, can only serve to benefit

both employees and employers in the reduction of ill-health and associated productivity losses.

Working parents may access healthy eating information through their children and, in recent years, classes and assemblies on healthy eating may be given to children to educate them in making healthy choices. Home economics classes in schools and early education in healthy eating is seen as a key part of reducing current trends in childhood obesity (Mayor, 2013). Some local government authorities in the UK have invested in programmes to reduce rising childhood obesity. Programmes such as MEND (Mind, Exercise, Nutrition, Do It) are aimed at improving the health of children, but also the knowledge of parents in ensuring they provide good nutrition for their children (MEND Foundation, 2017). But, as discussed, for those parents who work long hours, shifts, or multiple jobs, it may simply not be possible to attend these courses even if they are put on outside normal working hours. Campaigns aimed at children in the UK, specifically the Change4Life campaign, have also targeted adult behaviours and the marketing of this information online or on mobile devices has made it widely accessible (NHS, 2017). This suggests therefore that whether an employee has dependants or not may also influence their knowledge and behaviours around healthy eating. Is it simply enough to encourage an employee to modify their behaviours at work, when actually their behaviours at home may negate the benefits of the workplace activity? An example of this is the parent who gets home from work tired and mindlessly grazes on the children's leftovers before preparing a meal for themselves, or perhaps 'pester power' encouraging a diversion home from school via a fast food restaurant as a treat for the family, leading to excessive calorie

consumption and a poor consumption of fresh fruits and vegetables.

Understanding the eating behaviours of working parents can be useful in the

design and implementation of eating behaviour change interventions at work.

A further reason for the importance of healthy eating research in the

workplace is its importance to overall population health. Workplaces are

ideally placed to deliver healthy eating awareness and interventions to working

adults to improve health, which should reduce the burden on the Government

to identify ways of engaging with this group. This has the potential to free up

time and resources to focus on the health of the young, elderly, and other

groups not in employment.

1.4 Theories of Behaviour Change

"The best way to discover effective interventions is research based on a

theory of behavior or behavior change" (Prochaska, Wright, & Velicer, 2008,

p. 562). Effective interventions should, therefore, have sound theoretical

foundations. It has been argued that if constructs can be identified that are

causally related to a behaviour they can be used to inform interventions that

target that behaviour. By changing a construct that causes a behaviour this will

lead to a change in that behaviour (Michie & Prestwich, 2010). However,

debate in the literature exists as to which theories are the most effective in

changing behaviour and what criterion to use to evaluate effectiveness

(Prochaska, Wright, & Velicer, 2008). Practical limitations also exist as to the

ease of applying behaviour change theory to a workplace setting (Lippke &

Ziegelmann, 2008). Webb, Sniehotta, and Michie (2010) suggest the theory is

more commonly used "to measure the process by which interventions

influence behaviour rather than to develop interventions" (p. 1885). Theory is

useful for the design of interventions that can change behaviour, but does not offer much guidance on how to go about it (Mitchie, Johnston, Francis, Hardeman, & Eccles, 2008). The following sections will outline some common theories of behaviour and a broader discussion, in relation to the current study, is presented in Chapter 8.

1.4.1 Continuum models

Continuum models of behaviour change are designed to identify predictors of behaviour change; the most commonly used is the Theory of Planned Behaviour (Lippke & Ziegelmann, 2008). Eating behaviours and weight status could arguably be influenced by human behaviours, as opposed to, or as well as, influences such as SES or socio-demographic factors. The Theory of Planned Behaviour (TPB) argues that human behaviour "can be predicted with high accuracy from attitudes towards that behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in behaviour" (Ajzen, 1991, p. 179). Three interacting factors will impact the degree of individual intention to carry out a behaviour: *behavioural beliefs* create an attitude toward the behaviour (favourable or unfavourable), *normative beliefs* give rise to subjective norm (social pressure) and *control beliefs* will impact perceived behavioural control (Ajzen, 2006). To predict whether an individual intends on doing something, such as eating healthily or losing weight, we need to know if they want to do it, if they feel pressured by society to do it, and if they feel they are in control of the behaviour (Francis et al., 2004). An assumption of the model is that if an individual has control of the behaviour they will carry it out, yet intention only accounts for about 20%

to 30% of variance in future behaviours, suggesting that many individuals intend to perform their desired behaviour but do not succeed (Budden & Sagarin, 2007). The model does not account for external influences, such as SES or demographic factors, which may too influence the likelihood of the individual carrying out a behaviour and maintaining it.

1.4.2 Stage Models

Stage models of behaviour change argue that behaviour occurs in different stages, rather than along a continuum (Lippke & Ziegelmann, 2008). The Transtheoretical Model of Behaviour Change (TTM) argues that people's intentions to change go through five stages (precontemplation, contemplation, preparation, action, and maintenance) and interventions should be designed based on the specific stage a person is at (Prochaska & Velicer, 1997). In *precontemplation* individuals are not considering changing their behaviours, in *contemplation* they have an intention to change, in preparation they are planning to make an immediate change (and may have already attempted a change), in *action* they are in the process or making that change and in *maintenance* they are maintaining the behaviour change (Prochaska & Velcier, 1997). The model gives advice on the behavioural processes that affect an individual employee at each stage of change, and the potential methods to encourage a behaviour at that stage, but does not advise on how to move from one stage to another. A further challenge in the workplace would be the number of interventions required given the likely dispersal of employees across the stages.

1.4.3 Consolidating models of behaviour change

Critique of continuum and stage based models of behaviour change has led to the development of new models that seek to address the perceived limitations (Michie, van Stralen & West, 2011). Michie et al. (2011) argue that existing models of behaviour change may not adequately meet the needs of intervention designers and therefore lead to their poor use. For example stage models and continuum models are focused on behaviours at stages of behaviour change, as well as behavioural intentions, norms and subjective beliefs, but the most commonly used models TPB and TTM may well overlap and therefore a combined approach in intervention may be more appropriate (Lippke and Ziegelmann, 2008).

A new model of behaviour change, the Behaviour Change Wheel has been developed (Michie et al., 2011). The authors argue that a 'behavioural system' exists whereby capability, opportunity and motivation will influence physical, social, reflective, automatic and psychological behaviour (the COM-B model). All three factors may influence one or all behaviours, and so too may only one or a combination of two of the three factors. At the next layer the authors argue there are nine evidence-based intervention functions that are aimed at changing the behaviour – restrictions, education, persuasion, incentivisation, coercion, training, enablement, modelling and environmental restructuring. These nine intervention functions can then be addressed through policy which includes: guidelines, environmental and social planning, communications and marketing, legislation, service provision, regulation or fiscal measures. These interventions could be at governmental or organisational policy levels. The authors argue that the framework is the most

comprehensive behaviour change model and most replicable for practitioners to use in multiple contextual settings (Michie et al., 2011).

The Behaviour Change Wheel has been also been applied to changing eating behaviours. First we must understand the behaviour – rather than focusing on the outcome of weight gain, which does not identify what behaviour one is trying to change, we should identify who (for example parents or the individual) and what (for example portion size) is driving the behaviour, and therefore which behaviour to change (Atkins & Michie, 2015). We can then identify the intervention options – for example an educational programme providing information on the benefits of healthy eating or changing the food on offer in a workplace canteen. Finally the implementation options can be selected – for example asking individuals to set a target goal for a behaviour (such as eating more fruit) and to keep a daily food diary monitoring that behaviour (Atkins & Michie, 2015).

1.4.3 Use of Theory in Interventions

Darnton argues that behaviour change models do not show how people can change behaviour (something arguably addressed in the Behaviour Change Wheel) but are simply a concept; models are simple whereas behaviour tends to be more complex and not every individual is the same - models group people into a classification (Government Social Research, 2008). It has been suggested that the three constructs in the Theory of Planned Behaviour, attitude, subjective norm and behavioural control, are not enough to explain behaviour; for example individuals may feel a moral obligation to perform certain behaviours or may be influenced by past behaviours (Ajzen, 1991). It is very difficult to compare theories of behaviour change or to identify which

technique may be critical to an intervention being effective because interventions may utilise different intensities, populations, methods of delivery and durations (Michie & Abraham, 2004). It could be argued that many interventions are "evidence-inspired rather than evidence-based" (Michie & Abraham, 2004, p.46) due to the limitations in study designs allowing for the results to be replicated time and time again. Likewise criticism of stage based models suggests that models such as the TTM, do not account for the true complexity of behaviours and individuals may move across the stages from other factors not associated with the behaviour (Adams & White, 2005).

The Behaviour Change Wheel (BCW) has been successfully applied to develop an intervention to reduce sitting time in the workplace through a behavioural intervention and could equally be used in the modification of eating behaviours (Munir et al., 2018). Thirty-one employees participated in the design of the intervention and the intervention itself, using activity monitors, over a twelve month period. The BCW was used in focus group discussions to understand capability, motivation and opportunity in the change of sitting behaviours and then enablement, education and training were identified as the intervention functions most relevant to changing the behaviour, and communication/marketing, guidelines, environmental/social planning and service provision were identified as the policy categories needed to inform the intervention (Munir et al., 2018). The BCW has also been applied in elite sport to change eating behaviours (Costello, McKenna, Sutton, Deighton & Jones, 2017). The eight steps of the BCW were used to design and implement a nutritional intervention for professional rugby league players to improve dietary intake and increase body mass. The intervention was

successful leading to increases in both calorie consumption and body mass over the 12 week intervention, and had additional improvements in diet quality and other fitness measures (Costello et al., 2017).

Behaviour change theories are important in the development of interventions, so the results can be tested and replicated, and it can be argued that they are essential for guided health promotion programmes (Lippke & Ziegelmann, 2008). The current research did not include measurement of a theory of behavioural change and focused directly on eating behaviours influenced by SES and sociodemographic factors. The application of theories of behaviour change in future research, in the context of the findings of the current study will be discussed in Chapter 8.

Chapter 2: Background Literature and Propositions

The previous chapter outlined the global and national imperatives to tackle the rising rates of overweight and obesity, and the importance of the workplace in this goal. The review presented in this chapter will examine the relationships between SES, demographic factors, and eating behaviours. Given eating behaviours have a direct influence on weight, and therefore on health, much of the background literature reviewed also considers weight status (most commonly measured in the literature by BMI). Five eating behaviours are discussed in this review: The consumption of a healthy, well-balanced diet, vegetable consumption, fruit consumption, the cost of food influencing purchasing behaviours, and the propensity to eat past the point of feeling full. Interventions aimed at addressing barriers to healthy eating at work are also discussed in this chapter.

The findings of the current literature review are presented as a discussion of existing research on eating behaviours and socioeconomic and demographic factors in both community and workplace settings, to identify limitations in the research to inform the research questions addressed in this thesis. The chapter is structured as follows. First, measures of socioeconomic status for use in survey research are described. Education, income and occupation and job grade are discussed in detail (as the most commonly used measures), in addition to other SES indicators. Second, the demographic and personal factors of age and weight (measured by BMI) are discussed in detail due to their significance identified in the literature on SES. Other demographic factors are discussed through the third section on eating behaviours. Five eating behaviours are discussed in detail beginning with

healthy diet. Given the nature of eating behaviours each construct may overlap and be interrelated, however the literature has been divided into three further constructs of *fruit and vegetable consumption* (combined in this review), *cost of food influencing purchasing behaviours* and *eating past the point of feeling full*.

2.1 Measures of Socioeconomic Status

In a review of 333 studies, McLaren (2007) found "an increasing proportion of positive associations and a decreasing proportion of negative associations as one moved from countries with high levels of socioeconomic development to countries with medium and low levels of development" (p. 29). This suggests that countries at different stages of economic development will experience the influence of SES on health in different ways. In the review it was found that the choice of SES indicator varied greatly from study to study, although most commonly used were education, income, and occupational class. In developed countries, as investigated in the current study, an inverse relationship between BMI and SES in women is often found, generally using education and occupation as the SES variables; whereas in low and medium development countries, the relationship was more strongly mediated by income and material possessions (McLaren, 2007). SES may be considered as "an umbrella concept – studies should include several socio-economic measures and consider their nature, stage over the life course and interrelationships, as well as explanatory pathways through which they may influence health-related outcomes, including food behaviour" (Lallukka et al., 2007, p. 702).

Education, occupational class (job grade), and salary (income) are the most often used measures of SES (Lahelma, Martikainen, Laaksonen, & Aittomäki, 2003; McLaren, 2007; Sobal & Stunkard, 1989), and form the definition of SES in this thesis. Education (generally measured by qualifications and formal study) is usually obtained by adulthood. Education determines health through knowledge and non-material resources that promote a healthy lifestyle. Education may also influence choice of occupation, and thus income, which will further influence health. Occupational class is related to social class and may reflect an individual's power and status, the hierarchical grade of job they possess, in addition to the income they receive. Income typically derives from paid employment (salary) and may reflect individual or household income, this determines purchasing power, and therefore the ability to obtain resources to maintain good health (Lahelma, Martikainen, Laaksonen, & Aittomäki, 2004). "Parts of the effects of each socioeconomic indicator on health are either explained by or mediated through other socioeconomic indicators" (Lahelma et al., 2004, p. 330). Some studies include just one indicator of SES and others include multiple. The following sections review each of the most common forms of SES and discuss their merits and limitations.

2.1.1 Education

"The paradox of the different relationships between SES and obesity in men in developed societies is a fascinating problem" (Sobal & Stunkard, 1989). In men in highly developed (HDI) countries the relationship between SES and obesity often does not reach significance, or is curvilinear (McLaren, 2007). It has been suggested that the choice of SES indicator is an important

mediator in that relationship, with education eliciting a negative relationship with weight, whereas income often shows a positive relationship. Men may value a larger body size, more so than women, as it may be seen as a sign of prowess and physical dominance suggesting traditionally men may be driven by the pursuit of high income and physical dominance. Therefore, BMI may not be significantly different between men in different SES (measured by income) groups (McLaren, 2007).

Multiple measures of SES (education, occupational class, and household income) were examined as determinants of health in 6,243 men and women from the Finnish Helsinki health study (Lahelma et al., 2004). It was found that health inequalities were greatest between SES groups for education, and that even after adjusting for the effects of occupational class and household income, inequalities in health were found to be larger in self-reported health than for reported long-standing illnesses. Differences were found between men and women in the study; with men, education, and occupational class partly explain differences in health whereas household socioeconomic indicators may be more powerful in determining health among women. Household income was found to equalise the inequalities in health between genders unlike individual income. The authors argue that "causally preceding education exerts its effects on health partly through causally succeeding occupational class and household income – the effect, for example, of income can be partly explained by education and occupational class" (Lahelma et al., 2004, p 331). Thus education, or income or occupation, should not be used alone to measure SES; they are all interdependent and independent measures. The study may be limited by its cross-sectional design, limiting

causality, and by the limited nature of the Finnish civil service as a generalisable population group. However, through the use of a multiple measures of socioeconomic status, the authors effectively demonstrate the inter-relationships between the different SES measures and health inequalities (Lahelma et al., 2004).

Education had the strongest influence on obesity in a study of 15,061 individuals from the Health Survey for England, more so than occupational type (Wardle, Waller, & Jarvis, 2002). There was a greater likelihood of being obese for women and men who left school at an early age than for those who had more years in education, this result was independent of ethnicity, marital status, and age (Wardle et al., 2002). This study had several strengths. Obesity, height, and weight, were measured clinically rather than by self-report, unlike most studies, and the study population came from a range of occupations offering a good cross-section of the population (Wardle et al., 2002).

In a study of education, as a measure of socioeconomic status, and its relationship on body weight changes, a higher BMI was associated with lower education level in half of the male population studied and in the majority of the female population studied (Molarius, Seidell, Sans, Tuomilehto, & Kuulasmaa, 2000). The study used data from the WHO MONICA project across 26 countries and 42,000 individuals. Educational level was measured by years of schooling, rather than by the more traditional method of educational obtainment, and this may make comparison between countries challenging because of the different educational systems in place in each country (Molarius et al., 2000). A strength of the study was that BMI was measured clinically rather than by self-report. The researchers found that when obesity was

common in a population, those with a higher level of education had a lower BMI than those with a lower educational level; whereas in populations with lower levels of obesity, a positive relationship was found with obesity and higher educational level (Molarius et al., 2000). The study was limited by the use of education on its own as a measure of SES, as income and occupation may also contribute to the prevalence of obesity; the level of urbanisation, prevalence of smoking, physical activity, alcohol consumption, and dietary choice may also confound the relationship between weight gain and SES (Molarius et al., 2000). The cross-sectional nature of the study and measurement of education as years of study, when years in education varies widely across the world, are further limitations. Despite these issues, the research offers insight into the complex relationship between education level and obesity across a range of countries.

Based on the review outlined above, it could be argued that education is the most important factor in measuring SES – arguably education determines one's job which determines one's income. However, as the next section suggests, educational level can only go so far as to understanding eating behaviours – income determines purchasing power and potentially the ability to purchase healthy foods.

2.1.2. Income

The relationship between obesity and income is complex; just as a low income may predispose an individual to developing obesity, obesity itself may limit earnings (Baum & Ford, 2004). In a US longitudinal study by Baum and Ford (2004), the authors tested whether lower wages were earned by obese workers "because (i) they are limited by health constraints, (ii) they are more

economically myopic, (iii) they are costlier for employers who provide health care, (iv) or they are discriminated by customers" (p. 885). The authors found a stronger wage differential in obese women than in obese men: Wages were 6.1% lower in obese women than in non-obese women and 3.4% lower for the equivalent in men. The results did not reach statistical significance for customer discrimination, provision of health care, or for economically myopic employees (those not far-sighted in their behaviours such as putting themselves forwards for training) or for health constraints, but they did exhibit a lower earnings profile for obese workers (Baum & Ford, 2004). Economic deprivation has also been observed to increase the risk of obesity (Wardle et al., 2002). A more detailed analysis of the research on income and food choices follows in Section 2.4 of this review, examining eating behaviours. Inextricably linked to income is occupation – generally the occupational grade an individual inhabits will determine the salary they receive, the next section gives a brief overview of the impact of occupation on eating behaviours and obesity.

2.1.3. Occupation and job grade

Wardle et al. (2002) examined the relationship between occupational type and obesity in the Health Survey for England and observed differences between genders; for women an increased risk of obesity was observed in lower occupational status, whereas for men a non-linear relationship was observed. A lower risk of obesity was observed at the highest occupational status, but this result became non-significant when age was controlled for (Wardle et al., 2002). It has been suggested that men in lower SES groups are often in manual occupations that have higher physical demands (this is

supported by the authors' finding of the relationship between physical activity and occupation) and therefore their physical activity may mediate the relationship between occupation and obesity in a different way than for women (Wardle et al., 2002).

McLaren's review of SES and obesity suggested that individuals high up the occupational status hierarchy "may internalise the symbolic value of a thin body and a healthy lifestyle (in line with their class) and at the same time face exposure to a workplace environment that likewise promotes these values" (McLaren, 2007, p. 35). For example the offices of a global finance company in a big city with on-site gym facilities and healthy canteen may normalise exercise during the working day and promote a healthy lifestyle, whereas a small manufacturing company with mostly blue-collar workers on a busy trading estate served by a burger van or cafe may not promote opportunities for physical activity or healthy eating.

Health behaviours, including diet, have been shown to predict mortality in both the French GAZEL (n = 17,760) and UK Whitehall II (n = 9,771) studies, but each cohort exhibited different effects to measures of SES (Stringhini et al., 2011). Inequalities across socioeconomic groups in dietary intake (in addition to smoking and physical activity) were greater in the Whitehall II cohort than for the GAZEL cohort. This supports the findings of McLaren (2007) that differences exist across countries in SES and health behaviours. The authors suggest that the differences between the two countries may be down to different stages of change in the social gradient of health. There has been a shift from high levels of smoking, drinking, and consumption of rich foods in more affluent groups to these now being more prevalent in

lower SES groups, thus shifting the associated diseases from a high prevalence in the more affluent to the high level of disease now seen in less affluent groups; this may not have happened at the same rate between the two countries (Stringhini et al., 2011). SES may influence health through psychosocial factors, such as job control or social support, work stress and work environment, maternal deprivation or financial insecurity, or differential access to health care (Stringhini et al., 2011). A limitation of this study is the lack of measurement of these potential mediators of the SES and health behaviour relationship. A further limitation is the cohort studied; the income level of participants in the Whitehall II study was higher than in the general UK population and, in both studies, although university degree obtainment was consistent with that of the general population, people with only primary education were underrepresented; therefore suggesting that socioeconomic differences in mortality and, morbidity may be underrepresented (Stringhini et al., 2011).

Measures of SES, such as education, income, and occupational type, are distinct measures that cannot be used interchangeably; they are linked yet individual constructs (Braveman et al., 2005). Another study using the Whitehall II data analysing the role of obesity and metabolic syndrome in the relationship between SES and reduced kidney function found that those in lower employment grades tend to get kidney disease earlier than those in higher employment grades (Al-Qaoud, Nitsch, Wells, Witte, & Brunner, 2011). The study found higher levels of obesity at lower occupational grades and the obesity accounted for one sixth of the relationship between SES and kidney disease. However, SES was measured by occupational grade, which

incorporated income and job type, and this may not reflect the income of the household or non-wage related income that may also have an impact on SES (Al-Qaoud et al., 2011). It could be argued that women are traditionally not the highest household earners, and therefore household income may have more of an impact on their health than personal income.

Education, income, and occupation are not the only measures of SES, and, as detailed in the previous sections, all have their strengths and limitations. Other measures of SES may be beneficial, these are outlined in the next section.

2.1.4. Other SES indicators

SES in children is likely to be influenced by that of their parents, and obesity in parents often predicts obesity in their children (Sobal & Stunkard, 1989). As well as the influence of household income and education on the development of obesity, parental eating habits, values, and beliefs are often inherited by their children. Likewise, genetic influences may predispose children to gain weight (Sobal & Stunkard, 1989). In a study of multiple socioeconomic factors, it was found that childhood socioeconomic circumstances did not have an association with current healthy food habits (Lallukka et al., 2007). Childhood SES was measured by childhood economic difficulties and the highest level of parental education from either parent. It could be argued that this may not be an accurate measure because of the recall bias or the impact of current circumstances on perceptions of the past (Lallukka et al., 2007). This measure may not have been significant because of the narrow occupational field of the population measured (8,960 employed

civil servants from the Helsinki Health Study), which may limit

generalisability across a wider population (Lallukka et al., 2007).

Socioeconomic conditions in childhood, after adjustments for current

indicators of socioeconomic position, remained associated with obesity in

participants of the Helsinki Health Study of Finnish civil servants (Laaksonen

et al., 2004). The study consisted of 1,252 men and 4,975 women; participants

were asked to fill in a questionnaire examining the association between eight

measures of SES and self-reported BMI data. It was found that the prevalence

of obesity was higher, for both men and women, with lower parental

education. Household income did not impact on obesity, but it was found that

individuals who rent were more likely to be obese than home owner occupiers.

Those individuals experiencing economic difficulties showed a higher

prevalence of obesity, but economic satisfaction did not have a significant

impact. The indicators of adult SES somewhat attenuated the association

between obesity and parental education, but negligible effects were made by

other adjustments, suggesting that "better circumstances achieved later in life

do not fully compensate the effects of childhood environment on adult obesity"

(Laaksonen et al., 2004, p. 1854). Limitations of this study are the cross-

sectional design and use of self-reported BMI data. Another limitation may be

the reporting of past economic circumstances whereby current circumstances

may bias feelings of the past (Laaksonen et al., 2004).

Social class had differing impacts on adult obesity at different stages of

the life course and for different genders in a study of 5,362 individuals in a

community-based study of obesity and SES (Langenberg, Hardy, Kuh,

Brunner, & Wadsworth, 2003). For both men and women who had moved up

the social classes, a lower level of both central and total obesity was found compared to those who remained in the same social class over time. It was also found that for women, low social class influenced the prevalence of obesity through adult life and for men childhood social class had more of an impact of obesity over time (Langenberg et al., 2003). These results suggest that the impact of early life disadvantages on obesity can be reversed by upward social mobility through the life course. A limitation of the Langenberg et al. (2003) study is the measure of social class; social class may be an amalgamation of many health influencers that may cause occupational disease, rather than just simply being an occupational type. A woman's social class in this study was measured by her partner's occupation rather than her own, which again may limit the generalisability of the findings of this study (Langenberg et al., 2003).

Independent of other measures of socioeconomic position, neighbourhood deprivation has also been observed to be associated with obesity (Stafford, Brunner, Head, & Ross, 2010). These neighbourhoods are often associated with less healthy food outlets, more fast-food restaurants per head than other neighbourhoods, and fewer opportunities for physical activity. Behavioural norms may be different in these neighbourhoods than in more affluent areas amplifying the differences in obesity between SES groups (Stafford et al., 2010).

Using data from 8,151 individuals in the Whitehall II study on English civil servants, a socioeconomic gradient was found in women for BMI, and women in more deprived neighbourhoods – who remained there for the length of the 10-year study follow up – gained more weight than those in more affluent neighbourhoods (Stafford et al., 2010). A 3.25kg weight gain was

observed in the more affluent neighbourhoods compared to a 4.25kg in the least over the 10-year study follow up. However, this effect was not observed in men, suggesting that the neighbourhood environment may have more of an impact on the health of women than of men (Stafford et al., 2010). The study did not take into account diet in its analysis which has been shown to influence obesity (Berning & Hogan, 2014; Darmon & Drewnowski, 2007; McLaren, 2007). The study may have limited generalisability as the majority of study participants resided in London and the south-east of England with areas of high population density, the findings may be less relevant in other areas of the UK or across other countries. The data is also derived from a limited occupational group of civil servants and the majority of the females in the study were of middle age, again limiting the generalisability across the population. Strengths of the study include the longitudinal design and participant numbers (Stafford et al., 2010).

A review of 34 studies of SES and weight change in adults observed most studies found an inverse association between occupational status and weight change in both men and women. However, there was little support for this relationship within the relatively few studies of black adults (Ball & Crawford, 2005). The review suggests that the findings of many cross-sectional studies of a higher BMI in lower socioeconomic groups (McLaren, 2007; Sobal & Stunkard, 1989) are reflected over time; body weight, as influenced by SES, increases over time (Ball & Crawford, 2005). However, different measures of SES were associated with different levels of weight gain in the review. Education and occupational type were associated with weight gain over time, however inconsistent results were found with income and

weight gain. It is suggested that "occupation may have most impact on current day-to-day life/activities that might impact weight gain and obesity, as opposed to education (which may have been attained long ago, and is usually stable through life), or income (given that numerous weight management activities such as walking for exercise are free or inexpensive)" (Ball & Crawford, 2005, p. 2007).

2.2 Demographic and Personal Factors

The relationship between obesity and SES is complex, as the mechanisms that lead to or predispose an individual to obesity are multifaceted. In the employed population, research suggests that the workplace may contribute to overweight and obesity in individuals through physical forces or psychosocial risks present at work (Schulte et al., 2007). The studies outlined in the previous section suggest that individuals may be more likely to gain weight when they are at the lower end of the earning scale, are less educated, and of a lower occupational class (McLaren, 2007; Sobal & Stunkard, 1989). Therefore, studies that do not take into account psychosocial risks in the workplace – or other confounding factors such as age, ethnicity, physical activity, smoking, or alcohol consumption in addition to the complexities of SES and obesity – may not get a full picture of the impact of SES on obesity (McLaren, 2007). This section will cover age and weight (measured by BMI) in more detail. The demographics of gender and number of dependants will be covered through the detailed literature review on eating behaviours in Section 2.3.

2.2.1 Age

Significant behavioural differences were found between age groups in a qualitative study of food choice in working aged individuals (Chambers et al., 2008). The authors argued that "the food choices people make may be determined by their circumstances and life stage" (Chambers et al., 2008, p. 364). Six focus groups, with a total of 43 participants, were conducted to investigate differences in eating behaviours and body dissatisfaction among different ages and genders. Participants filled out a questionnaire and results were analysed on frequency of response by age and gender group; the results from the focus groups were analysed by thematic content analysis. Participants were grouped into three age categories: 18-30 ($n = 3$), 31-59 ($n =14$) and 60 and over ($n =16$). All participants stated they consumed both fruit and vegetables on a weekly basis, with the older groups consuming a greater proportion than the younger groups. Participants aged over 30 were more likely to purchase fresh fruits and vegetables, whereas those under 30 were more likely to purchase more frozen or tinned varieties. Male and female participants in the 18-30 age group and males in the 31-59 age group stated they had less healthy diets and consumed unhealthy foods often. Cost was seen as a barrier to healthy eating by the 18-30 age group, but not in the older age categories, however the majority of participants stated that cost of food influenced their purchasing behaviour (Chambers et al., 2008). Time to prepare food was also seen as a barrier to eating healthily, with the over 60 age category stating they found it easier to prepare healthier meals than the younger participants. Health was also a significant influence over food choice in older participants, especially for those who had experienced illnesses and

wanted to prevent future illness; however, all participants were aware of the links between healthy eating and health, but this did not influence the younger participants to consume a healthy diet. The results of this study suggest that interventions which take a general approach to healthy eating may not be successful because of the age and gender differences in food choice and more stratified campaigns may elicit more effective results. The study was limited by its small sample size and the narrow geographical location of participants (Reading in south-east England). The study may also be limited by self-selection bias, as most participants reported relatively healthy diets and participants may have chosen to take part in the study as it was an area of interest for them (Chambers, Lobb, Butler, & Traill, 2008). Despite these limitations, the study offers a mix of quantitative and qualitative data that demonstrate demographic differences in food choice.

Age differences were examined in a study of 8,960 civil servants participating in the Finnish Helsinki Health Study which investigated the relationship between multiple measures of SES and health behaviours (Lallukka et al., 2007). A limited age range of participants between 40-60 years old were included and analysed in 5-year age bands. Women in the 50-60 age group were more likely to report healthy food habits than women in the 40-60 age group, however these differences may be accounted for by the higher education, occupational class, and income reported by the higher age category. Men showed a tendency for healthier eating in the over 60 age category, however the results were not significant. This study is limited in its cross-sectional design, however its investigation of age-related differences in eating behaviours demonstrates that demographic factors should be taken into

account when examining socioeconomic differences in eating behaviours (Lallukka et al., 2007). The study was limited in its narrow age range of 40-60-year-olds and therefore in its application to workplace health promotion.

In many studies examining eating behaviours (fruit and vegetable consumption, dietary cost influencing purchasing behaviours, and the consumption of a healthy diet) and SES, age is used as a control measure rather than a dependent variable (Lahelma et al., 2009; Aggarwal, Monsivais, Cook, & Drewnowski, 2011; Morris, Hulme, Clarke, Edwards, & Cade, 2014).

2.2.2 Body Mass Index (BMI)

A systematic review of eating behaviours and excess body weight found there was mixed evidence for the prevalence of different eating behaviours in individuals with excess body weight (Mesas, Muñoz-Pareja, López-García, & Rodríguez-Artalejo, 2011). Ten eating behaviours were considered in the review of 153 studies: Skipping breakfast, lunch, or dinner, snacking, daily meal frequency, consumption of fast food, eating while away from home, portion size, eating takeaway food, eating quickly, eating until full, and eating irregular meals. Of the 153 studies included in the review, only one behaviour was examined in 103 of the studies, two behaviours in 37 of the studies, three behaviours in eight of the studies, and four behaviours in five of the studies. This demonstrates a strength of the current study of including five eating behaviours: *Eating past the point of feeling full, cost influencing purchasing behaviours, fruit consumption, vegetable consumption,* and the *consumption of a healthy, well-balanced diet.* The systematic review suggests behaviours often overlap and definitions were not clear, making evidence for the links between eating behaviour and excess body weight inconsistent

37

(Mesas et al., 2011). None of the studies included in the review examined BMI as a determinant, rather than an outcome, of eating behaviours, and the authors suggest a need for further research in this area, including adjusted analysis for SES (Mesas et al., 2011).

The impact of BMI and age on Three Factor Eating Questionnaire scores was examined in a community-based study of 60 males; participants with a higher BMI exhibited higher levels of disinhibition than healthy weight participants (Harden, Corfe, Richardson, Dettmar, & Paxman, 2009). There were no significant differences in age-related disinhibition scores, however susceptibility to hunger was more prevalent in the younger rather than older group (Harden et al., 2009). The study was limited by its small sample size and narrow BMI and age groupings; however, the study did indicate that eating past the point of feeling full was a complex measure which benefits from understanding disinhibition, restraint, and hunger.

In a longitudinal analysis of 869 food diaries from the Whitehall II study of English civil servants, a relationship between SES and the reporting of food consumption was found (Stallone et al., 1997). A random sample of 459 men and 406 women was included (aged 39 to 61 years). This finding is of significance for other studies in the field of SES and obesity/diet, suggesting that those in lower SES groups are prone to underreporting dietary intake. This was assessed using self-reported 7-day diet diaries and the calculation of basal metabolic rate (BMR). Weight, height, and blood samples were collected through a health screening clinic to ensure the accurate calculation of the BMR and therefore the expected calorie consumption of an individual. SES was identified as an employment grade, of which six grades were included based on

their salary band. The finding that both males and females had a higher propensity to under-report nutrient intake at lower employment grades was also mirrored by a gradient in obesity, with lower grades having higher average weights than those in higher grades. The implication of under-reporting of food quantity, especially for those of higher weights and lower SES groups, means that nutrient quantity will also be under-reported and micro-nutrients are often associated with health outcomes. If lower SES groups underreport nutrient intake, it may have an implication on the accuracy of nutrient influence on health at different SES groups (Stallone et al., 1997). It may also impact the validity of health programmes designed to improve behaviours, as true eating behaviours may not be known and therefore effectively addressed through behaviour change. However, as with other studies using the Whitehall II data, the research is focused on civil servants in the south-east of England and may not be representative of the population as a whole (Stallone et al., 1997).

Underweight women were found to have poorer psychological health than *normal-weight* women, and normal-weight women better health-related behaviours than those of *overweight* and *obese* women in a Swedish community-based study of 13,715 females between 18 and 34 years old (Ali & Lindström, 2005). The data formed part of the Scania 2000 public health survey which was a cross-sectional study investigating socioeconomic, behavioural, psychosocial, and psychological determinants of BMI in young women. Participants were asked to fill in a questionnaire answering a range of questions including self-reported height and weight. They were then grouped into four categories: Underweight, normal-weight, overweight, and obese. As well as reporting poorer psychological health, underweight women were also

more likely to work overtime, be students, have poor health and receive less emotional support than the normal-weight group. Obese and overweight groups were more likely to be unemployed, have low education, and have a low locus of control leading to unhealthy behaviours such as smoking and lack of physical activity than the normal weight group (Ali & Lindström, 2005). While the study was limited in its cross-sectional design and self-reported measures, it does present an interesting theory. The theory that women in different BMI groups have differing socioeconomic and psychosocial characteristics and loci of control for health behaviours; suggesting that interventions to change behaviours may be more effective if they target these differences.

Differences in BMI and weight gain were examined for differing occupational classes in 8,635 (1,737 men and 6,948 women) Finnish civil servants and 4,080 (2,859 men and 1,221 women) Japanese civil servants; a significant gradient was found among the Finnish workers, but not in the Japanese sample (Silventoinen et al., 2013). BMI and weight gain measured at follow up were higher in Finland than in Japan. The authors suggested that there was a more obesogenic environment in Finland than Japan that may account for this difference (Silventoinen et al., 2013). However, given the gender imbalances between the two samples the predominance of females in the Finnish cohort could account for the gradient, rather than occupational class differences. Likewise, the gender differences in grades differed between both samples with a higher percentage of females holding more senior positions in the Japanese cohort than the Finnish. These gender-related differences would benefit from more exploration in the analysis to control for

their effects. Changes in BMI between occupational classes over time, through longitudinal analysis, failed to reach significance. A further limitation of the study was the limited collection of occupational class data; there were only four categories for men and less for women which may limit the analysis of differences between the gradients. Another limitation was the exclusion of income and education as additional measures of SES, although the authors suggest that in Finland and Japan these are related to the social hierarchy of civil servants and therefore occupational class will encompass all three elements (Silventoinen et al., 2013). These findings reflect those of Lahelma et al. (2009) who also observed social class differences in health behaviours in Finnish and British employees but not in Japanese employees. This suggests that there are other, perhaps cultural or dietary factors, which may also influence BMI, leading to between-country differences in findings in addition to the demographic and socioeconomic factors.

Although BMI is the most convenient measure for obesity, it does not take variations in body structure across ethnic groups into account (Ng et al., 2014). Ethnicity may also be a confounder in the relationship between SES and obesity. In the study by Wardle, Waller, and Jarvis (2002) there was a high incidence of the risk of obesity among black women, although not in black men, independent of all the SES indicators. It has also been noted that black and Asian populations in England consume more vegetables and fruit than the general population; vegetable consumption is highest in Chinese and Asian populations and fruit consumption is highest in black and mixed groups (Boukouvalas, Shankar, & Triall, 2009). Ethnicity is not explored in detail in the current thesis because of the limited diversity of the study population

examined, however further research would benefit from understanding the impact of ethnicity in order to better direct interventions to improve eating behaviours in the workplace but also in a community setting.

This section demonstrates the importance of age and weight status on eating behaviours and makes an argument for their analysis as independent variables, rather than as a control measures in the analysis of socioeconomic differences in eating behaviours.

2.3 Eating Behaviours

While many differing eating behaviours, or traits, may contribute to overweight and obesity, the focus of this literature review is on five specific self-reported behaviours; *eating past the point of feeling full, the consumption of a healthy, well-balanced diet, the cost of food influencing purchasing behaviour, fruit consumption,* and *vegetable consumption*. An individual who believes they eat a healthy diet may be unlikely to engage in workplace activities designed to improve their healthy eating behaviours, even if their belief is different from the reality of what they eat. This is true also of fruit and vegetable consumption (often used in studies as a measure of healthy eating) as many medical and biological studies (not covered in depth in this thesis) demonstrate the health benefits of eating fruit and vegetables and adhering to Government guidelines. The previous sections of this literature review examining SES demonstrate that an individual's personal or household wealth may have a significant effect on their ability (or perception of their ability) to purchase healthy foods. The extent to which cost influences purchasing behaviours is important for workplaces to understand as small modifications to menus or subsidisation of healthy options may be effective in nudging the

behaviours of more cost-conscious employees. Finally, and very much linked to overweight and obesity, is the propensity to eat past the point of feeling full. While an individual may consume a healthy diet, regularly eating past the point of feeling full may contribute to weight gain. As with many eating behaviours, this may be a complex mix of biology and psychology. For the workplace to be an effective place for behaviour change, an understanding of the psychology of eating behaviours may enable modifications to workplace canteens or to healthy eating interventions. The following section will explore each of the five eating behaviours (with the fruit and vegetable section combined) in more detail.

2.3.1 Healthy diet

The WHO suggests that the "exact make-up of a diversified, balanced and healthy diet will vary depending on individual needs (e.g. age, gender, lifestyle, degree of physical activity), cultural context, locally available foods and dietary customs" (World Health Organisation, 2015, p. 1). A healthy diet is one that contains fruits, vegetables, legumes, whole grains, and nuts, with at least 400g (five portions) of fruits and vegetables each day. A healthy diet should contain less than 10% of total energy intake from free sugars (i.e. processed sugars not occurring naturally in foods) and less than 30% of total energy intake from fats – with a preference for those coming from unsaturated fats (nuts, fish, avocado, olive oils, etc.) rather than saturated fats (fatty meat, cream, cheese, lard) and not from industrial trans-fats (found in processed foods and snacks). Less than 5g of salt should be eaten per day (World Health Organisation, 2015). The following section presents a review of diet and healthy eating and the socioeconomic differences in consumption patterns. The

previous section outlined age and weight differences in eating behaviours, and will therefore not be repeated in this section in great depth. Some of the gender-related differences discussed in Section 2.1 are also supported by the research in this section.

Much evidence exists from across countries (including European nations, Australia, and the United States) that there is a socioeconomic gradient in diet "whereby persons in higher socioeconomic groups tend to have a healthier diet, characterised by greater consumption of fruit, vegetables, and lower-fat milk and less consumption of fats" (McLaren, 2007, p. 35). It has been suggested that this not only reflects the individual's ability to purchase healthier foods, but also of the availability of these foods where the individual lives (Berning & Hogan, 2014; McLaren, 2007). With greater affluence may come access to higher-quality diets, but for people of lower financial means there is a tendency towards energy-dense and nutrient poor foods (Darmon & Drewnowski, 2007). Fresh fruits and vegetables, lean meats, whole grains, and fish offer a diet that is high in minerals and vitamins, lower in energy density, and often found to lead to better health; whereas diets that have added sugars and fats and are high in refined grains, have a tendency to be low in nutrients but still energy-dense; these diets often lead to higher energy intakes but with poorer micronutrient content (Darmon & Drewnowski, 2007). People in lower socioeconomic groups may have less knowledge of the benefits of a healthy diet and physical activity, different behavioural attributes or social norms that lead to obesity, or less access to healthy food options (Ball & Crawford, 2005).

Obesogenic environments can lead to the consumption of an unhealthy diet and to obesity. Neighbourhoods with low-incomes tend to attract a greater

amount of small convenience shops and fast-food outlets as opposed to large

supermarkets and fresh food outlets; neighbourhoods with higher incomes tend

to have fresher produce, local restaurants, and more opportunities for physical

activity (Drewnowski, 2009). Energy-dense foods are low cost and highly

palatable, containing mostly fats and sugars, and they are quick and easy to

access; because of their low cost they are more likely to be consumed by low

income households and because of their high energy density are likely to lead

to obesity (Drewnowski, 2009). Energy-dense diets often cost less and lead to

an increase in total energy intake; "this means that paradoxically, it is possible

to spend less and eat more, provided that the extra energy comes in the form of

added sugar and fat" (Drewnowski, 2009, p. S37). Dietary guidelines, in

countries such as the US and the UK, encourage a diet rich in fruits,

vegetables, fish, lean meats, poultry, and whole grains, with a limited intake of

fats and sweets. The cost of this recommended dietary intake may make it

unobtainable for families on a low income. "Whereas increasing food

expenditures does not guarantee a healthy diet, reducing food spending below

a certain limit virtually guarantees that the resulting diet will be nutrient poor

and energy dense" (Drewnowski, 2009, p. S38).

In a study of 1,474 French adults (classified as over 15 years of age), a

nationally representative stratified sample of sociodemographic participants

were asked to complete a 7-day diet diary, indicating dietary content and

volume (Andrieu, Darmon, & Drewnowski, 2006). The study included 672

men and 802 women and included both self-reported measures of diet and

photographic evidence of portions. Dietary cost was calculated by using mean

national retail prices for foods and the content of the 7-day self-report food

diaries. The study found that the lower-cost diets, freely chosen by participants in the study, were energy-dense and low in nutrients; conversely the higher cost diets were lower in energy and higher in nutrients. "The minimum budget for a nutritionally adequate diet seems to surpass the current food budget of the poorest households" (Andrieu, Darmon, & Drewnowski, 2006, p. 436). This suggests that for some households it is not possible to achieve a healthy diet on their budget. This was a community-based study and did not detail the household income of each participant. This information would be beneficial to understand the socioeconomic differences in costs and healthy diet consumption. In the current thesis, focused on employees, one may assume that a basic level of income is available to purchase healthy foods, however further investigation may warrant understanding the costs of foods (and nutrient values) and therefore insight into the feasibility of consuming a healthy diet.

A community-based random sample of 2,929 men and 2,767 women in Geneva, Switzerland, took part in a survey measuring occupation and education, and cardiovascular risk factors (Galobardes, Morabia, & Bernstein, 2001). It was found that participants with lower occupational status and lower education consumed a relatively poor diet of less fish and vegetables and more fried foods, sugar, and pasta, that those in higher occupational status groups. Nutrient intake, such as intake of calcium, iron, vitamin A and vitamin D, was lower in lower education and occupation groups. The effect of education was measured adjusting for occupation and vice versa; both demonstrated similar results, suggesting both measures are reliable indicators of SES (Galobardes et al., 2001). However, income was not directly measured in this study and the

46

cross-sectional design of the study limits causality of the direction in relationship between diet and SES. This is true of other studies (as detailed in this literature review) and the findings are consistent, demonstrating a lower quality diet with lower SES.

Lower socioeconomic groups were more likely to buy foods low in fibre and high in fat, sugar, and salt in a study of 1,003 participants in Brisbane, Australia, focusing on education, occupation and household income, and dietary intake (Turrell, Hewitt, Patterson, & Oldenbeurg, 2002). Education was measured by highest qualification since leaving school, occupation was stratified into occupational groups based on skill levels in the Australian Standard Classification of Occupations, and household income was based on the total annual income. The authors argue that measures of SES should not be used interchangeably and by using them separately this may not take into account the covariance between measures (Turrell et al., 2002). It was found through correlation analysis that weak to moderate relationships existed between the three SES indicators. This suggests that each SES indicator may influence both purchasing power and choice of foods separately as well as concurrently (Turrell et al., 2002). The main findings for dietary intake were that those employed in blue-collar jobs, those who were least educated, and households with the lower total incomes, consumed fewer vegetables and fruit less often than more advantaged groups. A limitation of this study was the small sample size and limited geographical area, which may limit generalisability (Turrell et al., 2002). The study however does reflect other research in this section on both general dietary intake and the consumption of

fruits and vegetables and SES. It also supports the rationale of the current

thesis to use three measures of SES in education, job grade, and salary band.

Three methods for the measurement of diet type were used in a Belgian

study of SES and diet, the Mediterranean Diet Score, Healthy Eating index,

and principal component analysis, to analyse the composition of diets at

different education and income levels (Mullie, Clarys, Hulens, & Vansant,

2010). The study of 1,852 military men found that all three measures of dietary

analysis demonstrated better diet quality being consumed at higher income and

education levels, adjusted for both age and physical activity levels. Less

healthy behaviours such as smoking, low physical activity, high consumption

of fats and sugars, and low consumption of vegetables and fruits, were

associated with the least healthy quintiles of dietary pattern. The study was

limited by its cross-sectional design and the use of only men in a narrow

occupational field, and therefore there may be limited generalisation of results

(Mullie et al., 2010). A strength of the study is the comprehensive measures of

diet content enabling a detailed analysis of food choices. This study suggests

that using only one measure of dietary intake may be effective in identifying

SES patterns because of the comparability of the three different measures used.

Lower income groups were found to consume less vegetables, fruit,

milk, and cereal servings, but higher levels of cholesterol than employees in

higher income groups in a community-based New Zealand study of 4,007

employed adults (1,952 men and 2,092 female) investigating dietary intake

across SES (Metcalf, Scragg, & Jackson, 2014). SES was measured by area-

based deprivation, education level, household income, and occupational level

(based on the New Zealand SES Index). All data was collected through

interviews carried out face-to-face in clinics, along with the completion of a questionnaire. Basal metabolic rate was calculated from the data collected at the clinics and a food frequency questionnaire assessed dietary intake from the previous three months. A healthier diet was found in those individuals of higher SES groups, with income demonstrating the strongest relationship of those SES measures used. A limitation of the study was the self-reported nature of not only dietary intake, but also of occupational type and income; people may under or over record dietary intake and may not be willing to divulge their true income level. The study generalisability may be limited because of its cross-sectional design and there was limited research in this area in New Zealand, so further study of longitudinal data is needed in this country to replicate the findings (Metcalf et al., 2014). The study was strengthened by the large sample size, and broad SES measures used, and concurs with other studies in this section that a SES gradient in nutrient intake exists (Darmon & Drewnowski, 2007; Metcalf et al., 2014; Mullie, Clarys, Hulens, & Vansant, 2010).

Fresh fruit and vegetables, lean meats, and fish have a higher per calorie cost than sugars and fats. "Poverty may lead to the selection of low-calorie diets that are both energy rich and shelf stable – the emphasis on maximum calories and least waste and spoilage is another characteristic of poverty" (Darmon & Drewnowski, 2007, p. 1111). An association has also been found with lower consumption of fruits, vegetables, and fish and living in lower-income neighbourhoods; "the quality of food choices was directly influenced by the ease of access to a supermarket as well as to the availability and variety of healthy food in neighbourhood stores" (Darmon & Drewnowski,

2007, p. 1111). Lower-income neighbourhoods may also allow for fewer physical activity opportunities, also leading to a higher prevalence of obesity. Darmon and Drewnowski argue that nutritional interventions must not lose touch with reality and take food costs into account when promoting healthy eating (2007). Although a linear relationship between SES and diet cost and quality has been found, it would be difficult to identify if improved health outcomes were from an improved diet or influenced by diet costs, wealth, or poverty (Darmon & Drewnowski, 2007). It is important that health promotion agencies encourage the consumption of foods that are not only high in nutrients and lower in energy density, but also lower in cost, to help reduce the prevalence of obesity in lower SES groups. This may be a challenge when "consumers are unwilling to depart from the usual eating habits or resist familiar foods that may be perceived as unpalatable or unfamiliar" (Andrieu, Darmon, & Drewnowski, 2006, p. 436).

The current section has presented a review of a range of literature examining socioeconomic inequalities in eating behaviours. While the measures of SES may vary (as detailed in Section 2.2 of this thesis) a consistency is evident in inequalities. Diet has been measured through self-reported food frequency questionnaires and single-item measures, through photographic evidence of food portion sizes and through nutrient profiling; in addition to comparisons with basal metabolic rate and BMI. Despite the inconsistencies of measurement, the literature establishes that individuals of lower SES have poorer diets than those of higher socioeconomic status. The following section will review one important element of diet – fruit and vegetable consumption – in more depth.

2.3.2 Fruit and vegetable consumption

Greater fruit and vegetable consumption is associated with a reduced risk of certain types of cancer, type 2 diabetes, stroke, and cardiovascular disease as well as improved ability to manage weight (Backman, Gonzaga, Sugerman, Francis, & Cook, 2011). Studies indicate that consumption of fruit and vegetables vary across SES (Backman et al., 2011; Nagler, Viswanath, Ebbeling, Stoddard, & Sorensen, 2013). Fruit consumption and vegetable consumption are often assessed as one joint construct as a measure of healthy eating. The following section presents a range of community and workplace studies demonstrating the importance of fruit and vegetable consumption as measures of healthy eating behaviours and the SES gradients in their consumption.

In 2004, the WHO published a 'Global Strategy on Diet, Physical Activity and Health' to respond to the rising burden of chronic diseases seen globally. This was developed by member states at the World Health Assembly in 2002 (WHO, 2004). The strategy was put together with the support and input of member states and recognised the importance of fruit and vegetable intake in the prevention of chronic disease. Globally, circa 2.7 million deaths each year can be attributed to low fruit and vegetable intake and member states asked WHO for support in the promotion of their '5-a-day' (or equivalent) fruit and vegetable consumption campaigns (WHO, 2003). The '5-a-day' message dates back to 1980 when the WHO recommended a daily intake of 400g of fruit and vegetables a day, minimum, to protect against cardiovascular disease (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2016). However, despite this legacy of evidence and promotion, there is little supporting evidence to support

the success of government campaigns to increase consumption (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2013). Research in Europe suggests that fruit and vegetable consumption is equal to 220g per person per day and in the United States only 6-8% of people achieve the recommendation of 400g (Rekhy & McConchie, 2014).

A positive relationship was found between fruit and vegetable consumption (FVC) and income and the belief of the importance of eating healthily in an American cross-sectional study of FVC in motor freight workers and construction labourers (Nagler et al., 2013). The study of 1,013 male workers assessed fruit and vegetable consumption using a seven-item measure assessing frequency of fruit and vegetable intake over the last four weeks. Additional measures included questions around the consumption of junk food (time constraints, stress, lack of choice, and propensity to eat well for health), the number of dependants living at home, financial ability (measured as comfortable, enough, have to cut back, and cannot makes ends meet), job strain (using Karasek's Job Content Questionnaire) and job shift (day or night shift). In construction labourers, lower FVC were found for individuals who reported consuming more junk food because of fatigue and stress in the workplace; and in motor freight workers, those who perceived fast food as the only choice of food on the road and lack of time also had a lower FVC (Nagler et al., 2013). A limitation of this study was the inclusion of only blue-collar jobs; the lack of white-collar employees resulted in limited investigation into differences across occupational types. Likewise, no females were included in the study despite the questionnaire being completed by some female participants. The age of participants was also not assessed which could

have accounted for some of the variability in consumption. The study was cross-sectional, making it difficult to determine causality, and the research would benefit from more in-depth questioning (perhaps a qualitative follow-up) as to why workers do not feel they had time to eat healthily and what aspects of their work made them fatigued and stressed (Nagler et al., 2013). Despite these limitations, the study indicates that income is a strong predictor of FVC in male blue-collar workers. These findings are supported in the study by Lallukka et al. (2007) who found that disposable income influenced healthy food habits.

The relationship between education level and vegetable consumption was observed in a study of nine European countries; it was found that educational level only influenced vegetable intake in the Nordic/northern European countries, whereas in the Mediterranean there was no educational impact on consumption (Prättälä et al., 2009). Data from nine European health surveys from 1998 to 2004 were used in the review, with in excess of 160,000 respondents aged between 20 and 64 years of age. Vegetable consumption was measured by frequency of consumption both daily and weekly (to account for those who did not achieve the daily recommended intake of 5-a-day). SES was measured by occupational class (non-manual, manual, self-employed and other), education (measured by highest level obtained) and place of residence and age and gender were controlled for in the analysis. Logistical regression analysis revealed an association between the daily consumption of vegetables and educational level in all countries except Germany. This relationship is likely to be mediated by the cost of vegetables and their availability in the countries studied (vegetables were cheapest in Germany). Education had a

weaker effect on vegetable consumption in Italy, France, and Spain (classed as the Mediterranean/southern Europe countries in the study), but when occupational class and place of residence were controlled for, those with a lower education were seen to consume fewer vegetables. In the Baltic (Estonia, Latvia, and Lithuania) and Nordic/northern Europe (Finland, Denmark and Germany) countries greater significance was found in consumption, with those with higher education obtainment seen to consume vegetables more than those with lower education. "Northern Europeans have not developed a tradition of using vegetables on a daily basis. When new foods entered the market, the higher socioeconomic groups were the first to buy them and to adopt them" (Prättälä et al., 2009, p. 2181). This suggests that the daily use of vegetables may not be the cultural norm in lower SES groups in northern Europe as it is in the Mediterranean, hence the lower significance in results in those countries. This study may have interesting applications to the workplace and to community studies, as cultural norms relating to vegetable intake may be another influence on consumption. For example, if an individual comes from a culture where vegetable consumption is not the norm, increasing consumption may be more of a challenge that in cultures where it is. This may also relate back to an individual's ethnicity. This suggests that when designing workplace interventions to increase consumption, both cultural and ethnical norms must be considered to engage employees with the intervention and to maximise chances of successful behaviour change.

The issue of racial/ethnic differences in spending on fruits and vegetables was explored in a study of 58,547 households in the United States Consumer Expenditure Survey (Ryabov, 2015). The survey consists of two

forms of data collection. A quarterly interview survey covering monthly

expenditure (including housing, transportation, and health care) and a weekly

diary survey which covers weekly expenditure on perishable items such as

fruit and vegetables. Information on household income, education attainment,

gender, and age were also collected, in addition to ethnicity information. Black

respondents consumed 36% less fresh fruit than white respondents (whereas

Hispanic respondents consumed 29% more than white respondents). These

differences reduced slightly when controlling for income and education, but

were still significant. However, when researchers considered residential

segregation, the difference disappeared, suggesting it may not be the ethnicity

differences that were driving the socioeconomic differences in fruit intake, but

rather the neighbourhood in which the individual lived. Similar results were

found for vegetable intake, with black respondents consuming 36% less fresh

vegetables than white respondents and Hispanic respondents consuming 19%

less than white respondents. The study was limited based on the nature of

personal-recall in the self-report questionnaires, and the potential for bias in

overstating consumption. The survey also covers household purchase rather

than individual consumption of fruit and vegetable intake. The study benefits

from the separate measurement of fruit and vegetable consumption and of the

large sample size (Ryabov, 2015). It suggests that the neighbourhood, or

environment, that someone lives in may have a significant influence on eating

behaviours and negate other socioeconomic differences in consumption. This

has interesting implications for workplaces who may benefit from an

understanding of the neighbourhoods in which their offices are located and

their employees reside in designing appropriate interventions to change health behaviours.

Despite the finding that education may increase earning potential and thus access to environments that enable healthy behaviours, education must not be confused with dietary knowledge (Berning & Hogan, 2014). In a cross-sectional community study of 10,213 individuals, it was found that education was significantly related to both fresh and tinned fruit and vegetable consumption (Berning & Hogan, 2014). Data taken from the United States 2010 Consumer Expenditure Survey (CEX) included diarised household expenditure on food (among other nondurable items). Education was reported as the highest educational level in the household, and age, gender, ethnicity and dependants were also included. Older age groups were associated with a higher intake of fruit and vegetables and number of dependants was negatively associated (i.e. the more dependants the lower the purchase of fruit and vegetables). Education had greater significance over the purchase of fresh fruit and vegetables than for tinned fruit and vegetables. The authors suggest that further study should include the assessment of nutritional knowledge within the component of education to identify whether targeted education on nutrition has a significant influence on dietary consumption and therefore implications for interventions (Berning & Hogan, 2014). A limitation of the research was the cross-sectional design and the inclusion of only purchase data. Just because a household has purchased fruits and vegetables does not necessarily mean they have been eaten. The inclusion of survey data on consumption would be beneficial to this study to compare purchasing and consumption behaviours. A further weakness may lie in using household data. While the study does

suggest a lower purchasing of fruit and vegetables in households with more

dependants, it does not tell us who in the household is consuming the

purchased foods, and whether they are meeting Government guidelines for

consumption. There is a potential for a household purchasing more fruits and

vegetables to have higher wastage, especially for fresh produce. This suggests

that the measurement of *consumption* of fruit and vegetables may be a more

accurate measure than *purchase*.

An intervention designed to assess the impact of improving fresh fruit

availability on the consumption of fruit and vegetables both at work and at

home, found that improving availability of fruit during the working day

encouraged individuals to increase their consumption of both fruit and

vegetables outside work (Backman et al., 2011). The study consisted of six

intervention worksites with 391 low income employees and three control

worksites with 137 low income employees in primarily Hispanic

neighbourhoods in Los Angeles. All participants were asked to complete

questionnaires detailing their vegetable and fruit consumption and purchasing

habits, job satisfaction, self-efficacy, and overall health, at baseline and at four-

week intervals until the end of the 12-week intervention. The intervention sites

were given deliveries of fresh fruit that allowed for one serving, three times a

week per employee for the 12-week intervention. It was found that participants

in the intervention group increased their fruit and vegetable consumption and

family purchasing habits and their self-efficacy for fruit consumption, unlike

those in the control worksite that showed no changes in consumption

(Backman et al., 2011). A limitation of the study is the very narrow

demographic studied – the employees were all the same job classification, sex,

and race/ethnicity. A further limitation is the self-reported nature of the questionnaires which may have given a self-selection bias whereby participants may have reported an increased fruit and vegetable intake as they knew the purpose of the worksite fruit deliveries; not all participants responded in full to the questionnaires and that too may have led to some bias, for example those who were less engaged with the intervention may not have filled in the follow up questionnaires, thus positively skewing the results of the study (Backman et al., 2011). Despite these limitations the study suggests that improving self-efficacy of fruit intake through workplace provision of fruit can lead to an increase in overall fruit and vegetable consumption both in the workplace and outside. This suggests that self-belief, or self-efficacy, may also be an important driver in the consumption of fruits and vegetables. Further study would be beneficial to assess the long-term implications of the interventions and whether the increased consumption was maintained following the study through lasting behaviour change.

In a randomised community-based study of fruit intake covering 627 adults (aged 18 to 87) self-efficacy, subjective norms, attitudes, expected pros and cons, intention, and habit strength were assessed over a two-week period (Brug, de Vet, de Nooijer, & Verplanken, 2006). The authors argue that eating behaviours are influenced by "such diverse factors as availability and accessibility of foods; familiarity with foods; physiological processes like hunger and thirst; inborn taste preferences; cultural, social and personal norms; prosperity; attitudes; intentions; and other cognitions" (Brug et al., 2006, p. 74). Data was collected via self-report through an online questionnaire and fruit consumption was assessed using a 14-item food frequency questionnaire

and 7-day dietary record. Participants had medium to high levels of education and 50.9% were female. Only 55.7% of respondents consumed the Dutch recommendation of two or more portions of fruit a day (with a mean intake of 254 grams). Analysis showed that older respondents were more likely to eat two or more portions of fruit a day when controlling for the 'Theory of Planned Behaviour' (TPB) and 'Attitude, Social Influence and self-efficacy' (ACE) models included in the data collection (Brug et al., 2006). This suggests that the older respondents were more influenced by their intentions and self-efficacy in fruit consumption than the younger. Respondents who had stronger habits and intentions had a greater likelihood of eating the recommended two servings of fruit. The study benefits from its assessment of potential behavioural determinants two weeks prior to the assessment of fruit consumption, but longer term behavioural intentions and change cannot be inferred from the research. It does suggest, in common with other studies (Backman, Gonzaga, Sugerman, Francis, & Cook, 2011) that intentions for consumption of foods warrant further investigation as potential confounders in the socioeconomic relationship with eating behaviours (Brug et al., 2006).

The relationship between fruit and vegetable intake and all-cause mortality risk was analysed in 65,226 participants over the age of 35 in a community study using Health Survey for England data (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2016). Data was collected through a face-to-face interview; the data collected included a range of demographic and socioeconomic data, as well as various measures of health including fruit and vegetable consumption. Biometric data was collected via a nurse, so height, weight, and bloods were clinically assessed, enabling the accurate calculation

of BMI and basal metabolic rate. Regression analysis revealed that participants who ate the most fruit and vegetables were more likely to be female, older in age, hold a university degree (or an equivalent educational obtainment), live in a non-manual household and were less likely to smoke. Further, the consumption of vegetables was found to elicit greater health benefits that that of fruit, and combined fruit and vegetable consumption was most beneficial if seven portions were consumed each day (Oyebode et al., 2013). The authors acknowledge that the majority of participants in the Health Survey for England are aware of the recommendation to consume five portions of fruit and vegetables a day, suggesting a potential self-selection bias in the data, but participants stated that cost, a lack of motivation, lack of time, and the challenge of changing behaviours were all barriers. Likewise, in participants who believed they had an overall diet that was 'very healthy' more than 50% of them ate less than the recommended '5-a-day' (Oyebode et al., 2013). This raises an interesting question around the correlation between a perceived healthy diet and the consumption of fruits and vegetables, and also stresses the importance of including both measures in analysis.

Fruit and vegetable consumption were found to differ significantly for gender and age within socioeconomic groups in an epidemiological community study examining health-related behaviours in England (Strait & Calnan, 2016). The study included 56,468 individuals from the Health Survey for England in 2001 and 2012 (methods of data collection are detailed in the previous paragraph). SES was measured by education, household income, and occupational social class and four health-related measures were analysed – smoking, alcohol consumption, physical activity and fruit and vegetable intake.

The authors found that fruit and vegetable intake was lower for men than for women, and lower in the younger age group than the older. In comparisons between educational obtainment groups, fruit and vegetable intake decreased between the data collections at 2001 and 2011, and the gap between the lowest and the highest educational intake narrowed. There was no change over time for occupational class, but for household income the consumption of fruits and vegetables had decreased in the lowest income households between 2001 and 2011. A narrowing in the difference between the highest income and lowest income groups however was also found between 2001 and 2011. The other health-related behaviours examined did elicit a widening of the relationship between low and high socioeconomic groups during the time of the study, but fruit and vegetable consumption did not (Strait & Calnan, 2016). The study benefited from a large sample size and from analysis over three-time points. The use of fruit and vegetable intake as the sole measure of dietary intake was a limitation as fruit and vegetable consumption may not be a predictor of a 'healthy' diet overall (Strait & Calnan, 2016). The study examined age and gender as confounders of the relationships between SES and health-related behaviours, rather than as independent variables, and therefore does not explore these differences in detail. This is consistent with other community-based studies (Boukouvalas, Shankar, & Traill, 2009; Oyebode et al., 2013).

Further examination of fruit and vegetable consumption of 11,044 individuals in England, based on income and education levels, from the Health Survey for England dataset, found, in medium income groups, that for every increase of £1,000 in income there was a 0.6% increase in fruit and vegetable intake (Boukouvalas et al., 2009). The authors used quantile regressions to

analyse fruit and vegetable consumption at different levels across the intake distribution, they found that income and education did boost fruit and vegetable consumption, but effects were small when other factors, such as gender, age, and ethnicity were controlled for. It was found that at the lowest intake of fruit and vegetables there was little influence of education or income, perhaps suggesting that those individuals have "inherent traits/preferences, unrelated to any particular socio-economic configuration, which cause them to be poor F&V consumers" (Boukouvalas et al., 2009, p. 2190).

Consumption of fruit differed between genders in a community-based study of 732 participants (361 male and 371 females) (Pechey, Monsivais, Ng, & Marteau, 2015). Participants were asked to complete an online questionnaire to assess consumption of fresh fruit, cheese, and cake, in addition to consumption frequency, enjoyment, motivations, and the perceived attributes of each food type. SES (measured by occupational group, income and education) was collected in addition to gender, age, number of dependants, and BMI. Proportional odds modelling was carried out to determine SES differences in the frequency of consumption. Participants of lower SES groups and males (in all SES groups) reported eating less fruit across all SES indicators investigated. Income was a stronger predictor of fruit consumption for males than females, and no SES differences were identified for the other eating behaviours examined. Lower SES groups reported a lower implicit 'liking' for fruit, which may indicate a SES difference in taste preference, although further study would be required to determine the relationship across a range of eating behaviours. Limitations of the study were the self-reported nature of the online survey and the cross-sectional design, in addition to only

using fruit consumption as a measure of healthy eating. However, it could be argued that examining fruit consumption as a separate measure is beneficial to compare with previous studies only examining vegetable consumption (Prättälä et al., 2009). This suggests differences in fruit and vegetable consumption behaviours and supports their analysis as separate constructs.

In a qualitative study of fruit and vegetable intake, 28 participants took part in six semi-structured interviews to investigate consumer understanding of fruit and vegetable intake. Participants in the community study were of working age (between the ages of 19-55) and from Northern Ireland (Rooney et al., 2017). A questionnaire was given to participants prior to the focus group to gather information on demographics in addition to questions ascertaining participant understanding of the '5-a-day' message, knowledge of which food constituted one of the '5-a-day', and questions covering consumption of various fruits and vegetables. The focus groups explored knowledge of '5-a-day' in more depth, including discussion on improving the information given to consumers to increase their fruit and vegetable intakes. Results demonstrated participants had a knowledge of messages around fruit and vegetable intake as part of the '5-a-day' campaign, however they were unsure as to what constituted a portion and what foods counted towards the target (Rooney et al., 2017). This may suggest that studies using self-reported measures of fruit and vegetable intake may have some inaccuracies in reported intake because of a lack of knowledge in participants on what constitutes '5-a-day' and how to achieve the target. Likewise, recent research has shown that reported calorie intake is falling in the UK, yet the weight of the population is increasing (Harper & Hallsworth, 2016). Both the 'Living Costs and Food

Survey' and the 'National Diet and Nutrition Survey' demonstrate a reduction in calorie consumption with a 5.6% and 6.8% reduction respectively over the period of 2000-2001 and 2011-2012. While a decline in physical activity over this time has occurred, the increase in weight in the UK suggests that the reported calorie intake is not correct (Harper & Hallsworth, 2016). Therefore, this suggests that both fruit and vegetable consumption and overall calorie consumption may be underreported in studies.

Dietary intake self-report records were accessed from datasets in Scotland to compare reported food intake against the UK Government Eatwell Plate (Whybrow, Macdiarmid, Craig, Clark, & McNeill, 2016). A total of 240 participants had weighed and recorded their food intake for 4, 6 or 7 days. The Eatwell Plate is a guide for consumers on which food groups to consume, and in what quantity, based on their dietary reference values. The five food groups included on the plate were starchy foods, milk and dairy foods, protein, foods and drinks high in fat or sugar, and fruits and vegetables. The study demonstrated the challenge of accurately recording dietary intake using the Eatwell Plate given many meals involve combinations of food groups and some foods are not included in the guide – the researchers attempted to categorise the reported dietary intake by the Eatwell Plate. The results showed that participants ate more foods high in fat and sugar than recommended, and more dairy products and starchy foods. Fruit and vegetables were underconsumed. The researchers recalculated the fruit and vegetable contribution of the Eatwell Plate to correspond with the '5-a-day' recommendation and found an intake of 377g per day, compared to the 419g calculated based on the Eatwell Plate reference intake level. The study was

limited given the data was collected between 1998 and 2001 for a 2016 study, however it does demonstrate the challenge to consumers of interpreting healthy eating advice, the overconsumption of foods that are high in fat and sugar, and the differences between two Government campaigns designed to improved eating behaviours – '5-a-day' and the Eatwell Plate. Consistency in messaging for fruit and vegetable campaigns may be important to improve understanding of the recommendations and to increase intake.

Attitudes towards healthy eating of 1,631 participants, asked to complete a questionnaire and a 3-day food diary, were examined in a French cross-sectional community study (Lê et al., 2013). Compliance to dietary guidelines was increased for higher educational levels with an increased intake of fruits and vegetables, whole-grains, meat, and seafood, and a decrease in the consumption of sweetened foods and pastries. The relationship between diet and education was stronger in men than in women. The relationship between education and consumption of fruit and vegetables was mediated by attitudes towards healthy eating and accounted for 23% of the relationship, likewise 22% of the relationship between education and consumption of whole-grain foods was accounted for by attitudes. Attitudes towards healthy eating were more pronounced in females with 37% of the relationship between education and diet accounted for by attitudes towards healthy eating versus 16% in men. The study may be limited by the exclusion of other socioeconomic markers, such as income and occupational class, which have been shown to further influence food choices (McLaren 2007; Sobal & Stunkard, 1989). The measurement of attitude as a mediator of the relationship between food choice and education is important, as eating behaviours may be influenced by

individual attitudes. However, further investigation would benefit from the analysis of other mediators such as nutritional knowledge, self-efficacy, access to healthy foods, food preparation skills, and demographic factors such as number of dependants and family values (Lê et al., 2013).

Higher quality diets were found to be consumed by more affluent, better educated people in a review by Darmon and Drewnowski (2007). Likewise, Maguire and Monsivais (2015) carried out a cross-sectional study of 1,491 responses from the UK National Diet and Nutrition Survey, and found that greater fruit, vegetable, oily fish, and lean meat intake was seen in participants with higher educational obtainment, higher income groups, and more senior occupational class. The researchers suggest that different mechanisms for each socioeconomic measure influence dietary behaviours; "income reflects material resources to afford and access healthful foods – in the case of occupational social class, the associated social environment can influence health behaviours through work-place culture and workplace social networks" (Maguire & Monsivais, 2005, p. 186). In addition, education may increase knowledge, skills and competencies which enable people to understand health messages. The cross-sectional design of the study limits causality, but it supports previous studies reported in this review that demonstrate the existence of a socioeconomic gradient in eating behaviours (Baum & Ruhm, 2009; Maguire & Monsivais, 2005; McLaren, 2007; Sobal & Stunkard, 1989). It is also worth noting the research by the Behavioural Insights team (Harper & Hallsworth, 2016) reported earlier in this section, that demonstrated under-reporting in the UK National Diet and Nutrition Survey, which may influence the findings of the Maguire and Monsivais study (2005) –

perhaps the dietary excesses and shortfalls would be even more pronounced for socioeconomic groups if fully reported?

The current section presents significant support for a socioeconomic gradient in fruit and vegetable consumption. The research also suggests the benefits of measuring fruit and vegetable consumption as separate constructs in addition to understanding the adherence to the Government recommendation of '5-a-day'. Cost of food has been shown to have a significant influence on the consumption of fruit and vegetables, and of overall diet in this review. The relationship between cost of food and purchasing behaviours is explored in more detail in the next section.

2.3.3 Cost of food influencing purchasing behaviours

Much research exists on the relationships between SES, obesity, and diet and the cost of food (Lallukka, Laaksonen, Rahkonen, Roos, & Lahelma, 2007; Darmon & Drewnowski, 2007; Drewnowski, 2009; Timmins et al., 2013). "It is economic deprivation that is obesogenic, and one key predictor of weight gain may be a low cost diet" (Drewnowski, 2009, p. S36). Data show that there is an SES gradient in diet quality, where more affluent individuals consume more lean meats, whole grains, and fresh fruits and vegetables, and individuals of lower SES consume more energy dense foods, such as refined grains and processed food higher in fats and sugars (Darmon & Drewnowski, 2007).

Food cost may determine dietary decision making (Timmins et al., 2013). In a community-based study of 1,014 individuals (51% female) in the UK, a positive association was found between diet costs and BMI, those on lower incomes (and with lower educational attainment and occupational class)

had a tendency to spend less on food and have higher BMIs than those with a higher income (Timmins et al., 2013). Education, household income, marital status, gender, and age were recorded by an interviewer in a face-to-face interview setting in addition to collecting weight and height. Dietary intake was assessed by a 4-day dietary diary and participants were given guidance through photographic portion references for 15 foods and the other amounts were measured by packet weights. The researchers then determined fruit and vegetable consumption from the diaries. It was found that consumption of fruit and vegetables was less in lower income groups, and for diets that contained the Government-recommended '5-a-day' or more fruit and vegetables recommendation had a higher cost associated with them (Timmins et al., 2013). A limitation of the study was the cross-sectional design limiting the interpretation of findings, for example individuals may simply prefer to purchase cheaper foods rather than their purchasing being based on monetary constraints (Timmins et al., 2013). Another limitation of the study is that individuals tend to under-report food consumption, especially those who are obese, which may bias the comparisons between groups (Timmins et al., 2013).

The relationship between socioeconomic position (as measured by income and education) and diet quality with diet cost (calculated from a database of retail prices for Food Frequency Questionnaire component foods) was examined in a community study of 1,266 adults (804 female) in the US (Aggarwal et al., 2011). The authors' hypothesis that diet cost may mediate the relationship between SES and diet quality was observed. Both higher education and income levels were found to be associated with a higher mean

adequacy ratio and lower energy density, and with higher energy adjusted diet costs (Aggarwal et al., 2011). Individuals with lower income and education levels, spent less on food and the food choices tended to be nutrient poor and energy dense. Age-related differences in cost of food influencing purchasing behaviour have been outlined in studies reported earlier in this chapter (Chambers et al., 2008; Maguire & Monsivais, 2005).

The relationship between the 2010 Healthy Eating Index (HEI) scores for 11,181 adults and diet cost was reviewed in a cross-sectional study of data from the United States National Health and Nutrition Examination Survey (Rehm, Monsivais, & Drewnowski, 2015). A strong positive association between lower energy-adjusted diet costs and lower HEI- 2010 scores was observed. The relationship was stronger among women than in men. A significant relationship was also observed between diet cost and diet quality for both men and women across different geographical areas in the US. A lower consumption of vegetables, fruits, whole grains, and seafood, was associated with diet cost as was higher consumption of refined grains and solid fat, alcohol, and added sugars. Limitations of the study include the estimation of food costs based on a food price database not allowing for measurement of geographical variability in food prices, food intake was self-reported which may lead to some underreporting or healthy food bias, and the study was cross-sectional (Rehm et al., 2015). However, the study was on a large sample size of 11,181 participants across diverse geographical and socioeconomic groupings and a significant relationship was found between diet quality and diet cost (Rehm et al., 2015).

Relations between cost and food intake patterns were investigated in a cross-sectional community study in Spain (Schröder, Marrugat, & Covas, 2006). Participants (N = 3,179; 1547 male and 1615 female) were interviewed using the Food Frequency Questionnaire to ascertain food intake and patterns over the last year. Additional information on smoking, alcohol intake, weight, and height (measured by the interviewer) and educational level was also collected. The study found that those participants who mostly consumed a diet close to the recommendations made by the Healthy Eating Index and Mediterranean Diet Score spent more money on their diet than those that did not. An inverse relationship was found between dietary patterns and BMI and obesity when controlling for many confounding variables.

The costs of eating healthily were examined in a cross-sectional community-based study of 33,337 females from the UK Women's Cohort Study (Morris et al., 2014). A significant relationship was found between higher cost foods and a healthier diet as measured by the Food Frequency Questionnaire and the Healthiness Index – a UK-based scale that measures adherence to the UK Department of Health's guide to healthy eating, the Eatwell Plate. The study found that the least healthy dietary pattern cost £3.29 per day, half that of the most expensive dietary pattern of £6.63 per day. Individuals in professional or managerial jobs and with a higher education were more likely to consume a healthy diet, thus indicating the relationship between SES and diet is mediated by cost (Morris et al., 2014). Limitations of the study are the use of the Food Frequency Questionnaire, which has been shown to overestimate the intake of food in the UK Women's Cohort Study; overestimation of the consumption of healthy foods and underestimation of

70

consumption of less healthy foods might result from social desirability bias in the data and finally the limited population studied, females aged from 35-69, may limit the generalisability of findings (Morris et al., 2014). However, a strength of the study was the large sample size and strong statistical significance suggesting that a healthy diet is more expensive and more accessible to females with higher educational obtainment and higher income (Morris et al., 2014).

A review of two hypothesis of the relationship between poverty and obesity examined the economic gradient of obesity, mediated by the observation that cheap food may encourage overconsumption of foods, thus leading to obesity (Hruschka, 2012). The two hypotheses were firstly, that satiety and fullness was influenced not by the energy content of food, but rather by the overall mass of food consumed and, secondly, that "humans and other animals continue to pursue and consume food until they obtain a specific quantity of protein" (Hruschka, 2012, pp. 279-280). The first hypothesis suggests that as energy density is increased, by the addition of fat and removal of water or fibre, the overall consumption of energy is increased; these types of food are often cheaper than foods with a low energy density and may then be overconsumed by lower income groups. The second hypothesis argued that people on low budgets may not be able to afford to eat the level of protein needed for satiety because of the high cost per calorie of protein relative to carbohydrate or fat, and might, therefore, overeat foods high in quantities of fat and carbohydrates, thus leading to overweight and obesity (Hruschka, 2012). There is some support for both theories from cross-sectional studies in population-based research, however energy density is not the only factor in

overeating; environmental and societal influences and trends (such as bigger portion sizes or frequent dining out rather than in the home), factors such as self-control, restraint and disinhibition, and socioeconomic factors such as education, occupation, and area of residence may all play a part (Hruschka, 2012; McLaren, 2007; Wansink, 2010). Hruschka (2012) analysed data from the US behavioural risk factor surveillance system (BFRSS) which consisted of a sample of more than 350,000 adults. The difference between data from white females aged 20-49 from 2004-2007 (the years prior to the economic downturn) and 2008-2010 (the years after the downturn) was analysed to assess whether the reduction in income as a result of economic downturn led to an increase in obesity. Little evidence was found supporting the hypothesis, and even in the lowest income group, the rate of increase in BMI during the recession was found to be no more than after the recession. A limitation of the study was the use of only one socioeconomic variable (income), the self-reporting of BMI, and the homogenous nature of the group studied which limits generalisability, however in such a large sample size the data provide an interesting insight into possible mediators in the relationship between poverty and obesity (Hruschka, 2012).

2.3.4 Eating past the point of feeling full

The previous sections have reviewed the consumption of a healthy diet and fruit and vegetable consumption (which are both interrelated and often used as proxies for each other). The cost of food, whether that be fruit, vegetables, or other foods, have been shown to influence purchasing behaviours, and differences have been demonstrated between socioeconomic groups (SES). It has been suggested that an important mediator of the

72

relationship between SES and obesity is dieting or the use of restraint in eating (Sobal & Stunkard, 1989). Eating past the point of feeling full has two primary drivers – restraint and disinhibition.

Restraint theory is the study of the psychological foundations of eating behaviours and disorders; restrained eaters consciously aim to lose or maintain weight by the restriction of their dietary intake (Dykes et al., 2004). The theory was developed to understand eating behaviours and disorders and their psychological basis (Dykes et al., 2003). A criticism of dietary restraint is that it is not always effective and often counterproductive in the control of weight "because of adverse effects on responsiveness to internal and external cues that influence food consumption" (Johnson et al., 2012, p. 667). For example, an individual may feel they are being restrained in their consumption of food, but the portion of food they are eating may be bigger than they require, thus minimising the effectiveness of the restraint. Likewise, the restraint itself may create stronger desires to eat certain foods, or overeat at other mealtimes, again minimising the effectiveness of the restrained eating behaviour.

Dietary disinhibition is defined as "a tendency to overeat in the presence of palatable foods or other disinhibiting stimuli, such as emotional stress" (Savage, Hoffman, & Birch, 2009, p. 33). Studies have found a positive relationship between disinhibition and weight, but have been inconclusive; it has also been suggested that disinhibition may be a more accurate predictor of body weight when measured with dietary restraint (Savage, Hoffman, & Birch, 2009). Individuals who are disinhibited, but also restrained, tend to have lower body weight than individuals who are less restrained (Savage et al., 2009). It has been argued that obesity is influenced by

a more reactive response to external cues, such as food palatability, and a less reactive response to internal cues such as satiety (Wardle, 2005). Disinhibition and dietary restraint often do occur together, but restrained eaters often differ in their tendency to disinhibition (Johnson et al., 2012).

Eating past the point of being full is not only determined by food choice, but it will also be determined by portion size and the frequency of eating (Wansink, 2010). We may be influenced to eat more by the pressure to *clean your plate* and not leave any food, or it may be the suggested portion sizes given on a packet or the size of a serving in a restaurant. Even the sizes of bowls and plates have increased in recent years, and these societal norms may influence the perception of what is a *normal* portion, yet this may be too much food. It has been argued that environmental cues often override our natural internal cues of satiation and lead to the overconsumption of food. People may believe that they know when they are full, but this may not be the case as we listen less to our stomachs and more to our eyes (Wansink, 2010). Dietary restraint will not necessarily lead to weight loss or be associated with low BMI because individuals may eat less than they would like to, or think they should be, but this may still be more than their homeostatic needs (Johnson et al., 2012). The differences in individuals' ability to self-regulate their food intake are likely to be partly influenced by genetics, but it may also be possible to learn better self-regulation skills. However, studies tend to show self-regulation is effective in weight loss, but not in the maintenance of losses over time (Johnson et al., 2012).

Restrained eating may be different to dieting. Dieting is a form of rigid restraint whereas a moderate and flexible approach to dietary restraint can be

more successful in the moderation of dietary intake (Johnson, Pratt & Wardle, 2012). This is because dieting may lead to an all-or-nothing behaviour that could lead to failure (Johnson et al., 2012). Dietary restraint has been found to be negatively associated with BMI in both overweight and obese people which "suggests that a degree of deliberate self-imposed restriction may be essential for control of weight among individuals with adverse appetitive traits and a propensity to overeat" (Johnson et al., 2012, p. 670). It is likely that an ability to regulate food consumption may come more naturally to some individuals than others: Some individuals may find it easy to maintain their planned, or inherent, eating behaviours; whereas others may experience disinhibition (Johnson, Pratt, and Wardle, 2012). Disinhibition and dietary restraint may also be influenced by upbringing (the influence of parental behaviours or influence), by environment such as living in an obesogenic environment (which may be associated with higher disinhibition), and social and economic factors (Bryant, King, & Blundell, 2007; Dykes, Brunner, Martikainen, & Wardle, 2004).

An American workplace study of dieting behaviours in 4,647 employees across 32 worksites (2,107 males and 2,540 females) found that dieting was more prevalent in females than in males (Jeffery, Adlis, & Forster, 1991). Dieting (at some point in their lifetime) was reported in 47% of males and 75% of females and participation in weight loss programmes was 6% in males and 31% in females. In logistic regression analysis, a strong positive association with dieting was found with education and occupational status and with relative body weight. Reported dieting was more prevalent in younger females than older, but older females were more likely to attend weight loss

programmes than younger females. It was also found that males with hypertension were more likely to diet than healthy males and were more likely to participate in weight loss programmes suggesting that health concerns were more of a motivation to lose weight in male than female participants. A limitation of this study was the lack of investigation into the type of dieting used by participants – it cannot be presumed that the diet involves restraint in eating as significant numbers of *fad* diets exist involving restricting certain food types, rather than all food types. A further limitation is the age of the journal – 1991 – however, it is included in this literature review because of its association with the Sobal and Stunkard (1989) research and the eating behaviours investigated by Stunkard and Messing in 1984.

The first comprehensive measure of three dimensions of eating behaviour was developed by Stunkard and Messing (1984). They found that existing dietary restraint scales (such as the Restraint Scale developed by Herman and Mack in 1975) were not effective for measuring eating behaviours in all weight categories. The *Restraint Scale* may not accurately measure eating behaviours in the obese because of the scale not only measuring restraint but also weight fluctuation: "Weight fluctuation is a function of obesity and is highly correlated with percentage overweight – the correlation of percentage overweight in the Restraint Scale could be because of nothing more than its weight fluctuation factor" (Stunkard & Messick, 1985, p. 72). The initial questionnaire of 67 questions was tested on 220 individuals (123 women) in three groups; a group of dieters, friends of the dieters who had unrestrained eating habits, and neighbours of the dieters who shared the same geographical location. The responses were factor analysed and the resulting

factors were used to reduce the questionnaire down to 51 items. The inclusion of questions on disinhibition enabled the prediction of weight gain which the Restraint Scale was unable to (Stunkard & Messick, 1985). The final scale measured three factors: Cognitive restraint of eating, disinhibition, and hunger. A limitation of this scale was its development on a small sample size, in a small geographical area, and with limited collection of additional demographic information which could have limited generalisability; however, the scale has been used widely in research since its development and demonstrated its validity across a range of communities and workplaces, and correlated with wide constructs such as measures of SES (Bryant, King, & Blundell, 2007; Dykes, Brunner, Martikainen, & Wardle, 2004; Stunkard & Messing, 1985; Williamson et al., 2007).

The mediation process of restraint, disinhibition, and hunger in the relationship between obesity and SES was investigated using the Whitehall II study of British civil servants (Dykes, Brunner, Martikainen, & Wardle, 2004). The study of 1,470 women, between 45 and 68 years of age, of six different occupational bands in the civil service measured obesity and body size not only by BMI, but by weight, and waist to hip ratio (Dykes et al., 2003). Eating behaviour was measured using Stunkard and Messick's (1985), Three Factor Eating Questionnaire which is a 51-item instrument that measures dietary restraint, hunger, and disinhibition (cited in Dykes et al., 2003). The study found significant relationships between both hunger and disinhibition, and body-size and weight, suggesting that individuals who continue to eat when they are satiated tend to have a greater weight and size. A positive relationship between restraint, and body size and weight, was only found in its relationship

with disinhibition. Women in the highest occupational grades had lower body size and weight and scored lower in disinhibition and hunger than women in lower grades. Hunger showed a greater association with occupational gradient than disinhibition and restraint, which is supported by other research that suggest hunger and appetite are strongly related to the regulation of food intake (Dykes et al., 2003). A limitation of this study for comparison with other occupational groups was that most women studied were in mid-grade occupations; the study was also cross-sectional in design and limited to female civil servants. Further study would be warranted with a larger sample size spread across occupational grades and to investigate if a similar pattern is found in men.

Dieting, restraint, and disinhibition were examined in 163 US women over a six-year period, in a community-based study (Savage et al., 2009). The study was longitudinal in design with data collected at two-year intervals on four occasions across a six-year period. Data collected included the socioeconomic measures of years in education and household income; biometric data of weight and BMI measured by the research team; and dietary restraint and disinhibition measured by the Healthy Eating index. The *Three Factor Eating Questionnaire* (Stunkard & Messick, 1985) has three subscales that examine dietary restraint, dietary disinhibition, and susceptibility to hunger through 51 questions. The study found a positive association between baseline and current levels of weight and of disinhibition, i.e. disinhibited individuals tended to have higher weights than those with low disinhibition scores (Savage et al., 2009). Dietary restraint at baseline, however, did not predict baseline weight and a reduction in restraint from baseline to the final

78

data collection was positively associated with weight gain. The study suggests that restraint mediates the effects of disinhibition on weight gain. The findings were consistent with previous studies that demonstrated dietary restraint findings at baseline "were not associated with weight or weight change over time, whereas women reporting higher baseline disinhibition scores were heavier at baseline and gained more weight over time, before dieting status was controlled for" (Savage et al., 2009, p.38). The study's strengths were its longitudinal design and examination of both restraint and disinhibition. Limitations of the study were the small sample size, the limited population studied (female and demographically homogenous) which prevented the generalisability of findings, and the self-reporting of data (Savage et al., 2009).

In a review article of disinhibition studies, it was found that disinhibition is positively associated with obesity and BMI (Bryant et al., 2007). In cross-sectional studies, the review found that disinhibition and BMI are positively associated across differing socioeconomic gradients, individuals with differing weight histories, and in individuals with differing dieting status. Disinhibition was also found to be related to an individual's responsiveness to eating cues, and therefore related to overeating in both high and normal weight individuals; studies using a pre-load design suggest that it is the best predictor of food consumption, over that of dietary restraint. Studies examining the impact of stress on an individual's disinhibition found that in women, disinhibition was associated with an increase in food consumption, especially foods that were sweet, while experiencing stress. An association was also found between exercise and disinhibition, whereby women who ate more after a bout of exercise had higher disinhibition tendencies than those who did not

modify their food intake following exercise; however, this response may be mediated by the weight of the individual, and therefore studies may be limited in generalisability if they do not measure starting weight or BMI (Bryant et al., 2007).

The validity of four different dietary restraint questionnaires were tested in a community-based study of eating behaviours (Williamson et al., 2007). The study was part of a wider randomised controlled trial that was testing three dietary approaches to weight loss in overweight individuals. The dietary restraint study consisted of 48 participants, 61% white, and 57% female with an average age of 38 and an average BMI of 27.7 (overweight). The four measures of dietary restraint tested were the *Revised Restraint Scale* (RS), the *Eating Inventory* or *Three Factor Eating Questionnaire* (TFEQ), the *Dutch Eating Behaviour Questionnaire* (DEBQ) and the *Current Dieting Questionnaire* (CDQ); in addition, measures of eating disorder, body weight and composition, energy balance, and demographic information were collected (Williamson et al., 2007). Baseline testing was completed during an initial 4-week period to calculate total daily energy expenditure; following this, participants were randomly assigned to one of four groups (calorie restriction CR, calorie restriction plus exercise CR+EX, low calorie diet LCD, and control – weight maintenance diet). All participants were supported by dieticians and exercise physiologists during the course of the 24-week study. The study found that the four measures of dietary restraint used did not measure the same theoretical construct; dietary restraint could mean the frequency of overeating or dieting, weight suppression, or current dieting. All four questionnaires did correlate in their measures of dieting and were able to measure changes in

dietary restraint for all four of the different dietary approach groups (CR, CR+EX, LCD and control) in the study. Three questionnaires were unable to predict changes in energy balance and were not sensitive enough to show a current state of negative energy balance, only the Eating Inventory (or Three Factor Eating Questionnaire) was able reflect a current state of negative energy balance in its score (Williamson et al., 2007). A limitation of this study was the small sample size, meaning that statistical significance was not met in a number of the analyses. This small sample size, in addition to no information on socioeconomic indicators being collected, also limited the generalisability of findings and prevented possible mediators in the relationships between dieting and the restraint scales being identified (Williamson et al., 2007).

The relationship between food beliefs, nutritional knowledge, and dietary restraint and food choice was examined in a US community study of 137 adult men, with a mean age of 35 (Tepper, Choia, & Nayga, 1997). The food frequency questionnaire was used to determine dietary patterns and choices, food beliefs were identified through a belief questionnaire on five different food types, nutritional knowledge was tested through a 10-item quiz, and the demographic information collected included education and income. Dietary restraint was measured by a brief questionnaire developed by the authors using six questions from the Three Factor Eating Questionnaire. Dietary restraint was shown to be a consistent predictor of reported food choice in the study population, and it was shown to influence the consumption of all four food groups in the study, other than for fast foods. The participants with the highest levels of dietary restraint consumed the greatest volume of 'healthy' foods, defined as chicken, fish, and green salad in the food groupings

used in the study. Nutritional knowledge and food beliefs influenced the reported consumption of two of the food groups, fast foods and healthy foods; nutrition knowledge was found to be the only measure that had a significant impact on fast food consumption. Income influenced food choice and those in the higher income groups tended to consume more fats and oils and beef and cured meats than those earning less. A strength of the study was the focus on males, as few studies of dietary restraint focus solely on this gender. Limitations include the small study size, the limited group studied (a community group setting but taken from army reservists) who may have a higher level of physical activity and nutritional knowledge than the general population because of their army reserve work, and therefore may exhibit higher dietary restraint scores than men in a more generalisable setting, such as the workplace (Tepper et al., 1997).

It is worth noting that self-control (and therefore likely disinhibition and restraint) is a limited resource and may be depleted during challenging decisions or difficult times in an individual's life (Hruschka, 2012). "Which mechanism is most responsible for reversing the relationship between socioeconomic resources and obesity has important implications for policy geared towards reducing obesity" (Hruschka, 2012, p. 283). In the context of disinhibition and dietary restraint, it may be education that is more influential in the rising trends in obesity, rather than income, and therefore greater focus in health promotion activities should be centred on behaviour change and educational interventions (Hruschka, 2012; Johnson et al., 2012).

2.4 Workplace Interventions to Improve Eating Behaviours

The purpose of examining socioeconomic and demographic differences in eating behaviours in the workplace is to better enable practitioners to develop interventions designed to modify behaviours. It is therefore important to understand the interventions that have been carried out in a workplace setting in order to recommend future design. Much of the research detailed in the previous sections has been from community-based settings as very little research exists on eating behaviours in the workplace. Much of the workplace research that does exist is in the form of interventions. This section will present a review of interventions carried out in the workplace to change eating behaviours.

Interventions to reduce obesity in the workplace may be influenced by SES. In a meta-analysis of 36 studies, it was found that the effects of interventions to improve diet were less in lower occupational classes, however the meta-analysis included only a limited selection of studies at lower SES groups so further study would be needed to test significance (Montano, Hoven, & Siegrist, 2014). A systematic review of 36 studies examining if interventions designed to promote healthy eating are equally effective for all socioeconomic groups found that interventions may inadvertently increase inequalities (McGill et al., 2015). The authors identified six main themes for the interventions included in the review – price, place, product, prescriptive, promotion, and person. Interventions designed to impact eating behaviours 'upstream' through the purchase of foods based on *price* were most likely to decrease health inequalities, whereas those focused on modifying the *person* in a 'downstream' way were most likely to increase inequalities. No interventions

were identified as *prescriptive,* and only one was aimed at modifying a *product*; those interventions aimed at modifying *place* did not increase inequalities. This suggests that effective interventions designed to modify behaviours without widening socioeconomic inequalities are more effective when focused on the cost of food (McGill et al., 2015). In a workplace context, this might be subsidising or reducing the cost of healthy foods on the workplace canteen menu. The finding that 'person' interventions – such as health education or nutrition counselling – widens inequalities should be considered in the design of interventions in the workplace.

Interventions were found to elicit the most success for higher socioeconomic groups in a review of community-based obesity prevention interventions, primarily focused on socioeconomic position (Beauchamp, Backholer, Magliano, & Peeters, 2014). However, the studies each used different age ranges from children aged four to the over 60s, and it could be argued that comparison between the studies is limited because of the diverse demographic factors, none of the studies were specifically targeted at differing age groups among adults and only studies of children included specific weight-based targeting (Beauchamp et al., 2014). The review demonstrates a lack of consistency in the design and implementation of health promotion interventions and a need to implement more structural interventions to prevent the widening socioeconomic inequalities in health. Considerations may also be required for demographic factors such as age and BMI. This raises the question of complexity, and whether it is financially and logistically practical for governments or organisations to factor in both socioeconomic and demographic factors when designing health interventions.

An Australian workplace health intervention 'POWER' (Preventing Obesity Without Eating like a Rabbit) had 110 overweight and obese males (with a BMI ranging between 25-40), aged 18-65 ($M = 44.4$) take part in a 3-month programme that included an information session, information booklets, a pedometer, online goal setting support, and group-based financial incentives (Morgan et al., 2011). The participants, from a manufacturing company, were assigned to one of two groups; the POWER group or a 14-week waiting list (control group) and they worked in teams with fellow members of their work shifts. The intervention resulted in reductions in a number of health measures including waist circumference, weight (an average loss of 4.5kg per participant) and resting heart rate, and found positive increases in physical activity, however no significant change in dietary variables were measured. The intervention is a positive example of using group support to change behaviours in addition to education and goal setting (Morgan et al., 2011). However, it could be argued that the use of online support and goal setting could be a barrier to workers with limited computer access or knowledge (perhaps influenced by age), the intervention was also carried out on a relatively small sample size of 110 employees from 1,200 staff at the manufacturing site and it is possible that those who signed up to the study were more open to changing their behaviours; if a greater range of employees had taken part, the effect may have been smaller (Morgan et al., 2011). Despite these limitations, the study is a positive example of an intervention aimed at male shift workers. This study demonstrates that targeted workplace interventions based on BMI group can be effective, and perceived as ethical, in the workplace. A further limitation of the study is the lack of analysis on the

age-related differences in groups. It would be valuable to understand the age of those participants who completed the intervention (and those who dropped out) in addition to analysis of any differences in weight loss success between age groups. This may be challenging on such a small sample size, but future studies may benefit from this additional analysis to enable targeting of the educational materials used.

In a systematic review of 47 nutrition and physical activity interventions aimed at controlling obesity in the workplace, a modest effect was found in weight reduction in the 6-12 month follow up (Anderson et al., 2009). The review included worksite intervention studies reporting weight loss outcomes in a single group of employees, with a follow up of more than 6 months. Most of the interventions used a combination of behavioural and informational strategies to modify diet and physical activity, while other studies adjusted the work environment to encourage healthy activities. Limitations of the review may be the omission of studies not reporting a weight reduction and many of the studies only assessed weight loss in terms of gender differences, but did not break it down to age, starting weight, or SES (Anderson et al., 2009). The study indicates that the combination of physical activity and diet advice can have a positive effect on reducing obesity in the workforce, however messages may require more refinement to be targeted at specific groups.

Certain lifestyle behaviours were found to cluster in workgroups in a prospective multi-site workplace study of 4,730 employees in Denmark (Quist, Christensen, Carneiro, Hansen, & Bjorner, 2014). Workgroups accounted for 2.62% of variance in current BMI and 6.49% of the variation in smoking

status. The findings may be because of social learning within the workgroup, selection into or out of the workgroup, or similar sociodemographic or socioeconomic characteristics within groups. While the study has methodological limitations, such as the narrow demographic field studied (Danish eldercare workers), it does present an interesting proposition that if employees of similar behaviours tend to cluster in work groups, it may make the targeting of specific health behaviours more practical in a workplace intervention (Quist et al., 2014). For example, interventions may be targeted at different work units or departments (with similar demographic characteristics) without the need to target individuals based on demographic factors such as age or BMI, which may be seen as discriminatory in the workplace.

Millennials, as an age group (defined broadly as those born between 1982 and 2004), have been the subject of much study in a range of academic disciplines. Data shows that obesity increases as children become young adults and first enter the workforce, but very few interventions specifically target this age group (Watts, Laska, Larson, & Neumark-Sztainer, 2016). In a cross-sectional study of 1,538 employed young adults in the US, the workplace environment that participants were exposed to had a direct impact on their weight (Watts et al., 2016). Millennials reported challenges in maintaining a healthy weight when fizzy drinks were easily available, a fast food restaurant could be reached within a 5-minute walk, they live more than 30 minutes' walk away from work, and there are poor opportunities to access healthy eating and exercise opportunities at work. While the workplace will be unable to prevent fast-food restaurants being built near the office, they may be able to provide healthy alternatives that encourage employees to access healthier foods than

the high fat and sugar alternatives of a fast food restaurant. Likewise, removing fizzy drink vending machines could also reduce consumption, and promoting cycling to work or healthy commuting may also support younger employees to maintain a healthy weight.

Overweight participants benefitted the most from an intervention designed to modify nutrition and physical activity behaviours in a health promotion intervention at a German logistics company (Mache et al., 2015). The longitudinal study of 1,753 employees had an intervention and a control group who were surveyed at baseline, at 6 months and 12 months. Employees in the intervention group were invited to participate in coaching to foster motivation towards physical activity, eating healthy foods, and achieving a healthy BMI. Changes in eating behaviours (fruit and vegetable consumption and healthy eating) were more significant in the *overweight* group than in the *normal-weight* group, however the intervention did not have a significant impact on BMI pre- and post-intervention, with no significant weight loss attributed to the change in eating behaviours. Readiness to change was assessed for all BMI groups pre- and post-intervention, and it was found that, for the overweight group, 35% of participants at baseline were in the preparation stage, with 8% in the action or maintenance stage and this increased significantly to 53% in the preparation stage and 12% in the action or maintenance stage following the intervention. This suggests that while weight loss was not significant in the overweight category, readiness to change eating behaviours increased and further data collection in a further 6 or 12 months' time may reveal weight loss associated with changing behaviours (Mache et al., 2015). While the study was limited in the self-selection and self-report

design, it benefited from the longitudinal data collection and presented findings that should be considered in future workplace interventions. It also demonstrated that targeting interventions to different weight groups may enable interventions to be more effective, and when done using participant self-selection it may not be considered as discriminatory.

Workplace interventions to promote healthy eating were found to have only limited effectiveness in a systematic review of 17 workplace interventions in Europe promoting healthy eating (Maes et al., 2011). The review incorporated a wide range of studies with differing design and intervention types, and found limited effects of multi-component, educational dietary interventions on dietary behaviours and weight in the workplace. The review highlights the lack of consistency in intervention design in this area. There is an acknowledgement that randomised control trials (RCTs) would enable more effective analysis of the impact of interventions on behaviours, however these are often inappropriate and unachievable in a workplace setting (Maes et al., 2011). This demonstrates a need for further analysis in this area and more consistency in intervention design. None of the studies included in the review were targeted for specific socioeconomic or demographic groups (such as age or BMI).

Modification of food choices in a workplace canteen can be an effective way of promoting the healthy food habits of employees (Raulio, Roos, & Prättälä, 2010). In a Finnish review examining both school and workplace meal modification, the researchers identified that 30% of employed adults regularly ate in a workplace canteen and 45% of females and 30% of males prepare a packed lunch for work. Those who did eat in the workplace

canteen generally had a higher SES (measured by years in education) and lived

within the city of Helsinki, than those who bring a packed lunch. Employees

with a lower income were also less likely to consume food from a canteen.

These findings are relevant for the design of workplace interventions to modify

healthy eating behaviour. As previously reported (McGill et al., 2015), price

changes may be the most effective intervention to modify health behaviours

without widening inequalities. Offering healthy choices in the canteens

frequented by the participants of the Finnish studies may, on its own, be

ineffective in improving the health of the workforce, as those of lower SES are

less likely to use them. Subsiding or reducing the price of healthy food in the

canteen may be more effective.

In a study of two Scottish worksites, price incentives were used to

promote healthy eating with modest results (Mackison, Mooney, Macleod, &

Anderson, 2016). The researchers encountered methodological challenges in

measuring food consumption during the study. Reducing portion sizes in the

workplace canteen did lead to increased purchase of the lower calorie meals,

however it was not possible to establish if individuals who consumed those

meals then snacked or ate additional calories because of the smaller portion

size. The intervention was assessed using canteen purchase data and

questionnaire data, but a poor response rate in the questionnaires meant that the

evaluation was limited. This study demonstrates the challenge of effectively

evaluating dietary modification interventions in the workplace.

Choice architecture has long been used to encourage consumers to

make certain decisions in a supermarket – product placement is designed to

encourage purchase and manufacturers pay a premium to have their products

placed in the eye of sight to ensure consumers pick their product rather than that of the competition. A similar approach has been tested in the workplace to *nudge* employees to make healthy decisions. A nudge is designed to modify an individual's behaviour, but without modifying other aspects such as price or prohibiting the purchase of unhealthy options (Boers, De Breucker, Van den Broucke, & Luminet, 2017). A review of studies in a range of settings was carried out to assess the effectiveness of nudging to increase the consumption of fruits and vegetables (Boers et al., 2017). Three categories of nudges were defined in the review: (1) *altering properties* such as size, functional design, and labels, (2) *altering placement* such as the location and availability of the item and (3) *altering both properties and placement* using a combination of nudges. Twelve studies were included in the review, deemed quality studies based on their effect sizes, however only one was carried out in the workplace and one was carried out in a conference setting; the rest were all in schools, university, and hospital settings which may therefore limit the generalisability of the study findings. The review identified a moderate overall effect size of the effectiveness of increasing fruit and vegetable consumption through nudging (d=.30). Altering the properties of the products (such as size, functional design, and labels) was ineffective in increasing consumption – although one might argue it may be challenging to change the size, design, and labels on a piece of fruit. A significant effect was found for altering the placement of fruits and vegetables ($d = .39$) and combining the alteration of placement and properties ($d = .28$). This suggests that nudging could be an effective way of increasing the consumption of fruits and vegetables in the

workplace, however further research specifically on the workplace is required to verify these findings.

A workplace systematic review of 22 studies concluded that only one study had been effective in improving the weight or BMI of employees through a *choice architecture* intervention, however 13 of the studies did report significant changes in eating behaviours (Allan et al., 2017). The initial literature search identified 8,157 articles, but the inclusion criteria narrowed this down to the 22 studies included in the review. Studies were excluded if they were not intervention studies, did not involve environmental changes, and were not in the workplace. The most common strategy to modify choice-architecture was labelling. This was either to display the nutritional components of the food choice or to indicate how healthy it was. Other studies modified the availability of healthy foods, prompted the purchase of healthy foods at purchase points (for example at the till when paying for food in a canteen), or subsidised or reduced the cost of healthy foods. Only one intervention changed the presentation of foods, two altered the size of portions, and four changed the accessibility of healthy food options. As a result of methodological limitations, effect sizes could not be calculated, but studies did suggest that choice architecture could be used to modify behaviours. Longitudinal studies are needed to identify if these behaviour modifications are maintained over time, rather than over the short duration of an intervention such as a few weeks. It is challenging to test the effect of choice architecture on weight, as an employee may be nudged into making a healthy choice in the workplace, but they may compensate with unhealthy behaviours outside of the workplace. This emphasises the importance of understanding employee

behaviour not only in the workplace, but also as consumers outside of the workplace.

A creative workplace intervention designed to increase consumption of vegetables in the workplace used consumer marketing to influence choices (Turnwald, Boles, & Crum, 2017). The study carried out in a university cafeteria over 46 days featured a vegetable on the menu each day with a descriptor that was either *basic*, *healthy restrictive*, *healthy positive,* or *indulgent*; diners were observed each day in the cafeteria and their selections analysed. For example, a basic description was 'carrots', indulgent was 'twisted citrus-glazed carrots', healthy positive was 'smart-choice vitamin citrus carrots' and healthy restrictive was 'carrots with sugar-free citrus dressing'. Over the course of the study, 8,279 of 27,933 total diners selected the vegetable choice of the day (29.6%). Labelling was found to have a significant effect on the selection of vegetables with a 25% higher consumption with an indulgent label in comparison to the basic descriptor, 41% higher than the healthy restrictive descriptor, and 35% higher than the healthy positive descriptor. Overall mass of vegetables consumed was also influenced with 23% higher consumption with the indulgent descriptor compared to the basic descriptor. This study suggests that even small changes to the way vegetables are labelled can have a significant influence on consumption (Turnwald et al., 2017). Interventions that are creative with the labelling of healthy options in workplace canteens may, therefore, be effective and cheap, methods of influencing purchasing behaviours.

The current section represents an overview of intervention studies in the workplace designed to improve healthy eating among employed adults.

The varied methodologies and approach demonstrate a variety of ways the workplace can be used to influence health behaviour change. It also suggests that to have a positive influence, multiple interventions, and approaches may be needed to be effective for the range of employees who may be employed in an organisation. To decide where to focus their interventions (and potential budget) an organisation would benefit from a greater knowledge of employee health behaviours to allow them to be targeted in their approach.

2.5 Key Findings of the Review and Aims of the Investigation

SES is a complex construct that should be measured incorporating multiple factors such as income, education, and occupation type. The relationship between obesity and SES tends to show a tendency for lower SES groups to have higher rates of obesity than higher groups. This relationship may be moderated by diet (including fruit and vegetable consumption) and eating behaviours.

2.5.1 Based on the literature the following conclusions can be drawn:

1) Education, occupational class, and income are the most often used measures of SES (Lahelma et al., 2003; McLaren, 2007; Sobal & Stunkard, 1989).

2) Education determines health through knowledge and non-material resources that promote a healthy lifestyle. Education also influences choice of occupation and therefore income (Lallukka et al., 2007).

3) Income may be measured as individual or household income and is mostly derived from paid employment. Income determines purchasing power and therefore the ability to obtain the resources to maintain good health (Lahelma et al., 2003).

4) Occupation, or occupational class, is generally measured by job type and may also reflect social class and an individual's power and status, in addition to the income they receive (Lahelma et al., 2004).

5) Gender differences are found in the relationship between occupational type and obesity, with females showing an increased risk of obesity in lower occupational groups, whereas a non-linear relationship is observed for men (Wardle et al., 2002).

6) There is a socioeconomic gradient in diet. People in higher SES groups tend to have healthier diets and consume more fruit and vegetables than those in lower SES groups (McLaren, 2007).

7) Dietary cost may determine dietary decision making (Timmins et al., 2013). The cost of food has been seen to influence those of a lower SES more than those in higher groups (Darmon & Drewnowski, 2007; Drewnowski, 2009; Lallukka et al., 2007; Timmins et al., 2013).

8) Age-related gradients in eating behaviours have been observed, with older people consuming more fruits and vegetables and reporting the consumption of a healthier diet more than younger groups. (Chambers et al., 2008; Lallukka et al., 2007; McLaren, 2007; Timmins et al., 2013).

9) Obesity (measured by BMI) may be an outcome or a determinant of eating behaviours. Mixed evidence has been presented on the influence of obesity on various eating behaviours (Mesas et al., 2011), and it has been found that individuals with a higher BMI exhibit higher levels of disinhibition than those of a healthy weight (Harden et al., 2009).

10) Dieting, eating past the point of feeling full (disinhibition), and the use of restraint in eating may mediate the relationship between SES and obesity (Sobal and Stunkard, 1989).

11) Fruit and vegetable consumption have been shown to be influenced by income and education (Lallukka et al., 2007).

12) Workplace interventions designed to improve healthy eating behaviours use varied methodologies and evaluation, to varying effect. Studies include adjusting the cost of food in the workplace (McGill et al., 2015), implementing workplace weight loss courses through dietary modification or physical activity (Anderson et al., 2009; Morgan et al., 2011), nutritional education (Maes et al., 2011), changing the way food is displayed or marketed in a workplace setting (Raulio et al., 2010) or using the principle of 'choice-architecture' and nudges (Boers, De Breucker, Van den Brouke, & Luminet, 2017).

13) The effectiveness of workplace interventions may vary for socioeconomic group (Beauchamp et al., 2014; Montano, Hoven, & Siegrist, 2014; McGill et al., 2015), for age group (Watts et al., 2016) and for weight status (Mache et al., 2015).

2.5.2 This thesis aims to address a number of the limitations of the current literature

1) Most research examining the socioeconomic and demographic characteristics of individuals and their eating behaviours is based on community studies, rather than the workplace.

2) Many of the studies in this review were cross-sectional in nature and therefore causality was limited. Future studies would benefit from a longitudinal study design.

3) Studies looking at dietary restraint, and disinhibition, tend to focus on women. Future studies would benefit from an investigation into the impact of dietary restraint for both genders in multiple SES groups.

4) The relationship between fruit and vegetable intake and income may be moderated by gender, age, and ethnicity, however these relationships were not specifically investigated in the literature.

5) The Whitehall II studies of civil servants measure SES by occupational grade, and do not look at education and income as separate measures. The use of all three measures may be of benefit to the understanding of civil service employees.

6) Inconsistent results are found in the relationship between income and weight gain, whereas education and occupational type are associated with weight gain over time.

7) Eating behaviour is often assessed using a single measure, such as healthy diet or vegetable consumption, rather than as multiple measures.

8) Fruit consumption and vegetable consumption are often grouped into one measure, but research suggests behaviours may differ for each.

9) No studies could be found examining the cost of food influencing purchasing behaviour in the workplace; while intervention studies exist that modify the costs of food, none could be identified examining the

extent to which employees eating behaviours at work are influenced by cost.

2.6 Summary

The literature review presented in this chapter covers both socioeconomic and demographic and personal factors and their influence on eating behaviours in both workplace and community-based studies. Interventions designed to modify employee behaviours were considered and suggestions made for future development. In order to develop interventions designed to change eating behaviours in the workplace, it is important to understand both socioeconomic and sociodemographic differences to tailor the intervention for maximum effectiveness.

Key findings and limitations of the literature are presented. These findings and limitations have informed both the study aims and the research questions presented in each chapter. The next chapter presents the methodology for quantitative investigation of the aims in a workplace setting. The subsequent chapters present results and discussions of the descriptive epidemiology, cross-sectional, prospective, and longitudinal analysis and finally the influence of age and BMI on eating behaviours. The barriers and facilitators to healthy eating in the workplace are presented through an additional literature review and qualitative analysis in Chapter 7.

Chapter 3: Quantitative Study Context and Methods

Building on the aims identified through the literature review in Chapter 2, the current chapter presents the context and methods for the quantitative study presented in this thesis. The study was carried out on employees working in the NICS at two separate time points (2012 and 2014), which allowed for multiple forms of analysis detailed in this chapter. The majority of questions used in the survey were pre-determined as part of the Stormont Study design prior to the commencement of this thesis. However, two additional questions were added to the 2014 survey to reflect the literature review presented in Chapter 2.

The aim of the analyses was to investigate the limitations identified in the literature presented in Chapter 2, and identify the strength of the relationships between eating behaviours, socioeconomic status, and demographic and personal factors. Given most research on eating behaviours comes from community studies the current workplace study aims to identify relationships in the workplace in order to better inform interventions. Four research questions were investigated through descriptive epidemiology, and cross-sectional, prospective, and longitudinal analysis:

(1) What is the descriptive profile of eating behaviours for employees of NICS?

(2) Is SES, as measured by education, salary band, and grade, associated with eating behaviours?

(3) Is SES, as measured by education, salary band, and grade, associated with obesity (measured by BMI)?

(4) Are demographic factors associated with eating behaviours?

In order to address the first four research questions, a descriptive epidemiology presented descriptive results in addition to the descriptive profile for the five indices of eating behaviour, stratified by three indices of SES and four demographic characteristics. Cross-sectional analysis was carried out on the 2014 data set, enabling investigation of the relationships between all five eating behaviours, socioeconomic status, and demographic characteristics. The five eating behaviours were also subject to prospective analysis in their relationships with the SES and demographic and personal characteristics reported in the 2012 data set. Longitudinal analysis was carried out for the three eating behaviours, collected at both the 2012 and 2014 surveys, to understand their relationship with SES and demographic and personal characteristics. Two further research questions were identified as a result of the analysis outlined above:

(5) Do eating behaviours differ between age groups?

(6) Do eating behaviours differ between weight (BMI) groupings?

In order to address research questions four and five, one-way ANOVA were applied to BMI and age as separate constructs with the five eating behaviours to further investigate the significant relationships identified in the earlier quantitative analysis. To explore the interaction between age and BMI, on the five eating behaviours, two-way ANOVA were carried out.

The current chapter has been divided into six sections. The first section details the background to the study and presents the organisational context. The next two sections detail the participants who took part in the study and the measures used. Finally, the procedure, ethics and data analysis techniques are presented. The results and discussions are presented in Chapters 3, 4, 5, and 6.

3.1 Study Context

The Stormont Study is a large-scale research project designed to track a cohort of employees in the NICS both throughout and following on from their employment there. It was the brainchild of Professor Ken Addley who, prior to retirement in 2016, was head of the NICS Occupational Health Unit. In creating the Stormont Study, Professor Addley sought to emulate and develop on the Whitehall II study that had tracked a group of London-based civil servants since the mid-1980s.

NICS is one of Northern Ireland's largest employers. It is a public sector organisation employing 27,667 full-time employees and 194 temporary staff; 13,539 male and 13,952 female (NISRA, 2014). NICS consists of 12 government departments and employees work in a range of professions/roles from industrial or administration/clerical roles, through to more senior executive roles, with a wide range of salaries. NICS provides a range of services to the public of Northern Ireland such as staffing prisons, maintaining roads, paying benefits and pensions, and providing services to industry and agriculture (Northern Ireland Civil Service, n.d.). Civil service employees are generally called civil servants.

The Stormont Study tracked a large cohort of employees within NICS and was designed to add to, and test, the body of research generated by the Whitehall II studies in London on English civil servants focused on psychosocial risks in the workplace and health outcomes (University College London, n.d.). The study was also designed as a way for the NICS to better understand the health and wellbeing of their employees to ensure they identified areas of concern to address issues. With this goal in mind, a

quantitative survey was developed and administered to all employees with an email address at NICS in 2005, 2009, 2012, and 2014. This thesis presents data collected from the 2012 and 2014 surveys.

3.2 Measures

The Stormont Study questionnaire consisted of demographic questions and organisational psychology measures such as psychological hazard exposures, health behaviours (smoking, alcohol consumption, diet, physical activity, and sleep), and job characteristics. The variables of interest in this study are outlined in Table 3.1. In addition to the demographic variables (age, gender, and number of dependants) included in the Stormont Study questionnaire are the measures of SES (SES), education, income, and job type, weight as measured by BMI, and five eating behaviours. The following sections present the measures used in this analysis.

Table 3.1

Socioeconomic status, demographic characteristics, and eating behaviour variables, from the 2012 and 2014 Stormont Study questionnaires, used in current analysis.

Construct	Survey	Variable	Categories
Socioeconomic Status	2012 & 2014	Education	No academic qualification; School Certificate, O Level, GCSE, A Level, SCE Higher, National Diploma/Certificate; Undergraduate Degree, Postgraduate Degree.
	2012 & 2014	Salary band	£10,001-£15,000; *£5,000 increments up to* More than £100,000.
	2012 & 2014	Grade	Industrial and Administrative Roles; Exec Officer, Staff Officer, Deputy Principal; Grade 7 (Principal) and above.
Demographic Characteristics	2012 & 2014	Weight BMI (kg/m²) measured by	Underweight ($\leq$ 18.4); Healthy Weight (18.5 – 24.9); Overweight (25 – 29.9);

		weight (kg) and height (m).	Obese I (30 – 34.9); Obese (II, III) (35 ≥).
	2012 & 2014	Age	Insert number.
	2012 & 2014	Gender	Male; Female.
	2012 & 2014	Number of dependants	0;1-2; ≥3
Eating Behaviour	2012 & 2014	Vegetable intake	Insert number
	2012 & 2014	Fruit intake	Insert number
	2012 & 2014	Healthy well-balanced diet	Yes; No; Don't Know.
	Added in 2014	Cost of food influencing purchasing behaviours	A lot; Entirely; Somewhat; A little; Not at all.
	Added in 2014	Eating past the point of feeling full	Every day; Often; Sometimes; Rarely; Never.

3.2.1 Background

Quantitative research is designed to measure relationships between attributes or categories, whereas qualitative research emphasises meanings and descriptions (Coolican, 2009). There has long been a debate in scientific

research as to the pros and cons of each approach. The current research employs a mixed-methods design enabling the use of both quantitative and qualitative data, which addresses the pros and cons attributed to both approaches. Chapter 7 will discuss the use of qualitative data in more depth. Quantitative data collection has historically been the primary means of collecting data to enable the development of *laws* that account for the relationships between the variables studied (Coolican, 2009). Quantitative approaches tend to use standardised measurement instruments and test *theory-driven hypotheses* using statistical analysis techniques (Taris, de Lange, & Kompier, 2010). Advocates for quantitative research argue that quantitative data collection allows for the objective analysis of data free from opinions and interpretative biases (Robson, 2011). Quantitative data allows the study of narrow fields of information in a highly structured setting, and with scientific rigour conclusions can be drawn as to the strength and direction of these relationships (Coolican, 2009). A criticism of quantitative data collection is that it may tell us the strength of the relationship, but does not always tell us why a phenomenon has occurred; "*facts* and *values* cannot be separated" (Robson, 2011, p. 21).

The Stormont Study consisted of a single self-report anonymous questionnaire in 2012 and 2014. Questionnaires are commonly used in social science research as they are an efficient method for gathering data (Robson, 2011). Given that the objective of the Stormont Study was to understand the workplace characteristics of as many employees as possible, a non-experimental design was used, i.e. employees were not randomly assigned to take part (Taris et al., 2010). The advantages of using a survey in this context

is that it allows for the collection of large amounts of data in a relatively short time-frame and is straightforward to administer. The Stormont Study was administered online and the link to participate sent via email, so for the organisation taking part in the research it is minimally invasive and easy to deploy. A large range of standardised data can be collected in a survey, thus allowing for comparisons between and within individual characteristics of the individuals under investigation (Robson, 2011). In organisational research, the anonymity of an online questionnaire may encourage more employees to take part and share their opinions more readily than if they had to hand in a paper survey or sign their name to their answers (Robson, 2011). Questionnaires also have their drawbacks and the issues of self-reported social desirability bias or recall bias may impact results (Robson, 2011). For example, employees may respond in a way they perceive their employer would wish them to respond, rather than giving their true opinion. Likewise, the employee may not remember how many portions of fruit they have on average each week, and may guess at the amount. A further challenge may be low response rates. However, comparisons with other similar studies may suggest a response rate 'norm' for the field that typifies relatively low response rates in a given research area and study population size which still allows for comparison with the current literature (Houdmont, Kerr, & Addley, 2015). Given that the characteristics of non-respondents are often unknown, it is challenging to establish whether the responses to the survey are representative of the study population as a whole (Robson, 2011). There are some arguments that suggest the existence of a *healthy worker effect* whereby employees with long-term health conditions or who are absent from work because of illness may be

missed from the questionnaire, thus capturing data for only healthy workers (Etter & Perneger, 1997). There may also be an argument to say that online surveys (such as the Stormont Study may favour those employees who have more ready access to information technology (IT) and those who feel more confident in using IT (Robson, 2011).

A further challenge of questionnaire data is the representativeness and generalisability of data collected. In organisational samples, it may be possible to measure the representativeness of the data collected through comparisons of the study demographics with those of the wider organisation as a whole. However, this is not always possible and is highly dependent on the data that the organisation collects and is able to share on the wider workforce. Assumptions from the data must also be made with caution given the profile of the study sample may not only differ from the organisation as a whole, but it may also not be representative of other organisations or regions. Therefore, care must be taken not to generalise in the application of the findings (Coolican, 2009). Despite these limitations and challenges, quantitative data collection through questionnaire remains one of the most common forms of data collection and therefore a useful way of understanding health behaviours in the workplace (Taris et al., 2010). The current study relies on single-item measures due to the breadth of data collected through the Stormont Study - "although single-item measures of psychological constructs are sometimes assumed to have low reliability and validity, if the meaning of the construct is clear to the respondent, a single-item approach may be adequate" (Houdmont, Kerr & Addley, 2012, p.99). The following sections outline the measures used for each of the constructs used in the current study.

3.2.2 Weight

Weight was measured using BMI. Participants were asked to report their height and weight, and a calculation of BMI (weight divided by height squared) was made during analysis of the survey findings. Obesity is defined as having a BMI greater than 30kg/m² and overweight as having a BMI of greater than 25kg/m² (Schulte et al., 2007). While BMI is not always the most accurate measure of obesity (it cannot be used to differentiate between muscle and fat) it is the most accessible and widely used in obesity literature. BMI is often self-reported and biased downwards (Ng et al., 2014) and it has been observed that women often under-report their weight, while men may over-report their height (Ng et al., 2014). Despite these limitations, in a survey format, BMI offers an easily administered method for assessing weight status in large samples.

3.2.3 Measures of SES

The literature review presented in Chapter 2 suggests that education, job grade, and salary tend to be the most often used measures of SES (Lahelma et al., 2003; McLaren, 2007; Sobal & Stunkard, 1989). These, however, are not used exclusively to measure SES, with some studies including parental SES (Sobal & Stunkard, 1989), neighbourhood deprivation (Stafford et al., 2010) and childhood SES (Laaksonen et al., 2004). The current study uses just three measures of SES (salary, education, and job type) as it could be argued that these are the most appropriate measures for occupational studies given their use in the exsisting literature, and thereore the opportunity for comparison with other studies. Parental and childhood SES can be argued to be more

appropriately used for community-based studies and their validity may be limited because of recall bias (Lahelma, et al., 2003).

In the current study, salary was measured on a self-selection of one of 19 options increasing in £5,000 increments from £10,001-£15,000 to £95,001-£100,000 and finally more than £100,000. Job type was based on NICS job grading and eight options were given for self-report ranging from senior civil service roles (*option 1*) down to administrative roles (*option 6*) and industrial roles (*option 7*). Education was measured with 5 options from (1) no educational obtainment; (2) School Certificate, GCSEs or O Level; (3) A Level, City and Guilds, and Diplomas; (4) Degree (BSc or BA); and (5) Higher Degree (MSc, MA, PhD) or professional qualifications.

The use of single-item measures in organisational research are useful because of practical constraints, such as survey length and time constraints of the respondents, and therefore can increase response rates (Fisher, Matthews, & Gibbons, 2016). While there are some limitations with single-item measures – such as concerns with validity and specificity – in some circumstances where it is not possible to ask multiple questions, a single-item measure can be a valuable alternative to be able to carry out organisational research (Fisher, Matthews, & Gibbons, 2015). It has also been argued that single-item measures are useful to obtain a 'snap-shot' of an area of interest rather than an in depth diagnosis (Houdmont, Kerr, & Addley, 2015). In the current study, there was only limited opportunity to add to the question set, because of pressures to reduce the number of questions used in the 2012 NICS survey, however it was possible to add a single item measure for each of two

additional eating behaviours identified as of interest in the review of the
literature.

3.2.4 Eating behaviours

Five eating behaviours were included in the current study. Three were
included by the team of researchers that developed the Stormont Study in
2009. A further two questions were added by the current researcher as a result
of the literature review presented in Chapter 2. Reviews carried out by Sobal
and Stunkard (1989) and McLaren (2007) both took the view that restraint and
disinhibition were important mediators of eating behaviours and therefore the
propensity for obesity. These papers, in addition to work by Drewnowski
(2009), also identified cost of food as an important determinant of eating
behaviours. Therefore the current researcher was able to justify the inclusion
of these two new measures to the team running the Stormont Study, and as a
result they were included in the 2014 survey.

Diet was measured using a single-item measure "*Do you believe you
have a healthy balanced diet?"* where respondents could select from (1) yes,
(2) no or (3) don't know. Vegetable consumption and fruit consumption were
included as two separate items in the Stormont Study question set. Participants
were asked to input how many portions they consumed each day, on average.
Guidance was given to participants on what a portion of fruit or vegetables
constituted. In order to assess whether participants achieved the UK
Government recommendation of the consumption of five or more fruits and
vegetables a day, the two survey items were added together during elements of
the data analysis.

The current study uses a one-question measure of dietary disinhibition *how often do you eat past the point of feeling full?* on a 5 point Likert scale with (1) *never*, (2) *rarely*, (3) *sometimes*, (4) *often* and (5) *every day*. Given the constraints of adding questions to the Stormont Study question set, it was decided that a one-item measure that covered disinhibition, and to some extent, dietary restraint, would be appropriate; the one question measure was based on the Stunkard and Messick Three Factor Eating Questionnaire TFEQ (1984). Only one study was found examining dietary disinhibition, restraint, and SES in the workplace for both genders (Dykes et al., 2004). There is limited literature on disinhibition in eating; the Restraint Scale (RS) by Herman and Polivy (1980) only looks at restraint and the Three Factor Model of Dietary Restraint (Stunkard & Messick, 1984) includes dietary restraint, hunger, and disinhibition, yet most literature focuses on just the dietary restraint element of the questionnaire (Bryant et al., 2007). *How often do you eat past the point of feeling full?* gives an indication of an individual's propensity towards both restraint and disinhibition.

Energy-dense foods are often low cost and highly palatable, containing mostly fats and sugars, and they are quick and easy to access. Because of their low cost, they are more likely to be consumed by low income households, and because of their high energy density are likely to lead to obesity (Drewnowski, 2009). To explore the relations between food cost and purchasing behaviour in the workplace, a one item measure of diet cost was inserted into the 2014 Stormont Study question set. The question *what extent does the cost of food influence what you buy?* was measured by a 5 point Likert scale from (1) *not at all*, (2) *a little*, (3) *somewhat*, (4) *a lot* and (5) *entirely*.

3.3 Procedure

Data were collected through a self-report wellbeing questionnaire sent to all NICS employees with an email address in 2012 and 2014 (approximately 26,000 individuals). The surveys were carried out 18 months apart in October 2012 and April 2014. The purpose of the survey was to gather data from as many employees as possible on individual health behaviours and psychosocial measures. The survey was sent via an email link for employees to access the online questionnaire. Communications to employees emphasised the confidentiality of responses, explained what the data was being collected for, and that the organisation would only use the aggregate information rather than individual data. The questionnaire remained open for four weeks to allow employees time to fill in the questionnaire. Administration and communication of the survey was carried out by NICS. Employee names were not requested in the survey and a unique code identifier was applied to the individual data collected to track respondent's answers over time. Only aggregated data were analysed, and no individuals could be identified through the course of the research. By completing the survey, employees consented for their data to be used for the purposes of the Stormont Study research project. In order to identify participants who completed the surveys in both 2012 and 2014, employees selected a unique identifying number by giving the first two letters of their postcode and their house number. This ensured that the responses given in 2012 could be matched with those in 2014 to enable longitudinal analysis.

The NICS data was post-cleaned by the team of researchers leading on the Stormont Study, and all incomplete data (individuals with fewer than 50%

of questions answered) were removed prior to this researcher receiving both data sets. Typographical errors and outliers had been removed. The current researcher removed participants with a BMI of above the obese II threshold of 45kg/m² and below the underweight category of 18 kg/m². The BMI was calculated following the survey and typographical errors in the entry of weight and height data may have contributed to the few outliers (the BMI amounts could not have been true values). It was decided to include participants with missing data (those who had completed more than 50% of questions) to maximise the reasonable use of data collected (Morgan, Leech, Gloeckner, & Barrett, 2013).

Given the introduction of two new questions in the 2014 dataset – eating past the point of feeling full and the cost of food influencing purchasing behaviours – as a result of the literature review, only cross-sectional analysis was possible for these questions. Prospective analysis was carried out to understand the relations between the SES and demographic characteristics in 2012 and the two new eating behaviours in 2014. Longitudinal analysis was carried out on the three eating behaviours included at both 2012 and 2014, fruit consumption, vegetable consumption, and the consumption of a healthy, well-balanced diet.

3.4 Ethics

The research was commissioned by the NICS Workplace Health Committee. Ethical approval was granted by the University of Ulster. This thesis follows the ethical code as outlined in the British Psychological Society (BPS) Code of Ethics (The British Psychological Society, 2009). The code of ethics follows four principles; (1) respect; (2) competence, (3) responsibility

and (4) integration. *Respect* includes the consideration, and fair treatment of individual, role, and cultural differences, in addition to the protected characteristics outlined in the Equality Act 2010. The protected characteristics are age, disability, ethnicity, sex, race, religion, sexual orientation, gender reassignment, and marital or civil partnership status. Respect also includes consent (for the release of personal information), appropriate record keeping, and confidentiality (all maintained through the collection and keeping of the NICS data). *Competence* relates to the maintenance of standards of competence and continuing professional development (CPD). In adherence with University of Nottingham requirements for CPD, and aligned with the BPS Code, this researcher underwent several training courses to ensure that the skills needed to analyse and present the current research were developed. *Responsibility* is to ensure the avoidance of harm through practice and to prevent misuse of data or contributions to society. With this in mind, the current research ensured that participants were aware of the uses their data would be put to and were made aware of support available in case of adverse reactions to participation. *Integration* includes accuracy, clarity, honesty, and fairness in practice, and in the interpretation and presentation of findings, this includes acknowledging limitations. The current thesis ensures that when results are displayed and discussed, the potential limitations of the data are also acknowledged, and potential development opportunities shared. The data collected were stored and handled in order to comply with the UK Data Protection Act, 1998.

3.5 Data Analysis

The current section presents the study methodology and statistical methods used in the quantitative analysis of socioeconomic and demographic characteristics, and eating behaviours of employees of the NICS. The types of analysis and statistical methods used are discussed in the next sections in relation to the research questions posed in Chapter 2.

3.5.1 Cross-sectional study

Cross-sectional studies remain one of the most commonly used methods of analysis and are useful in establishing whether relations between variables exist and therefore whether further study of an area is warranted (Taris et al., 2010). The advantage of a cross-sectional study is that it can support the development of theories by enabling the testing of a hypothesis or research question at a point in time (Coolican, 2009). Cross-sectional studies can be relatively cheap to carry out, ensure maximum participation rates (attrition may occur with longitudinal study), and, because of their nature, participants will be unlikely to become *wise* to the study having carried out the same questions more than once and perhaps adjusting their responses based on prior knowledge or what they think they researcher wants to find out (Coolican, 2009). As cross-sectional analysis allows for analysis of data collected only at one point in time, the temporal order of variables and causality between the variables under investigation cannot be established and change over time in individuals cannot be observed (Coolican, 2009). Cross-sectional studies are therefore limited in the control, prediction, and explanation of relations between variables (Robson, 2011). However, despite these limitations in the current study the use of cross-sectional analysis allows

for the analysis of all five eating behaviours, including those added into the data set at T2 as a result of the literature review presented in Chapter 2. This method therefore allows the research questions to be tested and recommendations to be made for further study.

3.5.2 Prospective study

Prospective analysis allows for analysis of data collected between two time points in the absence of a full panel design (described in the next section on longitudinal analysis). It allows for some temporal ordering of variables, therefore offering insight into the order in which variables have influence and possible the direction of causation. In a prospective study, data collected at one earlier point in time can be used to predict the status of a variable (or variables) collected at a second, later, point in time. The Framingham Heart Study (FHS) is an example of a prospective study designed to explore the risk factors for cardiovascular disease of inhabitants recruited from the town of Framingham, Massachusetts (Tsao & Vasan, 2015). Participants have been medically examined every 2-4 years, since the data collection first began in 1957, and prospective analysis used to identify potential risk factors shared by those participants who went on to experience cardiovascular disease and other illnesses. The benefit of a prospective study for medical research is that it would not be possible to control for the illness in an initial round of data collection (simply because the individual does not have the illness yet) and therefore longitudinal analysis would not be possible. To address the challenges of cross-sectional studies, the prospective study design allows for insight into the direction of causation and therefore causal inferences can be made (Tsao & Vasan, 2015).

In the current study, two new eating behaviour questions were added to the data collection at T2; cost of food influencing purchasing behaviour and eating past the point of feeling full. As these outcome variables were not included at T1, it was not possible to control for the variable at T1, and therefore produce longitudinal analysis. The study of these two new variables through cross-sectional analysis did not allow for causal inferences to be made and therefore to overcome this methodological constraint prospective analysis was carried out. All other variables under investigation (SES and demographic factors) remained constant between T1 and T2. Prospective linear regression analysis was carried out using the SES and demographic variables at T1 compared with the eating behaviour at T2.

3.5.3 Longitudinal study

Longitudinal studies allow for the examination of changes across time and the prediction of outcomes between variables, from data collected at two or more time-points (Taris et al., 2010). As a result of the need for data collection at more than one point in time, and the time lag required between collection longitudinal studies are less common than those of cross-sectional design. Between 2010 and 2014 it was found that only 29% of studies were of longitudinal design in a review of 283 papers published in the two leading occupational health psychology journals (Spector & Pindek, 2015). Longitudinal studies can follow changes in the same individuals over time, and the stability of the relations between variables is especially useful for testing the effect of an intervention in that cohort. A unique identifier must be applied to each individual, so their data can be matched at each data collection time point. There is a risk of attrition in longitudinal research design; participants

may recognise the questions and give the researchers the answers they may be looking for (rather than answering honestly) and applying modifications to the method of data collection between the multiple time points may impact objective comparison between datasets (Coolican, 2009).

In the current study, only those variables studied at both data collection points (i.e. a panel design) could be included in the longitudinal analysis (Coolican, 2009). The time lag between data collection in the current study was agreed between NICS and the researchers who designed the Stormont Study design before the current doctoral thesis investigation began. Convenience and practicality in the organisation dictated the time lag between data collection as is commonly found in organisational research (Taris & Kompier, 2014). The number of data collection waves used in a longitudinal study will generally be influenced by the organisation under investigation (Taris & Kompier, 2014). Data collection for the Stormont Study occurred in 2005, 2009, 2012, and 2014 – data from 2012 and 2014 were made available for the current research. No further data collection occurred at NICS after 2014 because the organisational contact who coordinated each wave of the study had retired.

A key strength of longitudinal analysis is the ability to make causal inferences as a result of analysis (Taris et al., 2010). Causal inferences can be made from longitudinal analysis if: (1) the causal variable is preceded by the outcome variable in time, (2) a statistically significant relationship between the two variables is present, (3) the possibility of a theoretical interpretation of the relationship is met, and (4) all alternative explanations have been excluded. It is important to note that causal relationships can never be proved, as it is not

possible to exclude the possibility that the associations observed are because of variables not included in the study; one can only argue that it is plausible that the statistical association is because of the variables under investigation (Taris & Kompier, 2003).

3.5.4 Statistical significance

Inferential statistic tests examine the statistical relationships between variables to identify statistical significance (Robson, 2011). The statistical test is designed to test the assumption of null hypothesis, i.e. that no relations exist between the variables, and therefore assist in ruling out that the results could be because of random factors. The alpha level, the a priori criterion for the probability of falsely rejecting the null hypothesis, of 5% probability ($p < 0.05$) has been applied as a minimum level for the identification of statistical significance in the current research.

3.5.5 Statistical methods

Statistical analysis was carried out using IBM SPSS Statistics for Windows version 21 to address the following research questions.

1) What is the descriptive profile of eating behaviours for employees of NICS?

2) Is SES, as measured by education, salary band, and grade, associated with eating behaviours?

3) Is SES, as measured by education, salary band, and grade, associated with obesity (measured by BMI)?

4) Are demographic factors associated with eating behaviours?

5) Do eating behaviours differ between age groups?

6) Do eating behaviours differ between weight (BMI) groupings?

Several statistical analysis techniques were used. The following sections outline the methods used.

3.5.5.1 Chi-square

To address research questions (1), (2) (3) and (4) descriptive results and a descriptive epidemiology of eating behaviours were presented to present the "*facts*, that is, on a particular state of affairs." (Schaufeli, 2004, p. 509). To examine cross-sectional differences, at both time points (2012 and 2014) between socioeconomic and demographic groups, a chi-square analysis was undertaken. Chi-square is a nonparametric statistical measure used, when both variables under investigation are nominal or dichotomous, to measure the difference between groups (Morgan, Leech, Gloeckner, & Barrett, 2013). The greater the difference between the frequencies between the cross-tabulation cells, the greater the chi-square (Robson, 2011). The eating behaviours in the current study were dichotomised into groups (detailed below) to understand the association between the variables by allowing between-group comparisons to be made. Comparisons were made between individuals who consume the Government-recommended fruit and vegetable intake and those who do not, and individuals who believe they consume a healthy, well-balanced diet compared to those who do not believe they consume a healthy, well-balanced diet. Chi square analysis was also undertaken for the two eating behaviours introduced to the 2014 survey (cost of food influencing purchasing behaviours and eating past the point of feeling full). Socioeconomic and demographic factors of individuals were compared, at T2, with those whose purchasing behaviours are influenced by cost a lot or entirely, compared to those whose purchasing behaviours are influenced by cost only somewhat, a little, or not at

all, and those who eat past the point of feeling full sometimes, often or every day compared to those who eat past the point of feeling full never or rarely.

Weighted cases chi-square analyses were applied to gender of both the NICS employees and of study participants to identify the extent to which the participant sample was representative of the wider NICS employee population (Coolican, 2009).

The large sample size from the Stormont Study was suited to chi-squared analysis, as was the nature of the data (i.e. the independent variables under investigation were frequencies) and the participants studied were unique to only one observation cell (i.e. participants fell into one of the dichotomised variables but not both) (Coolican, 2009). "Chi-square requires a relatively large sample size and/or a relatively even split of the subjects among the levels because the expected counts in 80% of the cells should be greater than five" (Morgan et al., 2013, p. 1361). An alternative method of analysis might have been the *Fisher's Exact Test,* had the sample size been smaller, and a cross-tabulation of two variables at two levels was required (Morgan, Leech, Gloeckner, & Barrett, 2013). Given the multiple groups examined in the independent variables, the chi-squared test was the most appropriate in this instance.

3.5.5.2 Correlation and linear regression analysis

To further explore research questions (2), (3), and (4), cross-sectional, prospective, and longitudinal linear regression analyses were carried out in addition to correlation analysis. The differences between cross-sectional, prospective, and longitudinal study design were covered earlier in this section and therefore will not be repeated in the current discussion, which will focus

on the analysis techniques. Multiple linear regression predicts an outcome based on a linear combination of two or more predictor variables (Field, 2013). In the case of the current research, the outcome is the eating behaviour under investigation, the predictor variables are the measures of SES, and the control measures are the demographic factors. Regression analysis is used to assess the strength of the relationship – or line of best fit – between the outcome and predictor variables (Coolican, 2009). Regression analysis is one of the most commonly used statistical technique in organisational research; for example, in a review of 283 papers it was found that 45% of studies applied regression analyses in the two leading occupational health psychology journals between 2010 and 2014 (Spector & Pindek, 2015). One disadvantage of the use of multiple regression is the issue of multicollinearity, whereby two or more predictors overlap or are collecting similar information. This, however, can be controlled for through the use of correlation analysis prior to carrying out a regression analysis (Morgan, Leech, Gloeckner, & Barrett, 2013). Multiple regression also relies on a number of assumptions in the data; it assumes there is a linear relationship between the predictor variables and dependent variable and that variance is constant (Morgan et al., 2013).

To identify which demographic variables should be controlled for in the regression analysis, a Pearson Correlation was carried out to produce a correlation matrix and the relationships of significance were identified. A Pearson's correlation was used, as opposed to a Spearman's correlation, as the variables under investigation are scale variables (as opposed to ordinal or not normally distributed) (Field, 2013). Correlation measures the strength of association between variables, and analysis generates a correlation coefficient

122

which can range from -1 (a perfect negative correlation) to +1 (a perfect positive correlation), with zero indicating no relationship between the variables (Coolican, 2009). While the demographic variables were initially included to control for their effects, the results determined that further analysis of age and BMI as independent variables would be worthwhile. A limitation of correlation is that it does not imply causation, and the direction of causation can only be established through longitudinal study (Robson, 2011).

Cross-sectional linear regression analyses were applied to all five eating behaviours in the 2014 data set to examine the associations between the three indices of SES (education, salary band, and grade) (the predictor variables), demographic factors (age, gender, and number of dependants) and BMI and each eating behaviour (criterion variables). Prospective linear regression was carried out in the same way as the cross-sectional analysis, however the predictor variables were taken from the 2012 data set and the criterion variables from the 2014 data set. Longitudinal hierarchical linear regression was carried out on the three eating behaviours included in both the 2012 and 2014 data sets. The hierarchical linear regression was carried to understand the relationships between the three measures of SES, while controlling for demographic factors (age, gender, and number of dependants), BMI and the respective eating behaviour at T1, to explain the variance in consumption of the eating behaviour at T2.

Four of the eating behaviours in this study are scale variables and one (the consumption of a healthy well-balanced diet) was categorical. Only *yes* and *no* answers were included in the analysis for the healthy diet question. There is debate in the literature as to the viability of analysis of a categorical

variable using linear regression (Hellevik, 2007). It has been argued that if one variable is categorical (with the exception of a dichotomous variable such as gender) then linear regression cannot be carried out and logistic regression should be used in its place (Coolican, 2009). However, the purpose of the research described in this thesis is to enable the comparison of a number of eating behaviours side by side. Comparing output of logistic regression against linear regression would not allow the identification of the incremental additional portion of variance, accounted for by the predictor variables, thereby hindering meaningful comparison between the two analysis types. Therefore linear regression was applied to all five eating behaviours.

Hellevik, argues that in choosing a statistical technique the researcher should be "guided more by considerations of what is meaningful in relation to the research problem, and less by a desire to demonstrate mastery of complicated statistical tools" (Hellevik, 2007, p. 60). Two arguments are often used against the use of linear regression on categorical variables; first a predicted probability may fall outside the range of 0-1 with the use of linear coefficients making the results meaningless, and second, is that linear regression for a binary dependent variable is inappropriate (Hellevik, 2007). Hellevik argues that if the purpose of the analysis is not prediction but rather a comparison of associations, then this argument is not relevant; "what matters for the results of a causal analysis is whether the sum of components of direct, indirect and spurious effects is identical to the bivariate association" Hellevik, 2007, p.61) – a requirement met by linear rather than logistic regression. To counter the second argument of the inappropriate use of linear regression, Hellevik carried out a series of parallel logistic and linear regression analyses

using two independent variables (one categorical and one scale variable) and a series of binary (categorical) dependent variables. Three hundred and twenty sets of analyses were carried out and there were no tendencies for the P values to be larger in one type of analysis than the other – correlation between the two statistical techniques had an explained variance of 99.96%, with the strongest correlation found in larger data sets (N>10). Given these findings Hellevik argues that this therefore presents the researcher with a choice between the use of logistic and linear regression when a categorical variable is present (2007). In the current analysis, given the large data set and the purpose of comparing the associations between SES and five eating behaviours, a consistent statistical technique was needed, and therefore linear regression was used for all five dependent variables (eating behaviours).

3.5.5.3 ANOVA

Finally, to address research questions (5) and (6), analysis of variance (ANOVA) was used to compare between-group differences for age groups and BMI groups (the independent variables) for each of the five eating behaviours addressed in this thesis – vegetable consumption, fruit consumption, the consumption of a healthy, well balanced diet, eating past the point of feeling full, and the cost of food influencing purchasing behaviours (the dependent variables). Tukey post-hoc tests were applied to each eating behaviour to identify which age or BMI groups differed from each other. Where no relationships were identified through the parametric one-way ANOVA, a non-parametric Kruskal-Wallis test was applied to compare the groups. Further two-way ANOVA were carried out to examine the combined effects of the two independent variables (age and BMI) on the dependent variables.

ANOVA are used to compare the mean scores of three or more groups of participants (e.g. different age groups or weight status measured by BMI) on a dependent variable (eating behaviour), i.e. "it compares the *variance between groups* with the *variance within groups*" (Coolican, 2009, p. 480). The ANOVA is calculated to establish where there is a significant variation between mean groups. A number of conditions need to be met before a one-way ANOVA can be carried out; the independent variable must be nominal (categorical), the dependent variable must be measured on a continuous scale, an individual can only be in one group, and the dependent variable is normally distributed and its variance equal across groups (Morgan, Leech, Gloeckner, & Barrett, 2013). Where no significance is established through ANOVA, the application of a non-parametric test, such as the Kruskal-Wallis test, can be used to test the assumption made through the ANOVA of a normal distribution (Field, 2013). Where significance is established, the *Tukey* post-hoc test can be applied to identify which of the differences identified through ANOVA are contributing to the differences (Robson, 2011). Tukey tends to be favoured as a post-hoc test for larger sample sizes (whereas the *Bonferroni* test may be used on a smaller sample size), both tests are effective at controlling Type I errors (relating to statistical significance) (Field, 2013).

3.6 Summary

The current chapter presented the study context and methods for the quantitative investigation in this thesis. The literature review presented in Chapter 2 identified the aims and hypothesis of this thesis to further understand SES (education, salary band, and grade), demographic factors (age, gender, number of dependants) and BMI and their relationships with five eating

behaviours – vegetable intake, fruit intake, the consumption of a healthy, well-balanced diet, the cost of food influencing purchasing behaviours, and the propensity to eat past the point of feeling full. Ethical and data protection considerations were addressed, the collection of self-report survey data from employees of the NICS was outlined and an organisational and participant context given. The quantitative methods of linear regression, chi-squared testing, and analysis of variance were discussed and their purpose in the analysis of the data collected for this study. The results and discussion for these methods are discussed in the next three chapters. Chapter 4 presents a descriptive epidemiology of eating behaviours (using chi-squared analysis). Chapter 5 presents the linear regression analysis of cross-sectional, prospective, and longitudinal eating behaviour data. Chapter 6 presents ANOVA (analysis of variance) of eating behaviours for BMI and age groups.

Chapter 4: Descriptive Epidemiology of Eating Behaviours

4.1 Introduction

Descriptive studies are beneficial to research as they can identify at-risk groups to inform targeted interventions and workplace guidance on improving eating behaviours. Much of the existing literature focuses on the eating behaviours of individuals in community settings (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2014; Strait & Calnan, 2016). Likewise, much of the current research on eating behaviours focuses on single dimensions of eating behaviour such as fruit intake as a single measure (Pechy, Monsavias, Ng, & Marteau, 2015), vegetable intake as a single measure (Appleton et al., 2016), fruit and vegetable intake combined (Rooney et al., 2016; Strait & Calnan, 2016), or overall diet (with an assumption this includes fruit and vegetable consumption) (Darmon & Drewnowski, 2008; Whybrow, MacDiarmid, Craig, Clark, & McNeill, 2016). The current study offers a multi-dimensional view of eating behaviours, through the inclusion of five measures of eating behaviour, and supports the findings in the next chapter examining cross-sectional, prospective, and longitudinal relationships, that demographic factors exert a significant influence on eating behaviours, as important as that of SES. It is therefore important to understand these relationships, and between-group differences, to design workplace interventions to improve eating behaviours.

Descriptive studies are a helpful pre-cursor to inferential statistics as they expose relationships that may warrant further investigation. Given the exploratory nature of the current thesis in understanding these relationships this analysis is presented in a standalone chapter. Descriptive studies can be helpful for benchmarking – they provide a reference value against which to

examine changes over time, whether positive or negative. It is necessary to first describe an issue, and identify it as a problem, before tackling it. Likewise it is helpful to know which sub-groups would most benefit from being targeted.

Four research questions are considered in the current chapter: (1) What is the descriptive profile of eating behaviours for employees of NICS? (2) Is socio-economic status (SES), as measured by education, salary band, and grade, associated with eating behaviours? (3) Is SES, as measured by education, salary band, and grade, associated with obesity (measured by BMI)? (4) Are demographic factors associated with eating behaviours?

4.2 Descriptive Results

In 2012, the NICS employed 27,739 employees, of which around 26,000 had access to email addresses. The 2012 Stormont Study survey achieved a 22% response rate with 6,091 employees completing the questionnaire. In the 2014 survey (from an employee base of 27,667 employees), there was also a 22% response rate of 6,206 responses (the percentage of completions remained unchanged because of the increase in employee numbers between surveys, despite the increase in number of responses). In 2012, a total of 2,667 males and 3,424 females completed the survey, and in 2014 a total of 2,741 males and 3,465 females completed the survey. In total 1,014 employees took part in both the 2012 and 2014 surveys. Participants ranged from 19 to 85 at T1 ($M = 44.13$; $SD = 10.03$) and from 18 to 85 at T2 ($M = 45.62$; $SD = 9.77$). At both T1 and T2 participants had an average of one child (with a range of zero to five) and the mean BMI at T1 was 27 (overweight) and 28 at T2.

Table 4.1 presents a descriptive profile of the five eating behaviours: Vegetable consumption, fruit consumption, the consumption of a healthy, well-balanced diet, the cost of food influencing purchasing behaviours, and eating past the point of feeling full.

Table 4.1

Descriptive profile of eating behaviours and Time 1 (T1) and Time 2 (T2).

Eating Behaviour	T1 *n*	T2 *n*	Response	Frequency at T1		Frequency at T2	
				N	*%*	*n*	*%*
Vegetable consumption (portions)	5526	5588	0	205	3.7	213	3.8
			1	1543	27.9	1559	27.9
			2	2292	41.5	2191	39.2
			3	1018	18.4	1049	18.8
			4	295	5.3	347	6.2
			5	121	2.2	144	2.6
			6	26	.5	66	1.2
			7	18	.3	15	.3
			8	6	.1	3	.1
			9	2	.0	1	.0
Fruit consumption (portion)	5527	5578	0	423	7.7	462	8.3
			1	1250	22.6	1201	21.5
			2	1574	28.5	1613	28.9
			3	1267	22.9	1310	23.5
			4	528	9.6	511	9.2
			5	301	5.4	332	6.0
			6	120	2.2	93	1.7
			7	48	.9	45	.8
			8	13	.2	11	.2
Healthy diet	5533	5560	Don't know	541	9.8	513	9.2

		No	1465	26.5	1492	26.8
		Yes	3527	63.7	3555	63.9
Cost of food	5578	Not at all			416	7.5
		A little			2239	40.1
		Somewhat			1907	34.2
		A lot			837	15.0
		Entirely			179	3.2
Eating past feeling full	5582	Never			317	5.7
		Rarely			1987	35.6
		Sometimes			2571	46.1
		Often			633	11.3
		Everyday			74	1.3

Table 4.1 demonstrates a similar distribution for both fruit and vegetable consumptions at both T1 and T2. At T1, participants had an average vegetable consumption of 2.05 and fruit consumption of 2.35, and at T2 average vegetable consumption was 2.33 and fruit consumption of 2.10. Likewise, the majority (64%) of employees at both T1 and T2 believed that they have a healthy, well-balanced diet. The cost of food influencing purchasing behaviours, measured only at T2, influenced the majority of employees (40%) a little and somewhat (34%), with only 3% entirely influenced by the cost of food. Most participants ate past the point of feeling full sometimes (46%) or rarely (36%) and only 1% of participants did this every day.

Bivariate correlations (Tables 4.2 and 4.3) demonstrated weak and moderate, but significant, associations between demographic and personal factors (gender, age, BMI, and dependants), SES (education, salary, and grade) and eating behaviours at both T1 (2012) and T2 (2014). A weak correlation is defined as between .1 and .29 (in either a positive or negative direction), a moderate correlation is defined as between .3 and .49 (in either a positive or negative direction), and a strong correlation is equal to or greater than .5 (in either a positive or negative direction) (Field, 2013). Table 4.2 displays the eating behaviours measured at T1; vegetable consumption, fruit consumption, and the consumption of a healthy, well-balanced diet. Of the three eating behaviours 'do you eat a healthy, well-balanced diet?' was positively associated with all three SES variables, education ($r = .14$; $p < .01$), salary ($r = .15$; $p < .01$), and grade ($r = .09$; $p < .01$) and the demographic variables age ($r = .12$; $p < .01$) and number of dependants ($r = .05$; $p < .01$), in addition to being positively associated with the other eating behaviours fruit consumption ($r = .34$; $p < .01$) and vegetable consumption ($r = .26$; $p < .01$). Gender which had a negative significant association ($r = -.05$; $p < .01$) with the consumption of a healthy, well-balanced diet, as did BMI ($r = -.16$; $p < .01$). Vegetable consumption had a significant negative association with gender ($r = -.09$; $p < .01$) and BMI ($r = .04$; $p < .01$) and a positive association with age ($r = .06$; $p < .01$), grade ($r = .32$; $p < .05$) fruit consumption ($r = .26$; $p < .01$) and healthy diet ($r = .26$; $p < .01$). Fruit consumption had a negative significant association with gender ($r = -.07$; $p < .01$) and positive significant associations with age ($r = .17$; $p < .01$), number of dependants ($r = .04$; $p < .01$), education ($r = .07$; $p < .01$), salary ($r = .08$; $p < .01$), income ($r = .07$; $p < .05$).

At T2 (Table 4.3) two additional eating behaviours were included –
eating past the point of feeling full and the cost of food influencing purchasing
behaviours. The consumption of a healthy, well-balanced diet had a significant
negative association with gender ($r = -.06$; $p < .01$), BMI ($r = -.17$; $p < .01$),
cost of food ($r = -.20$; $p < .01$) and eating past the point of feeling full ($r = -.03$;
$p < .05$) and was positively significantly associated with age ($r = 0.7$; $p < .01$),
the three SES variables education ($r = .08$; $p < .05$), income ($r = .12$; $p < .01$)
and grade ($r = .13$; $p < .01$) and the other eating behaviours fruit consumption
($r = .33$; $p < .01$) and vegetable consumption ($r = .28$; $p < .01$). Fruit
consumption was negatively associated with gender ($r = -.05$; $p < .01$), BMI ($r
= -.10$; $p < .01$), cost of food ($r = -.08$; $p < .01$) and eating past the point of
feeling full ($r = -.05$; $p < .01$) and positively associated with age ($r = .12$; $p <
.01$), number of dependants ($r = .03$; $p < .05$), salary ($r = .07$; $p < .01$), grade ($r
= .07$; $p < .01$), healthy diet ($r = .33$; $p < .01$) and vegetable consumption ($r =
.28$; $p < .01$). Vegetable consumption was negatively associated with gender ($r
= -.08$; $p < .01$), eating past the point of feeling full ($r = -.05$; $p < .01$) and cost
of food ($r = -.07$; $p < .01$) and positively associated with healthy diet ($r = .28$; $p
< .01$) and fruit consumption ($r = .27$; $p < .01$), no association was found with
the SES variables. Eating past the point of feeling full had a significant
negative association with gender ($r = -.05$; $p < .01$), age ($r = -.14$; $p < .01$),
grade ($r = -.03$; $p < .05$) healthy diet ($r = -.12$; $p < .01$), fruit consumption ($r = -
.05$; $p < .01$) and significant positive associations with BMI ($r = .23$; $p < .01$)
and the cost of food ($r = .09$; $p < .01$). Cost of food influencing purchasing
behaviours was significantly negatively associated with age ($r = -.19$; $p < .01$),
education ($r = -.07$; $p < .05$), salary ($r = -.19$; $p < .01$), grade ($r = -.20$; $p < .01$),

vegetable consumption ($r = -.07$; $p < .01$), fruit consumption ($r = -.08$; $p < .01$) and healthy diet ($r = -.07$; $p < .01$) and was significantly positively associated with BMI ($r = .14$; $p < .01$); dependants ($r = .12$; $p < .01$) and eating past the point of feeling full ($r = .09$; $p < .01$).

Table 4.4 presents weighted cases chi-square analysis applied to the gender of both the NICS employees and of study participants to identify the extent to which the participant sample was representative of the wider NICS employee population.

Table 4.2

Correlations between socioeconomic and demographic variables and eating behaviours of employees of the NICS at T1.

T1	Variable	*M*	*SD*	*N*	1	2	3	4	5	6	7	8	9
1	Gender	1.44	0.50	6091									
2	Age	44.13	10.03	6079	.08**								
3	BMI	27.05	5.09	6066	.06**	.11**							
4	Dependants	1.21	1.25	6027	.01	.15**	.01						
5	Education	5.64	1.65	5959	.14**	.25**	-.07**	.11**					
6	Salary	3.90	1.96	6067	.16**	.31**	-.05**	.09**	.86**				
7	Grade	4.89	1.71	6005	.11**	-.11**	-.10**	.00	.38**	.34**			
8	Do you eat a healthy, well-balanced diet?	1.54	0.67	5533	-.05**	.12**	-.16**	.05**	.14**	.15**	.09**		
9	How many portions of fruit do you eat daily?	2.35	1.48	5527	-.07**	.17**	-.02	.04**	.07**	.08**	.031*	.34**	

136

| 10 | How many portions of vegetables do you eat daily? | 2.05 | 1.11 | 5526 | -.09** | .06** | -.04** | .01 | .01 | .02 | .032* | .26** | .26** |

Note (a) Gender was coded "1" for female and "2" for male.
*p < .05; ** p < .01.

Table 4.3

Correlations between socioeconomic, and demographic variables and eating behaviours of employees of the NICS at T2.

T2	Variable	*M*	*SD*	*N*	1	2	3	4	5	6	7	8	9	10	11
1	Gender	1.44	0.50	6206											
2	Age	45.62	9.77	6209	.04**										
3	BMI	27.07	5.84	6159	.05	.02									
4	Dependants	1.12	1.23	6102	.043**	.08**	-.01								
5	Education	5.02	1.43	6224	.10**	-.15**	-.13**	-.05							
6	Salary	4.05	1.94	6106	.15**	.22**	-.10**	.08**	.41**						
7	Grade	5.61	1.62	6075	.12**	.20**	-.12**	.10**	.46**	.87**					
8	Do you eat a healthy, well-balanced diet?	1.55	0.66	5560	-.06**	.07**	-.17**	.02	.08*	.12**	.13**				
9	How many portions of fruit do you eat daily?	2.33	1.45	5578	-.05**	.12**	-.10**	.03*	0.04	.07**	.07**	.33**			
10	How many portions of vegetables	2.10	1.17	5588	-.08**	.02	-.03	-.01	0.04	.02	.01	.28**	.27**		

		M	SD	N											
	do you eat daily?														
11	How often do you eat past the point of feeling full?	2.67	0.80	5582	-.05**	-.14**	.23**	-.01	-.02	-.02	-.03*	-.12**	-.05**	-.02	
12	Does the cost of food influence what you buy?	2.66	0.93	5578	-.02	-.19**	.14**	.12**	-.07*	-.19**	-.20**	-.07**	-.08**	-.07**	.09**

Note (a) Gender was coded "1" for female and "2" for male.
*$p < .05$; ** $p < .01$.

Table 4.4

Comparison of respondents' gender at 2012 and 2014 against NICS population.

	Survey Respondents n %	Total NICS staff n %	X^2, *df, p* value
2012 Survey	(October 2012)	(October 2012)	72.84, 1, *p* <.001
Male	2667 (43.8)	13804 (49.8)	
Female	3424 (56.2)	13902 (50.2)	
2014 Survey	(April 2014)	(October 2014)	56.47, 1, *p* <.001
Male	2741 (44.2)	13732 (49.4)	
Female	3465 (55.8)	14043 (50.6)	

Table 4.4 displays a weighted cases chi-squared analysis of gender at 2012 and 2014 of survey respondents and all employees of the NICS. The weighted cases chi-squared is used to present the difference between categorical variables, in this case the overall NICS workforce and those who participated in the study questionnaire, in order to establish representativeness – i.e. were survey respondents typical of NICS employees as a whole (Field, 2013)? The sample included in the analyses did differ significantly to the overall NICS employee cohort in terms of gender proportion in 2012 (56.2% female [2012 Survey] versus 50.2% female [NICS employees], *p* < .001) and in 2014 (55.8% female [2014 Survey] versus 50.6% female [NICS employees],

$p < .001$). However, though the difference is statistically significant, it could be argued that this is not practically significant in percentage terms given the difference between the 44% males in the sample and 50% males in the population is not that great and is, therefore, unlikely to have an impact on the extent to which the sample is representative of the population from which it is drawn.

4.3 Epidemiological Results

The current section presents the results of descriptive analysis of eating behaviours of employees of the civil service. Four eating behaviours were explored – *fruit and vegetable consumption* (in relation to meeting the UK Government recommendation of '5-a-day'), *eating a healthy, well-balanced diet*, the *cost of food influencing purchasing behaviour* and *eating past the point of feeling full*. Fruit and vegetable intake and the consumption of a healthy, well-balanced diet were measured at both T1 and T2, and therefore inequalities can be assessed over time to understand if these differences are consistent. The cost of food influencing purchasing behaviours and eating past the point of feeling full were measured only at T2 and therefore no changes over time can be observed, however the relations between variables is outlined.

4.3.1 Socioeconomic status, demographic factors and the fulfilment of UK Government recommendations for fruit and vegetable intake at T1 and T2.

Table 4.5 shows socioeconomic and demographic differences between individuals who consumed the Government-recommended fruit and vegetable intake of '5-a-day' and those who did not at T1 and T2. The UK Government recommend consuming five portions of fruit or vegetables every day (Rooney

et al., 2016). The examples of one portion of fruit, given to participants at T1 and T2, include an apple, a banana, a slice of melon or a hand sized bunch of strawberries, raspberries or grapes. Examples of one portion of vegetables include two to three heaped tablespoons of cooked vegetables (e.g. carrots, broccoli etc.) or a similar quantity of salad.

Table 4.5

Association between Socioeconomic Status (Education, Salary Band and Grade), demographic factors and fulfilment of UK Government recommendations for fruit and vegetable consumption.

	T1 (2012)		T2 (2014)	
Characteristic N (%)	≥ 5 portions of fruit and vegetables a day N (%)	X^2, *df, p* value	≥ 5 portions of fruit and vegetables a day N (%)	X^2, *df, p* value
Demographics				
Gender				
Male	987 (37.0)	24.94, 1, p < .001	1004 (36.6)	23.21, 1, p < .001
Female	1484 (43.3)		1481 (42.7)	
Age				
18 to 24	34 (29.1)	91.50, 4, p < .001	12 (27.3)	35.57, 4, p < .001
25 to 34	371 (31.2)		350 (34.0)	
35 to 44	603 (38.7)		583 (39.0)	
45 to 54	1001 (43.9)		971 (40.5)	
55 and over	462 (49.3)		567 (45.6)	
Number of Dependants				
0	1017 (40.9)	15.71, 2, p < .001	1093 (40.4)	8.13, 2, p < .05
1-2	980 (38.4)		960 (38.3)	
≥3	321 (46.7)		388 (43.6)	
BMI				

Underweight	18 (35.3)	8.39, 4, ns	19 (35.8)	9.15, 4, ns
Healthy Weight	961 (42.2)		852 (42.0)	
Overweight	952 (41.1)		972 (39.9)	
Obese	348 (37.9)		355 (36.3)	
Obese (II, III)	161 (37.0)		226 (40.0)	

Socioeconomic Status

Education

No academic qualification	29 (42.6)	10.10, 2, $p < 0.01$	27 (37.0)	8.89, 2, $p < 0.05$
School Certificate, O 'Level, GCSE, A 'Level, SCE Higher, National Diploma/Certificate	1299 (38.9)		1385 (38.6)	
Undergraduate Degree, Postgraduate Degree	1114 (42.9)		1063 (42.4)	

Salary Band

£10,001-£30,000	1703 (38.4)	42.58, 3, $p < .001$	1630 (38.1)	24.47, 3, $p < .001$
£30,001-£55,000	721 (47.0)		762 (44.1)	
£55,001-£80,000	35 (42.7)		38 (40.0)	
£80,001 and over	12 (75.0)		6 (85.7)	

Grade

Industrial and Administrative Roles	581 (35.5)	35.45, 2, $p < .001$	616 (36.9)	15.9, 2, $p < .001$
Exec Officer, Staff Officer, Deputy Principal	1238 (40.9)		1250 (39.9)	
Grade 7 (Principal) and above	602 (46.3)		563 (44.2)	

To examine cross-sectional differences between socioeconomic and demographic groups at two time points, a chi-square analysis was undertaken to compare individuals who consume the Government-recommended fruit and vegetable intake and those who do not and is displayed in Table 4.5. More significant associations were found at T1 than at T2. Chi-square analyses at T1 identified significant differences for gender ($\chi2 = 24.94$, $p < .001$), age ($\chi2 = 91.50$, $p < .001$), number of dependants ($\chi2 = 15.71$, $p < .001$), education ($\chi2 = 10.10$, $p < .01$), salary band ($\chi2 = 42.58$, $p < .001$) and grade ($\chi2 = 35.45$, $p < .001$). Those who ate the Government-recommended amount of fruit and vegetables did not differ significantly in BMI ($\chi2 = 8.39$, $p > .05$). Chi-square analyses at T1 identified significant differences for gender ($\chi2 = 23.81$, $p < .001$), age ($\chi2 = 35.57$, $p < .001$), number of dependants ($\chi2 = 8.13$, $p < .05$), education ($\chi2 = 8.89$, $p < 0.05$), salary band ($\chi2 = 24.47$, $p < .001$) and grade ($\chi2 = 15.9$, $p < .001$). Those who ate the Government-recommended amount of fruit and vegetables did not differ significantly in BMI ($\chi2 = 9.15$, $p > .05$). Therefore age, gender, number of dependants, and all three indices of SES at T1 and T2 were significantly different for individuals who consumed the Government-recommended fruit and vegetable intake of '5-a-day' than those who did not. There were no significant differences observed between BMI groups achieving their '5-a-day' at T1 or T2.

4.3.2 Socioeconomic status, demographic factors, and the consumption of a healthy, well-balanced diet at T1 and T2

Table 4.6 shows the differences between socioeconomic and demographic groups of individuals who feel they consume a healthy, well-balanced diet and those who feel they do not consume a healthy, well-balanced

diet. The question *do you believe that you have a healthy, well balanced diet?* was answerable with *yes*, *no,* or *don't know*; no guidance or definition was given to participants to define what constituted a healthy, well-balanced diet in order to measure individual perception. The *don't know* group was excluded from analysis to capture only those participants with an opinion one way or the other.

Table 4.6

Association between Socioeconomic Status (Education, Salary Band and Grade), demographic factors and the consumption of a healthy, well-balanced diet.

	T1 (2012)		T2 (2014)	
Characteristic *N* (%)	Consume a Balanced Diet (yes)	X^2, *df, p* value	Consume a Balanced Diet (yes)	X^2, *df, p* value
Demographics				
Gender				
Male	1495 (69.6)	2.02, 1, ns	1513 (68.9)	4.39, 1, *p* < .05
Female	2032 (71.4)		2028 (71.6)	
Age				
18 to 24	45 (51.7)	114.00, 4, *p* < .001	23 (63.9)	74.54, 4, *p* < .001
25 to 34	595 (62.8)		526 (63.1)	
35 to 44	864 (66.3)		808 (65.8)	
45 to 54	1406 (73.9)		1401 (72.0)	
55 and over	617 (82.3)		786 (79.3)	
Number of Dependants				
0	1397 (69.8)	5.35, 2, ns	1532 (70.9)	0.95, 2, ns
1-2	1481 (69.8)		1429 (69.5)	
≥3	440 (74.5)		519 (70.5)	
BMI				
Underweight	32 (82.1)	301.85, 4, *p* < .001	30 (73.2)	349.7, 4, *p* < .001

Healthy Weight	1530 (81.1)		1377 (82.7)	
Overweight	1344 (70.8)		1429 (72.4)	
Obese	412 (55.6)		424 (53.8)	
Obese (II, III)	163 (44.7)		214 (46.9)	

Socioeconomic Status

Education

No academic qualification	33 (70.2)	38.47, 2, p <.001	31 (66.0)	28.5, 2, p <.001
School Certificate, O Level, GCSE, A Level, SCE Higher, National Diploma/Certificate	1790 (66.9)		1919 (67.6)	
Undergraduate Degree, Postgraduate Degree	1670 (75.0)		1573 (74.5)	

Salary Band

£10,001-£30,000	2394 (67.2)	73.78, 3, p <.001	2283 (67.4)	49.61, 3, p <.001
£30,001-£55,000	1063 (79.1)		1131 (76.9)	
£55,001-£80,000	56 (81.2)		62 (77.5)	
£80,001 and over	13 (92.9)		6 (100)	

Grade

Industrial and Administrative Roles	803 (63.6)	76.53, 2, p <.001	817 (64.1)	56.85, 2, p <.001
Exec Officer, Staff Officer, Deputy Principal	1747 (70.0)		1796 (70.3)	
Grade 7 (Principal) and above	912 (79.8)		859 (78.2)	

To examine differences between socioeconomic and demographic groups, a chi-square analysis was undertaken to compare individuals who

believed they consumed a healthy, well-balanced diet (*yes*) to those who believed they did not consume a healthy, well-balanced diet (*no*). Chi-square analyses at T1, presented in Table 4.6, identified significant differences for age ($\chi2 = 114.00$, $p < .001$), BMI ($\chi2 = 301.85$, $p < .001$), education ($\chi2 = 38.47$, $p < .001$), salary band ($\chi2 = 73.78$, $p < .001$) and grade ($\chi2 = 76.53$, $p < .001$). No significant differences were found for gender ($\chi2 = 2.02$, $p > .05$) or number of dependants ($\chi2 = 5.35$, $p > .05$), Chi-square analyses at T2 identified significant differences for gender ($\chi2 = 4.39$, $p < .05$), age ($\chi2 = 74.54$, $p < .001$), BMI ($\chi2 = 349.7$, $p < .001$), education ($\chi2 = 28.5$, $p < .001$), salary band ($\chi2 = 49.61$, $p < .001$) and grade ($\chi2 = 56.85$, $p < .001$). The perception of consumption of a healthy, well-balanced diet was not significantly influenced by number of dependants ($\chi2 = 0.95$, $p > .05$). Therefore age, BMI, and all three indices of SES at T1 and T2 were significantly different for individuals, and gender at T2, who believed they consumed a healthy, well-balanced diet to those who feel they do not consume a healthy, well-balanced diet. The number of dependants did not have a significant influence over the consumption of a healthy, well-balanced diet for either survey.

4.3.3 Socioeconomic status, demographic factors, and cost of food influencing purchasing behaviours (included in only the 2014 Stormont Study questionnaire) at T2

Table 4.7 shows the differences between socioeconomic and demographic groups of individuals whose purchasing behaviours are influenced by cost *a lot* or *entirely*, at T2, compared to those whose purchasing behaviours are influenced by cost only *somewhat*, *a little* or *not at all*.

Table 4.7

Association between Socioeconomic Status (Education, Salary Band and Grade), demographic factors and individuals where cost of food influences purchasing behaviour a lot or entirely.

	T2 (2014)	
Characteristic *N* (%)	Cost influences purchasing behaviour *a lot* or *entirely*	X^2, df, p value
Demographics		
Gender		
Male	455 (18.4)	0.05, 1, ns
Female	559 (18.1)	
Age		
18 to 24	10 (24.4)	119.66, 4, $p < .001$
25 to 34	248 (27.0)	
35 to 44	301 (22.3)	
45 to 54	341 (15.8)	
55 and over	113 (10.2)	
Number of Dependants		
0	373 (15.5)	23.08, 2, $p < .001$
1-2	448 (19.8)	
≥3	178 (22.0)	
BMI		
Underweight	10 (20.8)	26.9, 4, $p < .001$
Healthy Weight	282 (15.6)	
Overweight	385 (17.7)	

Obese	195 (21.8)	
Obese (II, III)	119 (23.7)	
Socioeconomic Status		
Education		
No academic qualification	9 (15.3)	14.9, 2, $p < .01$
School Certificate, O Level, GCSE, A Level, SCE Higher, National Diploma/Certificate	635 (20.0)	
Undergraduate Degree, Postgraduate Degree	365 (15.9)	
Salary Band		
£10,001-£30,000	820 (21.6)	96.45, 3, $p < .001$
£30,001-£55,000	172 (10.9)	
£55,001-£80,000	5 (5.7)	
£80,001 and over	0	
Grade		
Industrial and Administrative Roles	386 (26.5)	144.75, 2, $p < .001$
Exec Officer, Staff Officer, Deputy Principal	511 (18.1)	
Grade 7 (Principal) and above	96 (8.2)	

To examine the socioeconomic and demographic differences between groups, a chi-square analysis was undertaken to compare individuals, at T2, whose purchasing behaviours are influenced by cost *a lot* or *entirely* compared to those whose purchasing behaviours are influenced by cost only *somewhat*, *a little* or *not at all* (Table 4.7). Chi-square analyses identified significant

differences for age ($\chi2$ = 119.66, p < .001), number of dependants ($\chi2$ = 23.08,

p < .001), BMI ($\chi2$ =26.9, p < .001), education ($\chi2$ = 14.9, p < .01) salary band

($\chi2$ = 96.45, p < .001) and grade ($\chi2$ = 144.75, p < .001). Individuals whose

purchasing behaviours are influenced by cost *a lot* or *entirely* are not

significantly different from those whose purchasing behaviours are influenced

by cost only *somewhat, a little* or *not at all* in gender ($\chi2$ = .05, p > .05).

Therefore, age, BMI, number of dependants, and SES all significantly differed

between the two groups at T2.

4.3.4 Socioeconomic status, demographic factors and eating past

the point of feeling full (included in only the 2014 Stormont Study

questionnaire) at T2

Table 4.8 shows the socioeconomic and demographic differences

between groups of individuals who eat past the point of feeling full *sometimes*,

often, and *every day* compared to those who eat past the point of feeling full

never and *rarely*.

Table 4.8

Association between Socioeconomic Status (Education, Salary Band, and Grade), demographic factors and individuals who eat past the point of feeling full 'sometimes', 'often' or 'everyday'.

	T2 (2014)	
Characteristic *N* (%)	Eat past the point of feeling full *sometimes*, *often* or *everyday*	X^2, *df, p* value
Demographics		
Gender		
Male	1386 (55.9)	14.61, 1, $p < .001$
Female	1879 (61.0)	
Age		
18 to 24	29 (70.7)	62.93, 4, $p < .001$
25 to 34	606 (66.0)	
35 to 44	860 (63.7)	
45 to 54	1197 (55.7)	
55 and over	579 (52.3)	
Number of Dependants		
0	1412 (58.8)	0.04, 2, ns
1-2	1334 (59.1)	
≥3	482 (59.1)	
BMI		
Underweight	19 (39.6)	247.61, 4, $p < .001$
Healthy Weight	8308 (45.9)	
Overweight	1321 (60.6)	

Obese	644 (71.7)	
Obese (II, III)	375 (74.4)	

Socioeconomic Status

Education

No academic qualification	34 (57.6)	0.16, 2, ns
School Certificate, O Level, GCSE, A Level, SCE Higher, National Diploma/Certificate	1872 (58.9)	
Undergraduate Degree, Postgraduate Degree	1341(58.5)	

Salary Band

£10,001-£30,000	2264 (59.6)	4.07, 3, ns
£30,001-£55,000	902 (57.0)	
£55,001-£80,000	47 (54.0)	
£80,001 and over	3 (50.0)	

Grade

Industrial and Administrative Roles	871 (59.8)	4.55, 2, ns
Exec Officer, Staff Officer, Deputy Principal	1667 (59.2)	
Grade 7 (Principal) and above	655 (56.0)	

To examine the socioeconomic and between-groups differences, a chi-square analysis was undertaken to compare individuals who eat past the point of feeling full *sometimes*, *often,* or *every day* compared to those who eat past the point of feeling full *never* or *rarely* at T2 (Table 4.8). Chi-square analyses identified significant differences for gender ($\chi2$ = 14.61, p < .001) and age ($\chi2$

= 62.93, $p < .001$) and BMI ($\chi 2 = 247.61$, $p < .001$). Those who eat past the point of feeling full *sometimes*, *often,* or *every day* did not differ significantly in number of dependants ($\chi 2 = .04$, $p > .05$) or in the three SES indices: Education ($\chi 2 = .16$, $p > .05$), salary band ($\chi 2 = 4.07$, $p > 0.5$), or grade ($\chi 2 = 4.55$, $p > .05$). Therefore, only age and BMI differ significantly between individuals who eat past the point of feeling full *sometimes*, *often,* or *every day* compared to those who eat past the point of feeling full *never* or *rarely* and at T2.

4.4 Discussion of Findings

The findings of the chi-squared analysis of eating behaviours and socioeconomic, demographic, and personal factors demonstrate significant differences across groups. All indices of SES were significant for the eating behaviours (apart from eating past the point of feeling full) and age, gender, and BMI were all significant across the range of eating behaviours. Each eating behaviour will be discussed in more detail in the following section and a comparison made to existing literature.

4.4.1 Government recommendations for fruit and vegetable intake '5-a-day'

Age, gender, number of dependants, and all indices of SES (education, salary band, and grade) were significantly different for individuals consuming the Government-recommended *5-a-day* fruit and vegetables at both T1 and T2.

4.4.1.1 Main findings

Table 4.4 demonstrates the demographic and socioeconomic differences between individuals who consume the Government-recommended '5-a-day' fruit and vegetable intake and those who do not. In the current study

age, gender, number of dependants, and SES were significantly different for individuals who consumed the Government-recommended fruit and vegetable intake of '5-a-day' than those who did not at T1 and at T2. At T1 and T2 females were more likely to meet the Government recommendations for '5-a-day' than males. The results indicate an age-related gradient in fruit and vegetable consumption; older groups were more likely to eat '5-a-day' than younger groups. The age group of 55 and over, at both T1 (49.3%) and T2 (45.6%), were significantly more likely to eat '5-a-day' than the 18-24 age category (29.1% and 27.3% respectively). Individuals with no children, or three or more at T1 and T2 were more likely to achieve the '5-a-day' target than those with one to two children. BMI was not significantly different for individuals who achieved the Government recommendation for '5-a-day' than those who did not, at either time period.

At T1 there were significant educational differences ($p < .001$) in individuals who achieve the '5-a-day' target with those with a degree, or equivalent, and those with no educational qualification more likely to achieve the '5-a-day' than those with qualifications in between. This significance remained in the T2 analysis although weakened ($p < .05$). Salary was a significant influence between the two groups with a gradient in consumption favouring the higher salary bands – i.e. those earning £80,001 and over were more likely to eat '5-a-day' than not and were significantly more likely to eat '5-a-day' than those earning less. This difference was replicated at T2. Those in the £10,001 - £30,000 salary band were less likely to consume '5-a-day' than the £30,001-£40,000 salary band, however the £55,001-£80,000 salary band were less likely to consume their '5-a-day' than the £30,001-£40,000

salary band, but more likely than the £80,001 and over salary band. Finally, at T1 and at T2, job grade also had a significant influence on '5-a-day' with higher grades significantly more likely to achieve the recommendation than lower grades.

4.4.1.2 Comparison of findings with current literature

The UK Government's '5-a-day' recommendation, for the consumption of fruit and vegetables, is aimed at improving health (World Health Organisation, 2015). However, there is little available evidence to demonstrate the success of the UK campaign, or that of other countries also using the WHO recommendation to encourage improved consumption, (Oyebode et al., 2016). In the current study, consumption of fruits and vegetables in line with Government guidelines was low but not as low as reported in other studies; for example, only 6-8% of people achieved the recommendation in a US study (Rekhy & McConchie, 2014). Quantitative data collection alone may be unable to elicit why these campaigns are failing to achieve their goals. From the current analysis, we understand reported consumption in the study population, however this may differ from actual consumption. Participants may have been unclear as to what constitutes a portion of fruit and vegetables; while the questionnaire did give guidelines on what a portion is, this can be more complicated for composite meals where a variety of vegetables are included in a soup or sauce, for example.

In a qualitative study exploring consumer understanding of fruit and vegetable intake, participants were unable to define what a portion constituted and what varieties of food counted towards the target (Rooney et al., 2016). The self-reported nature of the study led to the potential for participants to

inflate their answers to more socially accepted levels. Previous research in females suggests that an underestimation of unhealthy foods and overestimation of healthy foods in food diaries may stem from social desirability bias (Morris et al., 2014). However, fruit consumption and vegetable consumption were collected as individual items on the questionnaire, so the concept of '5-a-day' was not alluded to, and therefore a reference to the '5-a-day' was not included. Given the low percentage of participants who actually achieved the goal, the overreporting of consumption is unlikely.

Community studies on diet suggest that food consumption is often underreported, especially in obese individuals (Timmins et al., 2013) and in those in lower SES groups (Stallone, Brunner, Bingham, & Marmot, 1997). This line of research suggests that foods may be more likely to be underreported in lower SES groups; there is no research examining the conflict between the social-desirability bias of overreporting fruits and vegetables and the tendency of lower SES groups to underreport. It could be argued that these two biases may ultimately even themselves out, and therefore the data presented in this study represents an accurate consumption of fruits and vegetables of the population studied. It is clear from the data that an association between SES and the consumption of the Government's '5-a-day' target exists, but given the nature of cross-sectional analysis no inferences can be made to the direction of the relationship over time or indeed the cause.

Gender differences in achieving '5-a-day' were significant. The findings at T1 and at T2 are consistent with other studies that females are more likely to achieve the '5-a-day' goal more than males (Boukouvalas et al., 2009; Chambers et al., 2008; Pechey et al., 2015; Strait & Calnan, 2016). Gender-

related differences in fruit consumption could perhaps be because of the perception it will not be satiating as a snack (Pechy et al., 2015) or down to accessibility and the perception that it is easier to pick up a chocolate bar, crisps, or other none-perishable snack item as they won't spoil so quickly if taken to work (Nagler et al., 2013). Given the wide range of job roles at the NICS, gender-related differences in consumption could arguably be grounded in an individual's job. At lower SES levels, women often work in more administrative office-based roles at the lower end of the pay scale and men work in manual roles – therefore differences in access to fruit and vegetables on site, or challenges in storing a packed lunch, may be present.

The age-related gradient in the consumption of fruits and vegetables, for both genders and at both data collection points is significant. Age-related gradients, where older age groups tend to consume more fruits and vegetables than younger people, have been reported in community studies of fruit and vegetable intake; these studies are a good basis for comparison to the current study as broadly similar age bands were used for analysis ranging from 18-24 up to 55-64 (Oyebode et al., 2016) and 35-44 up to 75 and over (Strait & Calnan, 2016). One area that might influence this consumption pattern is the cost of food, which will be explored in more detail later in this chapter. Other than cost, it is not possible to establish from the current data why this age-related gradient exists, however previous studies point to the perceived time constraints of preparing fruits and vegetables, not liking the taste, and low motivation to consume them (Oyebode et al., 2013). Self-efficacy (a belief that an individual can achieve the '5-a-day' goal), social support (others in the household also consuming fruit and vegetables), and knowledge (of why fruit

and vegetables are good for you and how to achieve the goal) are psychosocial factors that may predict consumption (Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2007).

The number of dependants showed an inverse relationship with fruit and vegetable consumption – individuals with no children were more likely to achieve the '5-a-day' goal than those with one to two children, however three or more children were more likely to achieve the goal than having one to two children. The difference between participants with one to two children and three or more, could be attributed to fussy eating – perhaps children with two or more siblings have less opportunity to become fussy eaters as catering for more children could mean there is less room for argument on what they are given, but this is a purely speculative statement. A previous study reported the relationship was more linear, with the probability of meeting fruit and vegetable recommendations reducing as the number of children increases (McMorrow, Ludbrook, Macdiarmid, & Olajide, 2016). Similar rationales, as detailed above for age-related drivers to fruit and vegetable consumption, may be attributed to number of dependants, preference/taste, time, knowledge, and motivation which may all be likely to influence consumption. Individuals with no children may also have a greater disposable income that those with children and, therefore, if the cost of food influences purchasing decisions, those with no children may have more disposable income and feel better able to afford fruits and vegetables. The findings of the current study show that number of dependants has a more significant impact on the cost of food influencing purchasing behaviour than those with one to two, or three or more children.

SES, measured by education, salary band, and grade, was a significant factor in achieving the '5-a-day' fruit and vegetable goal at both T1 and T2. Relations between fruit and vegetable intake and SES are well documented in community-based studies (Berning & Hogan, 2014; Boukouvalas et al., 2009; Darmon & Drewnowski, 2007). In the current study at T1 38.4% ($n = 1,703$) of those earning £10,001-£30,000 achieved their '5-a-day' in comparison with 47% ($n = 721$) earning £30,001-£50,000; and at T2 38.1% ($n = 1,630$) of those earning £10,001-£30,000 achieved their '5-a-day' in comparison with 44.1% ($n = 762$) earning £30,001-£50,000. In one community study, it was estimated that for every £1,000 increase in income, there was a 0.6% increase in fruit and vegetable consumption (Boukouvalas et al., 2009). A workplace study of blue collar employees also observed a positive linear relationship between income and fruit and vegetable consumption (Nagler et al., 2013), however it could be argued that comparisons between American motor-freight workers and Northern Irish civil servants may be limited, especially given the larger sample size and wider occupational grades in the Stormont Study in comparison to the Nagler et al. (2013) study ($N = 1,013$). The current study uses individual salary, but it could be argued that household income may be a more accurate measure of the purchasing power of a household and the potential spend on fruit and vegetables; having two salaries in a household may increase the available spend for fruits and vegetables.

A linear relationship between job grade and consumption of '5 a day' was found at both T1 and T2. Given the structure of job grades, around salary bands, in the civil service, the two constructs will be linked. No previous studies could be identified using solely occupational/job grade as a proxy for

SES and fruit and vegetable consumption in the literature. The majority of comparable studies, for example, those using the large Health Survey for England dataset (Boukouvalas et al., 2009; Oyebode et al., 2016; Strait & Calnan, 2016) use a combination of measures; in the case of the Health Survey for England, education, household income, and occupational class. A strength of the current study is the use of three measures of SES. Education had a significant linear relationship with the likelihood of achieving the '5-a-day' recommendation at T2 and an inverse relationship at T1 – with those with a School Certificate, O Level, GCSE, A Level, SCE, Higher, National Diploma/Certificate were around 2% less likely to achieve the '5-a-day' than those with no qualifications or a degree or above. Education is the most widely analysed measure of SES with fruit and vegetable consumption in the literature, and a consistent difference has been found with higher educational levels eating more fruit and vegetables than those of a lower educational attainment (Berning & Hogan, 2014; Prättälä et al., 2009). It is worth noting that even though a gradient in the current data can be seen for educational level and '5-a-day', most participants did not achieve the target.

The findings from the current analysis of employees of the NICS and their socioeconomic and demographic and personal factors are broadly consistent with the current literature on fruit and vegetable consumption and the achievement of '5-a-day'.

4.4.2 Consumption of a healthy, well-balanced diet

At T1 age, BMI and all socioeconomic variables were significantly different for individuals who believe they consume a healthy, well-balanced diet to those who believe they do not consume a healthy, well-balanced diet.

162

At T2 age, gender, BMI and all three of the socioeconomic variables (education, salary band, and grade) were significantly different between the two groups.

4.4.2.1 Main findings

Table 4.5 demonstrates the demographic and socioeconomic differences between individuals who perceive they consume a healthy, well-balanced diet and those who do not. In the current study age, BMI and SES were significantly different for individuals who perceived they consume a healthy, well-balanced diet at T1 and at T2 (with the additional significance of gender at T2). Females were more likely to believe that they had a healthy, well-balanced diet than males at T1 ($p > .05$), although significance was only observed at T2 ($p < .05$). The 55 and over age groups were more likely to consume a healthy, well-balanced diet than the younger groups (only 51.7% of 18-24-year olds believe they consume a healthy, well-balanced diet at T1 and 63.9% at T2, compared to 82.3% of those aged 55 and over at T1 and 79.3% at T2). At both T1 and T2, BMI elicited significant between-group differences with underweight individuals (82.1%) at T1 and healthy weight individuals (82.7%) at T2 most likely to believe they consume a healthy, well-balanced diet; a gradient in diet is evident for overweight, obese, and obese (II, III) individuals with higher BMI groups less likely to perceive they consume a healthy, well-balanced diet. A gradient can also be seen for SES at T1 and T2, with individuals who are better educated, with a higher salary, and a higher job grade all more likely they believe they consume a healthy, well-balanced diet.

4.3.2.2 Comparison of findings with current literature

Age-related differences in the consumption of a healthy, well-balanced diet follow a similar pattern to those of fruit and vegetable consumption. Previous community studies have reported that older age groups tend to consume a diet higher in a wider variety of fish, lean meats, grains, dairy, and fruits and vegetables, whereas younger age groups consumed more sugars, snack foods, fizzy drinks, take-away and fast foods, and ready meals (Chambers et al., 2008; Lallukka, Laaksonen, Rahkonen, Roos, & Lahelma, 2007; McLaren, 2007; Timmins, Hulme, & Cade, 2013). There are few studies exploring healthy eating behaviours in a workplace setting (other than on the effect of interventions), and therefore comparisons can only be made with community-based studies. The current study differs from many previous studies, as rather than controlling for age and concentrating only on the socioeconomic variables in the study, it demonstrates significant age-related gradients in eating behaviours, in the civil service workplace, that warrant further investigation. While the current study demonstrates the gradient, it does not offer any explanations as to why this is the case, and therefore qualitative study would be beneficial to explore these findings and understand the barriers and facilitators to a healthy diet between age groups.

Differences in the consumption of a healthy, well-balanced diet were observed between BMI groups with those who are underweight and of a healthy weight more likely to agree that they eat a healthy diet than those who are overweight and obese. A systematic review of 153 studies found mixed evidence of relations between weight and eating behaviours (Mesas et al., 2011). The majority of studies focused on weight as an outcome of eating

behaviours rather than as a determinant. Likewise, a review of literature on SES and weight demonstrated an inverse relationship between SES and BMI, however eating behaviours are not explored as a potential mediator in the relationship (McLaren, 2007). Much of the research focused on weight differences and BMI is examined in relation to dieting, restraint, and disinhibition which will be discussed later in this chapter.

The gender-related differences in the consumption of a healthy, well-balanced diet are similar to those of differences in fruit and vegetable consumption. While at T1 no significance was observed, at T2 females were more likely to state that they consume a healthy, well-balanced diet than did males. These findings are consistent with the literature (Boukouvalas, Shankar & Traill, 2009; Chambers et al., 2008; Pechey et al., 2015; Strait & Calnan, 2016). The SES variables may play a part in this relationship. It has been found in previous studies that educational attainment, income, and occupation have a significant impact on eating behaviours (Darmon & Drewnowski, 2007; Maguire & Monsivais, 2015). It could be argued that as men are predominantly the highest household earners, they may spend more time away from the home and feel they have less time, or inclination, to prepare healthy foods than females (Chambers et al., 2008). Reviews of SES and obesity have also reported that differences in societal expectations may drive this relationship, with females experiencing more pressure to be thin and males valuing a larger body size as a symbol of prowess (Sobal & Stunkard, 1989; McLaren, 2007). Perhaps this societal pressure drives genders to eat a certain way to achieve this goal.

Previous community-based studies have used fruit and vegetable consumption as a proxy for the consumption of a healthy, well-balanced diet (Strait & Calnan, 2016). In the current study it is interesting to note that at T1, 69.6% of males and 71.4% of females believed they consumed a healthy, well-balanced diet. At T2, 68.9% of males and 71.6% of females believed they consumed a healthy, well-balanced diet. An assumption may be made that these individuals, therefore, are consuming a diet high in fruits and vegetables (an indicator of a healthy diet). However, at T1, only 37% of males and 43.3% of females were eating '5-a-day' or more fruits and vegetables. At T2, this remained broadly similar with 36.6% of males and 42.7% of females achieving '5-a-day'. This suggests that an individual's perception of what they are eating, and what they are actually eating, may differ and it also questions individual knowledge or perception of the makeup of a healthy diet. Measuring fruit and vegetable intake and the consumption of a healthy, well-balanced diet as separate variables is therefore important in the study of eating behaviours, as it identifies that the two measures are not interchangeable measures of diet. In a previous study of fruit and vegetable intake and diet, more than 50% of participants who believed they had an overall diet that was 'very healthy' ate less than the recommended '5-a-day' (Oyebode et al., 2013), so the findings of the current study are consistent with previous research.

Perception of a healthy diet is also important. A recent study demonstrated that physical activity levels in the UK are decreasing, but so too is reported calorie consumption; how then is overweight and obesity increasing in the UK (Berning & Hogan, 2014)? This has implications on the current study; while the current study does not measure calorie intake, it is likely that

under-reporting in calorie consumption may also alter the perception individuals have of a healthy, well-balanced diet and therefore result in overreporting. Whether the underreporting is a lack of knowledge on calories and nutrition, or a societal pressure to underreport, the current study may well see an overreporting in the perception of a healthy, well-balanced diet. A study of UK civil servants underreporting in food consumption was found for both genders – those with a higher BMI and of lower employment grades were most likely to underreport (Stallone et al., 1997). This could also help explain why some participants who did not consume the Government recommendation of '5-a-day' still reported they consumed a healthy, well-balanced diet.

4.4.3 Cost of food influencing purchasing behaviours

Age, BMI, number of dependants, and SES at T2 significantly differed between individuals whose food purchasing behaviours were influenced by cost a lot and entirely compared to those whose purchasing behaviours were influenced by cost only somewhat, a little, or not at all.

4.4.3.1 Main findings

Table 4.6 shows the demographic and socioeconomic differences between individuals whose purchasing behaviours are influenced by cost *a lot* and *entirely* compared to those whose purchasing behaviours are influenced by cost only *somewhat*, *a little,* or *not at all*. In the current study, age, number of dependants, BMI, and SES were significantly different for individuals whose purchasing behaviours are influenced by cost at T2. Gender did not significantly influence between-group differences in cost of food influencing purchasing behaviours.

The 25-34 age category were most likely to make purchases influenced by the cost of food, and the 55 and over age category least likely. But 73% of the 25-34 age category stated that their purchasing behaviours were only influenced by cost somewhat, a little, or not at all, and 90% in the 55-64 age category, which suggests that cost was not a significant factor for many of the respondents. Individuals with three or more children were more likely to be influenced by the cost of food than individuals with no children, however while there was a significant between-group difference, the percentage of individuals who were influenced by cost was low, with only 16% of individuals with no children, 20% with one to two children, and 22% of employees with more than three children stating that cost influenced their purchasing behaviours a lot or entirely. BMI demonstrated a gradient of influence, with the Obese (II, III) most influenced by the cost of food (at 23.7%) and the healthy weight least influenced by the cost (15.6%). SES also had an influence on the cost of food influencing purchasing behaviours, with the lower income groups and grades most likely to be influenced and the higher income groups and grades least likely ($p < .001$). Education had a slightly less significant influence on between-group differences ($p < .01$) with individuals with a degree least influenced by the cost of food.

4.4.3.2 Comparison of findings with current literature

The perception, and/or reality, that healthier foods cost more to purchase can lead to a socioeconomic gradient in eating behaviours. Individuals who have a lower income and job grade are more likely to perceive cost as a barrier to purchasing behaviours (Aggarwal et al., 2011; Drewnowski, 2009; Darmon & Drewnowski, 2007; Lallukka, Laaksonen, Rahkonen, Roos &

Lahelma, 2007; Timmins et al., 2013). This difference is stronger when educational level is taken into account. Those with lower educational attainment are more likely to perceive cost as a barrier to purchasing behaviours (Aggarwal et al., 2011; Morris, Hulme, Clarke, Edwards, & Cade; 2014). Much research however, including the present study, does not account for the *liking* of foods, or perhaps socioeconomic differences in food preferences or desirability. While cost of food may be a driver in purchasing behaviours, it may be that those with more nutritional knowledge (and education) are able to make healthier choices and have an awareness that cooking a meal from scratch may cost less than a take-away or ready meal.

The gradient in salary band for cost of food influencing purchasing behaviours is reflected in the gradient in job grade. However, the data cannot identify whether the influence of cost is based on necessity or simply being cost-conscious and being aware of purchasing 'good value' foods. Civil service employees have a fixed income, and a clear pattern for job progression through to higher salary bands, and therefore are unlikely to be 'priced out' of purchasing healthy foods (Andrieu, Darmon, & Drewnowski, 2006; Drewnowski, 2009). Further investigation to understand the culture or environment that the employees live in in Northern Ireland may also help in understanding the association between salary and job grade. It has been seen that the environment in which an individual lives, and the societal norms, may also influence eating behaviours (Drewnowski, 2009).

It is worth noting that much of the previous research discussed in this thesis is community-based, and therefore the socioeconomic trends observed may be greater than those seen in the civil service workforce (given the focus

on employees in contracted employment). With this in mind, caution must be used in drawing too strong a comparison with findings. For example, the majority of participants who responded to the cost of food question in the current study (apart from nine who had no qualifications) had qualifications of a School Certificate, O Level, GCSE, A Level, SCE Higher, National Diploma/Certificate or above, and therefore may have a greater understanding of healthy eating than those with no educational attainment. In addition, the current study demonstrated a significant educational influence on diet cost; those with GCSEs and A Levels, and equivalent, reported that diet cost influenced their purchasing behaviours more than that of individuals with a degree, although the difference between the groups is small. Educational gradients in the cost of food influencing purchasing behaviours are widely reported in community studies (Aggarwal et al., 2011; McLaren, 2007; Sobal & Stunkard; 1989). However, as most studies looking at socioeconomic differences in dietary consumption are community-based, further research is needed in the workplace to understand workplace influences and to ensure that interventions are tailored to specific behaviours and requirements.

The age-related gradients in cost influencing purchasing behaviour may be influenced by income, with employees likely to progress their careers (and therefore income and job grade) over time (Chambers et al., 2008). The finding that BMI has a significant influence on cost influencing purchasing behaviours is complex. Many studies observe BMI as an outcome of eating behaviour rather than a precursor (McLaren, 2007). There is an argument to say that individuals who are consuming cheaper foods higher in fats and sugars are both cost sensitive and more likely to gain weight from their behaviour

(Darmon & Drewnowski, 2007; Timmins et al., 2013). This may be driven by the strong relationship between SES and obesity (McLaren, 2007; Sobal & Stunkard, 1989). While the present study is not focused on underweight participants, it is worth noting that underweight participants were almost as likely as obese participants to report the cost of food influencing purchasing behaviours a lot or entirely – given the small sample size (only 10 respondents were underweight in comparison to 195 overweight) no conclusions should be drawn. Likewise, underweight employees were least likely to achieve their '5-a-day' fruit and vegetables, yet were among the most likely weight categories to believe they consumed a healthy, well-balanced diet. Caution may also be applied to this data because of the self-report nature of weight and height and the tendency, certainly for females, to underreport weight but over report height potentially misrepresenting the BMI (McLaren, 2007). Further study may be warranted to investigate relations between underweight employees and the cost of food influencing purchasing behaviours and other eating behaviours.

Number of dependants had a significant impact on cost of food influencing purchasing behaviours, and a positive linear relationship with number of children. This is not discussed in detail in previous literature, most probably because of dependants being used as a control rather than independent variable, and therefore no comparisons could be made. However, it would seem logical that as the number of people in a household increases, so too does spend on food, and perhaps sensitivity to those costs. However, the current research does not allow conclusions to be drawn as it merely demonstrates an association rather than causality in relations, and there is a

danger in stating too simplistic associations when SES, BMI, and age have also been shown to be of significance. The influence of dependants on eating behaviours will be discussed further in Chapter 7 following the qualitative analysis of perceived barriers and facilitators to healthy eating in the workplace.

4.4.4 Eating past the point of feeling full

Age and BMI, at T2, differ significantly between individuals who eat past the point of feeling full *sometimes, often* and *every day* compared to those who eat past the point of feeling full *never*, and *rarely..*

4.4.4.1 Main findings

Table 4.7 demonstrates the demographic and socioeconomic differences between individuals who eat past the point of feeling full *often*, *every day,* and *sometimes* compared to those who eat past the point of feeling full *never* and *rarely*. In the discussion, these two groups will be referred to as those who eat past the point of feeling full and those who do not, respectively. In the current study only age, gender, and BMI were significantly different for individuals who eat past the point of feeling full at T2. Number of dependants and SES did not significantly influence between-group differences.

Women were most likely to eat past the point of feeling full sometimes, often, or everyday (61%), and 44% of men stated that they never and rarely ate past the point of feeling full. Age demonstrated significant between-group differences, with a positive linear relationship between age and those who ate past the point of feeling full sometimes, often, and every day with the 18-24 age group most likely to eat past the point of feeling full (71%) and the 55 and over age group least likely (52%). BMI exerted a significant influence on

eating past the point of feeling full with a gradient in behaviour from underweight (40%) to obese (I, II) employees (74%). Education did not achieve significance, with broadly similar splits in those who eat past the point of feeling full and those who do not, with around 58% in each category affirming they do eat past the point of feeling full. A slight gradient could be observed for salary band, with lower earners more likely to report eating past the point of full than lower grades, but these between-group differences did not reach significance, potentially because of the low numbers completing this question in the questionnaire at higher salaries. The difference between grades also did not reach significance.

4.4.4.2 Comparison of findings with current literature

No socioeconomic differences were observed in eating past the point of feeling full. This contrasts with a study of female civil servants in London, whereby women in higher occupational grades, who were shown to have lower weights, scored lower in disinhibition and hunger than those in lower grades (Dykes et al., 2004). Women who continued to eat, even when they were no longer hungry, were more likely to have a higher weight. Unfortunately, no men were included in this study, so it is not possible to compare the gender-related findings of the current study. A study of only adult men found that those with the highest levels of dietary restraint were more likely to make healthier food choices that those who more often ate past the point of feeling full (Tepper, Choi, & Nayga, 1997). The current study adds to the research in this area, as no previous studies could be found exploring eating past the point of feeling full in both genders in the workplace. The finding that females report eating past the point of feeling full more than males may be linked to previous

research suggesting women feel a greater societal pressure to maintain (or lose) weight than do men (McLaren, 2007; Sobal & Stunkard, 1989) and therefore may be more conscious of their eating behaviours and identifying when they eat past the point of feeling full.

Much of the previous literature examining disinhibition and restraint assumes that females experience greater pressure to look a certain way and therefore engage in more dieting and restraint (Bryant et al., 2007). However, it could be argued in the 21st century a similar pressure is experienced by males. Whether this pressure is the same at all age groups is unclear. Certainly, in the current study, older age groups were less likely to eat past the point of feeling full than younger age groups. Perhaps, given previous studies report that older people's eating behaviours are driven more by health concerns, older people stop eating when they are full to maintain good health (Chambers, Lobb, Butler, & Traill, 2009). The current study is limited, as it does not assess whether this is associated with hunger. Certainly, in the difference between the oldest age group (55 and over) and the youngest (18-24) it could be that the younger group is significantly more active than the older group, and therefore have greater hunger; they may be less concerned about eating past the point of feeling full as they will burn the calories off throughout the course of the day. Activity level was not analysed as part of the current study, and future study may warrant its inclusion to assess whether an association exists between activity level and eating past the point of feeling full.

The gradient in the difference between eating past the point of feeling full and BMI may suggest that the more one overeats the more weight will increase if activity does not increase to compensate the behaviour. This is

consistent with previous research that reports disinhibition is positively associated with obesity and BMI (Bryant et al., 2007; Savage et al., 2009).

It is worth noting that self-control (and therefore likely disinhibition and restraint) is a limited resource and may be depleted during challenging decisions or difficult times in an individual's life (Hruschka, 2012). In the workplace, and at home, many potential sources of stress exist, and further study may benefit from the inclusion of psychosocial risk and work pattern data to further understand the drivers for overeating. The present study demonstrates SES does not have a significant association with eating past the point of feeling full in employees of the NICS and therefore other factors, not examined in the present thesis, must be of greater significance. Further analysis of eating past the point of feeling full is presented in Chapters 5 and 6.

4.5 Strengths and Limitations

The current analysis benefits from the inclusion of five eating behaviours. As presented in the discussion in the previous section, each eating behaviour has a slightly differing relationship with the socioeconomic and demographic and personal factors examined, and therefore this multi-faceted approach enables a more comprehensive discussion on eating behaviours in the workplace. The inclusion of three measures of SES – education, salary band, and grade – is also of benefit, as each has a different association with the eating behaviours examined.

A descriptive epidemiology is a helpful pre-cursor to inferential statistics, as it helps to expose relations that warrant further investigation. While the current chapter presents a cross-sectional examination of associations between the study variables, it is not possible to draw conclusions

on causal relations. The study of employees of the NICS may also limit the generalisability of results, given the narrow employment field and geographical location of study. However, the study does add to the current literature given most studies are community-based and no workplace studies investigate the range of eating behaviours examined in the current study. Northern Ireland had a population of around 1.4 million in 2016 and research shows that the population is ageing; the employment profile of Northern Ireland and the demographics of the workforce closely reflect that of Northern Ireland, and it is likely that the findings from the Stormont Study are applicable to other workplaces in Northern Ireland (Russell, 2016). Further strengths and limitations are discussed in Chapters 5 and 6 and a summary is presented in Chapter 8.

4.6 Chapter Summary

The current chapter examined cross-sectional differences between socioeconomic, demographic, and personal factors, and the eating behaviours of a large sample of civil servants. Data were drawn from workforce surveys conducted in the NICS in 2012 and 2014. Two eating behaviours were examined through data collected in 2012 and 2014 (UK Government recommendation for fruit and vegetable consumption of '5-a-day' and the consumption of a healthy, well-balanced diet) and two at the 2014 data collection (the cost of food influencing purchasing behaviours and eating past the point of feeling full). The current research supports previous research identifying an association between SES and eating behaviours, and identifies the significance of demographic factors in between-group differences in eating behaviours. The findings point to the potential for targeted and tailored

workplace interventions to promote healthy eating. To understand the

differences described in this chapter further, the next chapter will examine the

strength of correlations to better understand the extent to which it is the

demographic factors, or the socioeconomic variables, that exert the greater

influence on eating behaviours

Chapter 5: Results and Discussion of Cross-sectional, Prospective and Longitudinal Analysis of Socioeconomic Status, Demographic Factors and Eating Behaviours

5.1 Introduction

The previous chapter demonstrated the significance of demographic and personal factors (age, gender, number of dependants, and BMI) in addition to SES (measured by education, salary band, and grade) in their association with eating behaviours. These relationships are further explored in the current chapter to understand the extent to which each of these predictor variables (age, gender, BMI, number of dependants, education, salary band, and grade) influence eating behaviours. Five eating behaviours are examined – *cost of food influencing purchasing behaviour, eating past the point of feeling full, vegetable consumption, fruit consumption,* and the *consumption of a healthy, well-balanced diet*. Data on three behaviours were collected in employee surveys of NICS employees conducted in 2012 and 2014 – these are fruit consumption, vegetable consumption, and the consumption of a healthy, well-balanced diet. Two additional eating behaviours were added to the 2014 survey, as a result of the literature review contained in this thesis: The cost of food influencing purchasing behaviour and eating past the point of feeling full.

Three of the research questions, derived from the literature review in Chapter 2, are considered in the current chapter: (2) Is SES, as measured by education, salary band and grade, associated with eating behaviours? (3) Is SES, as measured by education, salary band, and grade, associated with obesity (measured by BMI)? (4) Are demographic factors associated with eating behaviours?

Table 5.1

Eating behaviours and analysis method (cross-sectional, prospective or longitudinal analysis).

	Linear Regression		
	Cross-sectional	Prospective	Longitudinal
Cost of food	Yes	Yes	
Eating Past Full	Yes	Yes	
Healthy Diet	Yes		Yes
Vegetable Intake	Yes		Yes
Fruit Intake	Yes		Yes

Cross-sectional analysis is included for all five eating behaviours from the 2014 survey data (T2), longitudinal analysis are included for the three eating behaviours included in the 2012 survey data (T1), and prospective analysis applied to the new eating behaviours at T2 (see Table 5.1).

5.2 Cross-sectional Results

The current section presents the results of cross-sectional analysis of SES and demographic factors in relation to eating behaviours.

5.2.1 Demographic and socioeconomic variables at T2 and cost of food influencing purchasing behaviour at T2

Cross-sectional linear regression analyses were applied to identify the extent to which the cost of food influencing purchasing behaviours was influenced by socioeconomic and demographic variables and are displayed in Table 5.2.

Table 5.2

Cross-sectional Linear Regression analysis predicting the extent to which

Socioeconomic Status (Education, Salary Band, and Grade) influences the cost

of food influencing purchasing behaviours (N=5,155)

	Model 1			Model 2		
	B	SE *B*	*β*	*B*	SE *B*	*β*
Model 1						
Age	-.02	.00	-.21***	-.02	.00	-.16***
Gender	-.04	.03	-.02	-.00	.03	-.00
Number of Dependants	.11	.01	.14***	.12	.01	.15***
BMI	.01	.00	.08***	.00	.00	.06***
Model 2						
Education				.01	.01	.04*
Salary Band				-.03	.01	-.06*
Grade				-.09	.02	-.15***
R^2	.06			.10		
ΔR^2	.06***			.03***		
R^2 *adj.*	.06			.09		

*$p < .05$, **$p < .01$, ***$p < .001$.

B, unstandardised regression coefficient; SE *B*, standard error of

unstandardised regression coefficient; *β*, standardised beta coefficient; R^2,

explained variance; ΔR^2, change in explained variance; R^2 *adj.,* explained

variance adjusted.

The results for the regression analysis with the cost of food influencing purchasing behaviour as the criterion variable are shown in Table 5.2. The covariates (age, gender, number of dependants, and BMI) explained 6% (6% adjusted) of the variance in cost of food influencing food purchasing behaviours (Model 1), and were statistically significant, $F(4, 5150) = 86.75$, $p < .001$. Among the covariates, age, number of dependants, and BMI significantly contributed to the model ($p < .001$), but gender did not. The addition of SES (education, salary band, and grade) (Model 2) accounted for a further 3% of the adjusted variance as compared to Model 1 ($R^2 = .06$; R^2 adj. $= .06$) and was statistically significant $F(3, 5147) = 77.210$, $p < .001$. In summary, the demographic variables (age, number of dependants, and BMI) in addition to education, salary band, and grade account for 9% of the adjusted variance in the cost of food influencing purchasing behaviours.

5.2.2 Demographic and socioeconomic variables at T2 and eating past the point of feeling full at T2

Cross-sectional linear regression analyses were applied to identify the extent to which eating past the point of feeling full was influenced by socioeconomic and demographic variables at T2 and are displayed in Table 5.3.

Table 5.3

Cross-sectional Linear Regression analysis predicting the extent to which Socioeconomic Status (Education, Salary Band, and Grade) influences eating past the point of feeling full (N = 5,164).

	Model 1			Model 2		
	B	SE B	β	B	SE B	β
Model 1						
Age	-.01	.00	-.15***	-.01	.00	-.16***
Gender	-.10	.02	-.22***	-.10	.02	-.06***
Number of Dependants	.01	.01	.01	.00	.01	.01
BMI	.03	.00	.00***	.03	.00	.22***
Model 2						
Education				-.01	.01	-.01
Salary Band				.02	.01	.04
Grade				-.00	.01	-.00
R^2	.07			.07		
ΔR^2	.07***			.00		
R^2 adj.	.07			.07		

*$p < .05$, **$p < .01$, ***$p < .001$.

B, unstandardised regression coefficient; SE B, standard error of unstandardised regression coefficient; β, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; R^2 adj., explained variance adjusted.

The results for the regression analysis with the eating past the point of feeling full as the criterion variable are shown in Table 5.3. The covariates

(age, gender, number of dependants, and BMI) explained 7% (7% adjusted) of the variance in eating past the point of feeling full (Model 1), and was statistically significant, F (4, 5159) = 92.86, p < .001. Among the covariates, only age, gender, and BMI significantly contributed to the model; the number of dependants did not. The addition of SES (education, salary band, and grade) (Model 2) accounted for no further variance when compared to Model 1 (R^2 = .07; R^2 adj. = .06) and was not statistically significant F (3, 5156) = 9.01, p < .05. Therefore, only age, gender, and BMI significantly accounted for 7% of the adjusted variance in eating past the point of feeling full.

5.2.3 Demographic and socioeconomic variables at T2 and vegetable consumption at T2

Cross-sectional linear regression analyses were applied to identify the extent to which vegetable consumption was influenced by socioeconomic and demographic variables at T2 and are displayed in Table 5.4.

Table 5.4

Cross-sectional Linear Regression analysis predicting the extent to which Socioeconomic Status (Education, Salary Band, and Grade) and BMI influence vegetable consumption (N = 5,163).

	Model 1			Model 2		
	B	SE *B*	*β*	*B*	SE *B*	*β*
Model 1						
Age	.00	.00	.16	.00	.00	.03
Gender	-.20	.03	-.08***	-.21	.03	-.09***
Number of Dependants	-.01	.01	-.01	-.13	.01	-.01
BMI	-.01	.00	-.04*	-.00	.00	-.03*
Model 2						
Education				.05	.01	.06***
Salary Band				.04	.02	.07*
Grade				-.05	.02	-.08*
R²	.01			.01		
Δ*R²*	.01***			.00***		
R² adj.	.01			.01		

*p < .05, **p < .01, ***p < .001.

B, unstandardised regression coefficient; SE *B*, standard error of unstandardised regression coefficient; *β*, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; *R² adj.,* explained variance adjusted.

The results for the regression analysis with vegetable consumption as the criterion variable are shown in Table 5.4. The covariates (age, gender,

number of dependants, and BMI) explained 1% (1% adjusted) of the variance in vegetable consumption (Model 1), and were statistically significant, $F_{(4, 5158)} = 10.70$, $p < .001$. Among the covariates, only gender and BMI significantly contributed to vegetable consumption. The addition of SES (education, salary band, and grade) (Model 2) accounted for no further variance when compared to Model 1 ($R^2 = .01$; R^2 adj. $= .01$) however was statistically significant $F_{(3, 5155)} = 9.12$, $p < .001$. Education, salary band, and grade all contributed significantly, however did not account for further variance. In summary, gender, BMI, and all three measures of SES accounted for 1% of the adjusted variance in vegetable consumption.

5.2.4 Demographic and socioeconomic variables at T2 and fruit consumption at T2

Cross-sectional linear regression were applied to identify the extent to which fruit consumption was influenced by socioeconomic and demographic variables at T2 and are displayed in Table 5.5.

Table 5.5

Cross-sectional Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade) and BMI influence fruit consumption (N = 5,153).

	Model 1			Model 2		
	B	SE B	β	B	SE B	β
Model 1						
Age	.02	.00	.13***	.02	.00	.12***
Gender	-.15	.04	-.05***	-.18	.04	-.06***
Number of Dependants	-.04	.02	-.03*	-.03	.02	.03
BMI	-.01	.00	-.05***	-.03	.00	-.05**
Model 2						
Education				.03	.02	.03
Salary Band				.03	.02	.04
Grade				.00	.03	.00
R^2	.02			.03		
ΔR^2	.02***			.02***		
R^2 adj.	.02			.00		

*p < .05, **p < .01, ***p < .001.

B, unstandardised regression coefficient; SE B, standard error of unstandardised regression coefficient; β, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; R^2 adj., explained variance adjusted.

The results for the regression analysis with fruit consumption as the criterion variable are shown in Table 5.5. The covariates (age, gender, number

of dependants, and BMI) explained 2% (2% adjusted) of the variance in fruit consumption (Model 1), and was statistically significant, $F_{(4, 5148)} = 28.06$, $p < .001$. All the covariates – age, gender, number of dependants, and BMI – significantly contributed to fruit consumption in Model 1. The addition of SES (education, salary band, and grade) (Model 2) accounted for no further variance when compared to Model 1 ($R^2 = .02$; R^2 adj. $= .00$) and was statistically significant $F_{(3, 5145)} = 18.69$, $p < .001$. Therefore, only age, gender, and BMI significantly accounted for 2% of the variance in fruit consumption.

5.2.5 Demographic and socioeconomic variables at T2 and consumption of a healthy, well-balanced diet at T2

Cross-sectional linear regression was applied to identify the extent to which the consumption of a healthy, well-balanced diet was influenced by socioeconomic and demographic variables at T2 and are displayed in Table 5.6.

Table 5.6

Cross-sectional Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade) influences the consumption of a healthy, well-balanced diet (N = 5,143).

	Model 1			Model 2		
	B	SE B	β	B	SE B	β
Model 1						
Age	.01	.00	.08***	.01	.00	.08***
Gender	-.08	.02	-.06***	-.10	.04	-.07***
Number of Dependants	.01	.02	.01	.02	.02	.00
BMI	-.02	.00	-.18***	-.02	.00	-.16***
Model 2						
Education				.03	.01	.07***
Salary Band				.01	.01	.03***
Grade				.02	.01	.05
R^2	.04			.05		
ΔR^2	.04***			.01***		
R^2 adj.	.04			.05		

*$p < .05$, **$p < .01$, *** $p < .001$.

B, unstandardised regression coefficient; SE B, standard error of unstandardised regression coefficient; β, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; R^2 adj., explained variance adjusted.

The results for the regression analysis with the consumption of a healthy, well-balanced diet as the criterion variable are shown in Table 5.6.

The covariates (age, gender, number of dependants, and BMI) explained 4% (4% adjusted) of the variance in the consumption of a healthy, well-balanced diet (Model 1), and was statistically significant, $F (4, 5138) = 53.20$, $p<.001$. Among the covariates, age, gender, and BMI significantly contributed to the consumption of a healthy, well-balanced diet. The addition of SES (education, salary band, and grade) (Model 2) accounted for a further 1% when compared to Model 1 ($R^2 = .04$; R^2 adj. $= .04$) and was statistically significant $F (3, 5135) = 41.16$, p<.001. Of the socioeconomic variables, only education and salary band were significant. Therefore, age, gender, BMI, education, and salary band significantly accounted for 5% of the adjusted variance in the consumption of a healthy, well-balanced diet.

5.3 Prospective Analysis Results

The current section presents the results of prospective analysis of SES and demographic factors at T1 with the eating behaviours only included in the 2014 study. The prospective study allows for the analysis of the new criterion variables, cost of food influencing purchasing behaviours and eating past the point of feeling full, at T2 with the predictor variables (SES and demographics) at T1 in order to make comparisons in the correlations over time.

5.3.1 Demographic and socioeconomic variables at T1 and cost of food influencing purchasing behaviours at T2

Prospective linear regression was applied to identify the extent to which the cost of food influencing purchasing behaviours at T2 was influenced by socioeconomic and demographic variables at T1 and the results are presented in Table 5.7.

Table 5.7

Prospective Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade) at T1, influences the cost of food influencing purchasing behaviours at T2 (N= 899).

	Model 1			Model 2		
	B	SE *B*	*β*	*B*	SE *B*	*β*
Model 1						
Age	-.02	.00	-.17***	-.01	.00	-.11**
Gender	-.12	.06	-.06	-.09	.06	-.05
Number of Dependants	.09	.02	.13***	.09	.02	.12***
BMI	.02	.01	.10**	.02	.01	.08*
Model 2						
Education				.01	.02	.02
Salary Band				-.05	.03	-.10
Grade				-.05	.04	-.08*
R^2	.04			.07		
ΔR^2	.05***			.02***		
R^2 adj.	.04			.07		

*p < .05, **p < .01, ***p < .001.

B, unstandardised regression coefficient; SE *B*, standard error of unstandardised regression coefficient; *β*, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; *R^2 adj.,* explained variance adjusted.

The results for the prospective regression analysis with the cost of food influencing purchasing behaviour as the criterion variable at T2 are shown in Table 5.7. The covariates at T1 (age, gender, number of dependants, and BMI) explained 5% (4% adjusted) of the variance in cost of food influencing food purchasing behaviours (Model 1), and was statistically significant, $F(4, 915) = 11.48$, $p < .001$. Among the covariates, age, number of dependants, and BMI at T1 significantly contributed to the cost of food influencing purchasing behaviours at T2. The addition of SES (education, salary band, and grade) (Model 2) accounted for a further 3% of the adjusted variance as compared to Model 1 ($R^2 = .04$; R^2 adj. = .05) and was statistically significant $F(3, 912) = 10.11$, $p < .001$, with only grade (out of the three SES variables) significantly contributing to the model ($p < .05$). Therefore, age, number of dependants, and BMI, with SES at T1 accounted for 7% of the adjusted variance in the cost of food influencing purchasing behaviours at T2.

5.3.2 Demographic and socioeconomic variables at T1 and eating past the point of feeling full at T2

Prospective linear regression analyses were applied to identify the extent to which eating past the point of feeling full at T2 was influenced by socioeconomic and demographic variables at T1 and are presented in Table 5.8.

Table 5.8

Prospective Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade) at T1, influences eating past the point of feeling full at T2 (N = 898) .

	Model 1			Model 2		
	B	SE *B*	*β*	*B*	SE *B*	*β*
Model 1						
Age	-.01	.00	-.14***	-.01	.00	-.13***
Gender	.02	.05	.01	.02	.05	.01
Number of Dependants	.00	.02	.01	.00	.02	.01
BMI	.03	.01	.21***	.03	.01	.21***
Model 2						
Education				.01	.02	.02
Salary Band				-.00	.03	-.01
Grade				-.00	.03	-.01
R²	.06			.06		
Δ*R²*	.06***			.00		
R² adj.	.05			.05		

*p < .05, **p < .01, ***p < .001.

B, unstandardised regression coefficient; SE *B*, standard error of unstandardised regression coefficient; *β*, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; *R² adj.,* explained variance adjusted.

The results for the prospective regression analysis with eating past the point of feeling full at T2 as the criterion variable are shown in Table 5.8. The covariates at T1 (age, gender, number of dependants, and BMI) explained 6% (5% adjusted) of the variance in eating past the point of feeling full at T2 (Model 1), and was statistically significant, $F (4, 913) = 13.88, p < .001$. Among the covariates, only age and BMI at T1 significantly contributed eating past the point of feeling full at T2. The addition of SES (education, salary band, and grade) (Model 2) accounted for no further variance when compared to Model 1 ($R^2 = .06$; R^2 adj. $= .06$) and was not statistically significant $F (3, 910) = 7.94, p > .10$. Therefore SES at T1 did not influence eating past the point of feeling full at T2, but age and BMI significantly accounted for 5% of the adjusted variance in eating past the point of feeling full at T2.

5.4 Longitudinal Results

The current section presents the results of hierarchical linear regression of demographic and personal factors and SES and the variance in eating behaviours between surveys in 2012 and 2014. All criterion variables (eating behaviours) collected at both T1 and T2 were subjected to longitudinal analyses in which the status of the criterion variable at T1 was controlled for in the regression analyses. The two new eating behaviours included in the study at T2 as a result of the literature review could only be analysed using prospective analysis given the absence of data on the criterion variables at T1, and are therefore not included in the following section.

5.4.1 Vegetable consumption

Linear regression was used to determine the variance in vegetable consumption at T2. Education, salary band, and grade (SES) did not account

for the variance in vegetable consumption between T1 and T2 and are

presented in Table 5.9.

Table 5.9

Longitudinal Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade), and vegetable consumption, at T1, influences vegetable consumption at T2 (N = 889).

	Model 1			Model 2		
	B	SE *B*	*β*	*B*	SE *B*	*β*
Model 1						
Age	.01	.00	.06*	.01	.00	.06*
Gender	-.11	.06	-.05	-.14	.07	-.06*
Number of Dependants	-.02	.03	-.03	-.02	.03	-.02
BMI	-.00	.01	-.02	-.00	.01	-.01
Vegetable Consumption (T1)	.54	.03	.55***	.53	.03	.54***
Model 2						
Education				.04	.03	.06
Salary Band				.07	.04	.11
Grade				-.08	.04	-.13*
R^2	.32			.33		
ΔR^2	.32***			.01		
R^2 adj.	.32			.32		

*p < .05, **p < .01, ***p < .001.

B, unstandardised regression coefficient; SE *B*, standard error of unstandardised regression coefficient; *β*, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; *R^2 adj.,* explained variance adjusted.

The results for the longitudinal regression analysis with vegetable consumption at T2 as the criterion variable are shown in Table 5.9. The covariates at T1 (age, gender, number of dependants, BMI, and vegetable consumption) explained 32% (32% adjusted) of the variance in vegetable consumption (Model 1), and were statistically significant, $F (5, 883) = 83.98$, $p < .001$. Among the covariates, only age and vegetable consumption at T1 significantly contributed to vegetable consumption at T2. The addition of SES (education, salary band, and grade) (Model 2) accounted a further 1% variance when compared to Model 1 ($R^2 = .33$; R^2 adj. $= .32$) but was not statistically significant $F (3, 880) = 2.45$ $p > .05$. Grade did reach significance ($p < .05$), but when combined with education and salary band, the significance diminished. In Model 2, gender also reached significance with the addition of the socioeconomic variables. In summary, age, vegetable consumption, and grade at T1 significantly accounted for 32% of the adjusted variance in vegetable consumption at T2.

5.4.2 Fruit consumption

Linear regression analyses were used to determine the variance in fruit consumption at T2. Education, salary band, and grade (SES) did not account for the variance in fruit consumption between T1 and T2 and are presented in Table 5.10.

Table 5.10

Longitudinal Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade), and fruit consumption at T1 influence fruit consumption at T2 (N = 889).

	Model 1			Model 2		
	B	SE *B*	*β*	*B*	SE *B*	*β*
Model 1						
Age	.01	.00	.07**	.01	.01	.09**
Gender	-.04	.08	-.01	-.06	.08	-.02
Number of Dependants	-.03	.03	-.03	-.03	.03	-.03
BMI	-.01	.01	-.04	-.01	.01	-.04
Fruit Consumption (T1)	.57	.02	.62***	.57	.02	.62***
Model 2						
Education				.06	.03	.06*
Salary Band				-.02	.04	-.02
Grade				-.01	.05	-.01
R^2	.41			.42		
ΔR^2	.41***			.00		
R^2 adj.	.41			.41		

*p < .05, **p < .01, ***p < .001.

B, unstandardised regression coefficient; SE *B*, standard error of unstandardised regression coefficient; *β*, standardised beta coefficient; R^2, explained variance; ΔR^2, change in explained variance; *R^2 adj.,* explained variance adjusted.

The results for the longitudinal regression analysis with fruit consumption at T2 as the criterion variable are shown in Table 5.10. The covariates at T1 (age, gender, number of dependants, BMI, and fruit consumption) explained 41% (41% adjusted) of the variance in vegetable consumption (Model 1), and was statistically significant, $F (5, 883) = 123.75$, $p < .001$. Among the covariates, only age and fruit consumption at T1 significantly contributed to fruit consumption at T2. The addition of SES (education, salary band, and grade) (Model 2) accounted for no further variance when compared to Model 1 ($R^2 = .42$; R^2 adj. $= .41$) and was not statistically significant $F (3, 880) = 1.32$ $p > .05$. Therefore, of the covariates analysed, only age and fruit consumption at T1 significantly accounted for 41% of the adjusted variance in fruit consumption at T2.

5.4.3 Consumption of a healthy, well-balanced diet

Linear regression was used to determine the variance in the consumption of a healthy, well-balanced diet between T1 and T2. Education, salary band, and grade (SES) did not account for the variance in the consumption of a healthy, well-balanced diet between T1 and T2 and are presented in Table 5.11.

Table 5.11

Longitudinal Linear Regression analysis predicting the extent to which SES (Education, Salary Band, and Grade), and the consumption of a healthy, well-balanced diet at T1 influence the consumption of a healthy, well-balanced diet at T2 (N = 887).

	Model 1			Model 2		
	B	SE B	β	B	SE B	β
Model 1						
Age	.00	.00	.05	.00	.00	.06
Gender	-.09	.04	-.07*	-.10	.04	-.08*
Number of Dependants	-.01	.02	-.02	-.01	.02	-.02
BMI	-.01	.00	-.09**	-.01	.00	-.08**
Balanced Diet (T1)	.43	.03	.45***	.42	.03	.44***
Model 2						
Education				.02	.02	.04
Salary Band				.00	.02	.01
Grade				-.01	.02	-.03
R^2	.24			.24		
ΔR^2	.24***			.00		
R^2 adj.	.23			.23		

*$p < .05$, **$p < .01$, ***$p < .001$.

B, unstandardised regression coefficient; SE B, standard error of unstandardised regression coefficient; β, standardised beta coefficient; R^2,

explained variance; ΔR^2, change in explained variance; R^2 adj., explained variance adjusted.

The results for the longitudinal regression analysis with the consumption of a well-balanced healthy diet at T2 as the criterion variable are shown in Table 5.11. The covariates at T1 (age, gender, number of dependants, BMI, and the consumption of a well-balanced healthy diet) explained 24% (23% adjusted) of the variance in the consumption of a well-balanced healthy diet (Model 1), and was statistically significant, $F (5, 881) = 54.33$, $p < .001$. Among the covariates, only age, BMI, and the consumption of a well-balanced healthy diet at T1 significantly contributed to the consumption of a well-balanced healthy diet at T2. The addition of SES (education, salary band, and grade) (Model 2) accounted for no further variance when compared to Model 1 ($R^2 = .24$; R^2 adj. $= .23$) and was not statistically significant $F (3, 878) = .48$ $p > .05$. Therefore, of the covariates analysed, only gender, BMI, and the consumption of a well-balanced healthy diet at T1 significantly accounted for 23% of the adjusted variance in the consumption of a healthy well-balanced healthy diet at T2.

5.5 Discussion of Findings

5.5.1 Main findings from the cross-sectional and prospective analyses

Five eating behaviours were examined in the current study. Based on the correlations reported in Chapter 4, and the literature review reported in Chapter 2, age, gender, and number of dependants were identified as control variables in addition to BMI to include in the regression analysis.

In cross-sectional analysis of the 2014 Stormont Study data, cost of food influencing purchasing behaviours was significantly influenced by age, gender, number of dependants, BMI, and all the socioeconomic variables. Eating past the point of feeling full was significantly influenced by age and BMI. Vegetable consumption was influenced significantly by age, gender, and SES. Fruit consumption was influenced by age, BMI, and gender. The consumption of a healthy, well-balanced diet was influenced by age, gender, BMI, education, and salary. The effect sizes for three of the eating behaviours in the cross-sectional analysis were relatively small; fruit consumption (2%), vegetable consumption (1%), and the consumption of a healthy, well-balanced diet (2%). However, for the two eating behaviours added to the questionnaire in 2014, *cost of food influencing purchasing behaviours* and *eating past the point of feeling full,* greater effect sizes were seen of 9% and 7% respectively. Although 91% and 93% of the variances are therefore not explained by the models. The finding that SES is associated with eating behaviours is consistent with previous research in this area.

In the prospective linear regression, examining the influence of SES and demographic variables from the 2012 Stormont Study (T1), on eating behaviours in the 2014 Stormont Study (T2), the cost of food influencing purchasing behaviours was influenced by age, number of dependants, BMI, and grade (with gender and other SES variables at T1 having no significant correlation). Eating past the point of feeling full at T2 was influenced by age and BMI at T1 (consistent with the cross-sectional findings from T2). The effect sizes for the prospective study were slightly higher than for those of the cross-sectional analysis for the cost of food influencing purchasing behaviours

and eating past the point of feeling full. The effect sizes reduced slightly to 7%

and 5% respectively, suggesting that there were other factors at T1 that

influenced these behaviours at T2.

5.5.2 Main findings from the longitudinal study

SES (education, salary band, and grade) did not have a significant

influence in longitudinal regression analysis of the eating behaviours (fruit

consumption and the consumption of a healthy, well-balanced diet) between

T1 and T2, except for grade which demonstrated a small significant difference

($p < .05$) in vegetable consumption and education ($p < .05$) in fruit

consumption. Age, and the corresponding eating behaviour at T1, had a

significant impact on the variance in both fruit and vegetable consumption

between T1 and T2. Gender, BMI, and the consumption of a healthy, well-

balanced diet at T1, had a significant impact on the variance in consumption of

a healthy, well-balanced diet between T1 and T2. The most significant

predictor of the three eating behaviours at T2, examined at both T1 and T2,

was their corresponding eating behaviour at T1. Therefore, the effect sizes

achieved in the longitudinal study were greater than those of the cross-

sectional and prospective studies – vegetable consumption (32%), fruit

consumption (41%), and the consumption of a healthy, well-balanced diet

(23%). This indicates that once the habit of eating healthily is formed it will

influence future intentions to continue to consume healthy foods. It is worth

noting that in longitudinal analysis, effect sizes are often smaller and more

challenging to identify than cross-sectional effect sizes (Ford et al., 2014).

Therefore, while the eating behaviours at T1 were the most significant

influence on eating behaviours at T2, the demographic variables – age, gender,

and BMI – demonstrated their importance in behaviours between the two time points.

The descriptive epidemiology presented in Chapter 4 demonstrated SES had a significant influence on fruit and vegetable intake and overall diet at T1 and T2. The analysis looked at the combined questions of fruit and vegetable consumption and whether individuals met the Government '5-a-day' recommendation for fruit and vegetable intake. The smaller sample size available for the longitudinal analysis may have diminished the effect size, potentially reducing any significant impact of socioeconomic variables between T1 and T2. Age and BMI, as identified through the cross-sectional analysis, had a significant impact on eating behaviours, with age significantly explaining variance between both fruit and vegetable consumption between T1 and T2 and age and BMI significantly explaining variance in the consumption of a healthy, well-balanced diet. The significance of demographic factors in the variance of eating behaviours suggests that rather than controlling for these in studies (for example as in Aggarwal, Monsivais, Cook, & Drewnoski, 2011; Lahelma et al., 2009; Morris et al., 2014), these warrant further study in the workplace to better inform workplace interventions to support behaviour change.

5.5.3 Comparisons of findings with current literature

A socioeconomic effect in the consumption of fruit and vegetables, and in diet, has been reported in previous studies (Boukouvalas et al., 2009; Lallukka et al., 2007; Timmins et al., 2013; Nagler et al., 2013) and supports the effects found in the current study. Given the participants in the current study represent a relatively homogenous group of employees from the NICS,

generalisability in findings across other workforce populations may be limited, however the results are consistent with previous community and workplace studies. There may be other variables, not included in the current study, that elicit a greater influence over eating behaviours – such as availability, taste or preference, local cuisine, or availability of nutritional information locally. The current study demonstrates the importance of using a variety of measures of SES and eating behaviour, as it demonstrates that each eating behaviour (even fruit and vegetable consumption, so often combined in studies) is independently influenced by SES and by the demographic variables reviewed. What is apparent from the current chapter is the importance of demographic variables in eating behaviours in the cross-sectional, prospective, and longitudinal studies. The current section will review the findings from these three studies in comparison with the current literature in this area.

Education has been reported to exert a stronger influence on obesity and eating behaviours than other SES measures (including salary and grade) in both cross-sectional (Lahelma et al., 2004) and longitudinal studies (Wardle et al., 2002). In the current study, gender was only significant for vegetable consumption and the consumption of a healthy, well-balanced diet in the cross-sectional study and prospective studies. Differences between males and females have been reported in the influence of SES on health, with education and occupational class explaining health differences for men and household income more likely to determine health among women (Lahelma et al., 2004). Arguably health outcomes and eating behaviours are slightly different constructs (a positive eating behaviour may be a positive health outcome), but so too is the absence or management of ill-health. Eating behaviours may

therefore be influenced by wider factors than those of health outcomes. Education exerted its strongest influence over vegetable consumption in the cross-sectional study and was the only of the socioeconomic variables in the prospective study to influence vegetable consumption, fruit consumption, and the consumption of a healthy, well-balanced diet.

In the longitudinal study, education was not seen to influence eating behaviours between T1 and T2. This is likely because education is a relatively stable measure for adults of working age. While some adults may obtain qualifications while in the workforce (data on this at the NICS could not be obtained) the educational level of employees would therefore have remained stable between T1 and T2. The argument that education influences income which influences job grade may also play a part in longitudinal analysis of SES variables and eating behaviours (Lahelma et al., 2004). Ultimately, the influence of education is to enable earning power which may facilitate the ability to afford to eat healthy foods. Education too, is not a proxy for nutritional knowledge. Future studies of eating behaviours may benefit from the inclusion of a measure of nutritional knowledge. In both longitudinal and intervention studies this may demonstrate more effectively the effect of behaviour change interventions to improve eating behaviours and also enable a comparison between education and nutritional knowledge. The influence of age may play a part in this relationship too, as perhaps it is nutritional knowledge gained as life experience that is a more significant factor than school or university education often obtained by an individual in their early 20s.

Age had a significant influence over all but one of the regression analyses carried out (in the longitudinal study of the consumption of a healthy, well-balanced diet, age failed to reach significance). The relationship between age and the consumption of a healthy diet has been observed in community-based cross-sectional studies (Lallukka, Laaksonen, Rahkonen, & Lahelma, 2007) and longitudinal studies (Lallukka et al., 2004; Timmins et al., 2013) as well as in qualitative studies (Chambers et al., 2008). The significance of age in the current study warrants further investigation to understand the between-group differences that exist and the direction of these relationships. This is important, as interventions to improve the consumption of a healthy, well-balanced diet in the workplace, as well as fruit and vegetable consumption, may require targeting to different age groups to improve effectiveness. This will be explored in further detail in Chapter 6.

Income was only significant in its relationship with the cost of food influencing purchasing behaviours and vegetable consumption in the cross-sectional analysis. As cost of food was only added as a variable into the 2014 survey, longitudinal analysis was not possible, but based on previous studies, one may hypothesise that it would maintain its significance over time (Hruschka, 2012). Most studies examining the cost of food are based on cross-sectional studies and are more likely to investigate the cost of food on diet quality than specifically examining the socioeconomic nuances (Darmon & Drewnowski, 2007; Lallukka et al., 2007; Timmins et al., 2013) and therefore this study would benefit from longitudinal data to examine the relationships over time. One might expect income to impact the cost of food influencing purchasing behaviour. Certainly, previous studies suggest that lower incomes

are associated with more price sensitivity in the purchasing of foods (Darmon & Drewnowski, 2008; McLaren, 2007). However, it does not necessarily follow that having more money to spend will result in buying healthier foods (Drewnowski, 2009), and the current study did not reveal a significant relationship between the consumption of a healthy diet, or fruit consumption, and income. Perhaps comparisons with community-based studies are limited in this respect given household income may vary more significantly in a community setting than in the workplace. Regression analysis is also only able to go so far; it can reveal an association, but does not explain why these relationships exist. Chapter 7 will explore this further through qualitative analysis in a workplace setting.

Grade had a significant influence over the cost of food influencing purchasing behaviour and vegetable consumption in the cross-sectional study and on vegetable consumption in the longitudinal study (the only SES variable to have a longitudinal relationship with an eating behaviour). While grade is closely linked to income in an organisation such as the NICS with a clear, tiered system of grades and associated salaries, the grade of the individual may be more closely aligned to their behaviours. The current study did not include measures of physical activity, smoking status, or alcohol consumption; these behaviours have been shown to have significant socioeconomic gradients (Stringhini et al., 2011). Traditionally, lower occupational grades work in more manual roles. In the NICS, these include refuse collectors, street cleaning operatives, and gardening staff, and the majority of these tend to be male. The physical exertion from these roles will burn significant calories and therefore weight gain from the consumption of unhealthy foods may be more limited

than for those in more sedentary roles. They may therefore, be less cognisant of the recommendation to eat a healthy, well-balanced diet as the calories they are consuming are rapidly worked off through their occupation, although in the current study, grade did not reach significance in its relationship with the consumption of a healthy, well-balanced diet. There may also be issues of accessibility and storage of healthy foods. For example, bringing in a healthy packed-lunch may not always be possible if there is nowhere for the individual to store it and no way for them to carry it. This may reduce fruit and vegetable consumption and increase the propensity to access fast-food options. Likewise, individuals carrying out a manual role outside in the middle of winter in the UK may well prefer a fried breakfast to a fresh fruit salad to start the day. These complexities are likely to account for the relatively low adjusted variances between the SES variables and eating behaviours in the cross-sectional study.

It is worth noting too that in the Whitehall II studies of English civil servants more individuals in lower grades were found to be smokers than individuals of higher grades (Stringhini et al., 2011) and this too could be hypothesised to impact healthy eating behaviours. For example, the cost of cigarettes may reduce budget available to spend on healthy foods and cigarettes may supress appetite. Further analysis of the Stormont Study may benefit from an understanding of the longitudinal impact of other health behaviours over time and their interaction with the socioeconomic effects.

Gender-related differences have been observed in previous studies, with females exhibiting a stronger socioeconomic obesity gradient than males (McLaren, 2007; Sobal & Stunkard, 1989). This relationship can be observed

in the current study, with gender exerting a significant influence in the consumption of a healthy, well-balanced diet in the cross-sectional, prospective and longitudinal studies. Gender was significant in the consumption of vegetables in the cross-sectional and prospective studies and in the cost of food influencing purchasing behaviours in the cross-sectional study. These findings are consistent with the literature where females have been found to consume more fruits and vegetables than men (Boukouvalas et al., 2009; Chambers et al., 2008; Pechey et al., 2015; Strait & Calnan, 2016). Interestingly, no significance was found in the influence of gender on fruit intake, but it was on vegetable intake. Most studies group fruit and vegetable intake together (Nagler et al., 2013) or just examine one in isolation, for example fruit consumption (Pechey et al., 2016); and both these examples only examined behaviours in males. Gender-related differences in beliefs around healthy eating have been observed in qualitative studies of fruits and vegetable consumption (Chambers at al., 2008). The discussion around grade from the previous section can be continued in the context of gender. In the NICS, females of lower grades are predominantly employed in administrative roles and therefore have more sedentary work lives than the males in manual professions. This difference in roles in the same grades levels may have more significance than the grade itself in the influence on eating behaviours, and on weight status (McLaren, 2007; Sobal & Stunkard, 1989). As discussed in the previous section, access to healthy eating opportunities may be challenging in manual roles, however in an office environment bringing in a packed-lunch should be easier, for example, if there is a fridge or area for employees to sit and eat lunch. Likewise, a worksite canteen may also be available for

employees, although the cost of the food and availability of healthy options may influence eating behaviours. For individuals of higher grades, their purchasing power may enable the consumption of a healthier diet, for both genders. Further understanding as to why gendered differences in eating behaviours exist may be beneficial in better targeting interventions to improve those behaviours. The current study adds to the literature as it includes both genders in analysis and demonstrates that gender differences may be significant in the consumption of a healthy, well-balanced diet over time.

A challenge with comparing the current results to the literature is the lack of previous studies examining the relationship between SES and eating behaviours in a workplace setting. The only comparable studies of employed adults identified were from civil service employees from the Finnish civil service (Lahelma et al., 2004) and English civil service (Stafford et al., 2010; Stallone et al., 1997; Stringhini et al., 2011), however these studies did not examine the breadth of eating behaviours examined in the current study. Most studies are based on community samples and do demonstrate significant SES gradients in obesity and eating behaviours, supporting the present cross-sectional study. Sobal and Stunkard (1989) and McLaren (2007) reviewed the links between SES and obesity through 144 and 333 studies respectively. They found that education, income, and occupational class were the most commonly used measures of SES, and their use together has been recommended because of the interrelationships between each (Lahelma et al., 2004). This is a strength of the current study using the three measures of SES; however, it could be argued that SES gradients in eating behaviours may be greater in community-based studies than in workplace studies because of the narrower SES groups

available to study in the workplace. Many of the community-based studies are based on samples of employed adults (Chambers et al., 2008; Langenberg et al., 2003; Metcalf, Scragg, & Jackson, 2014) and it could be argued that these will demonstrate more significant gradients in socioeconomic effects on eating behaviours because of the broader range of individuals included. For example, the NICS offers relatively well-paid roles and the lower grades in the NICS may not compare with individuals who are in employment and who are lower paid or on zero-hour contracts whose employment is more precarious and earnings more variable.

Just as age consistently had significance over eating behaviours in the study, so too did BMI. BMI was significant in the cost of food influencing purchasing behaviour, eating past the point of feeling full, fruit consumption, and the consumption of a healthy, well-balanced diet in both the cross-sectional and prospective studies. In the longitudinal study, BMI was significant in the consumption of a healthy, well-balanced diet. It is worth noting that as the cost of food influencing purchasing behaviours and eating past the point of feeling full were additional questions added to the 2014 survey, it was not possible to carry out longitudinal analysis on them; based on previous studies, one may hypothesise that had these measures been included in both data collection points, significance may have been achieved. There is limited research on the influence of BMI on healthy eating behaviours as discussed in the previous chapter. While some evidence in community-based studies does exist (Dykes et al., 2004; Harden et al., 2009) this is an area that warrants further investigation in the workplace. This will be explored in further detail in Chapter 6. It could be argued that it is may be the interaction between

the socioeconomic variables and demographic variables that will influence the eating behaviours. In the case of BMI, while this was not shown to have significance in the longitudinal analysis, it was significant in the cross-sectional and prospective studies. It has been argued that BMI, or obesity, can limit both opportunity and performance at work (Schulte et al., 2007) and may be influenced by cultural, social, psychological, and economic factors (Lahelma et al., 2009). The cross-sectional and prospective analysis of the two eating behaviours added to the 2014 question-set as a result of the literature review in this thesis, *cost of food influencing purchasing behaviours,* and *eating past the point of feeling full* both had significant associations with BMI. However, the analysis cannot tell us why having a high BMI predisposes someone to be more price sensitive in purchasing foods or eating past the point of feeling full more often.

Number of dependants was found to have a significant association with the cost of food influencing purchasing behaviours in both the cross-sectional and prospective studies and on fruit consumption in the cross-sectional study. This is consistent with other workplace studies which found that the number of children living at home influences eating behaviours (Berning & Hogan, 2014; Nagler et al., 2013). In a cross-sectional community study, a higher number of dependants was associated with lower purchases of fruit and vegetables. However, it could be argued that this cannot be directly compared to the current study as participants were asked about their consumption of fruits and vegetables as opposed to their purchase of them. Household purchasing of fruit and vegetables has been shown to be influenced by cost (Lallukka et al., 2007; Darmon & Drewnowski, 2007; Drewnowski, 2009; Pechey et al., 2015;

Timmins et al., 2013), however it does not necessarily follow that the fruit and vegetables will be consumed, or be consumed in equal portions by household members. In the current study, it could be hypothesised that participants with dependants may have lower consumptions of fruits and vegetables because of time constraints of preparation, they may focus on ensuring that the children are consuming them and forfeit their consumption, or perhaps, if the children do not like the taste, may adjust their own preferences to prepare (or purchase) food options that everyone will eat. It could also be argued that the cost of food for a household may be influenced by socioeconomic factors and number of dependants may mediate that relationship.

Eating past the point of feeling full may be the most independent of the five eating behaviours. Fruit consumption and vegetable consumption could be argued to be aligned with the consumption of a healthy, well-balanced diet (and as previously discussed are often used interchangeably as measures of a healthy diet) and the cost of food influencing purchasing behaviours is likely to influence the purchase of fruits, vegetables, and healthy foods. Eating past the point of feeling full, however, is not as closely related to the other four behaviours. While individuals may be inclined to overeat healthy foods, and may eat too many fruits and vegetables, the overconsumption of foods is generally more related to unhealthy foods and weight gain. In the cross-sectional regression, age, gender, and BMI were shown to have a significant relationship with eating past the point of feeling full, and age and BMI were shown to have a significant relationship in the prospective study. Sobal and Stunkard (1989) argued that "the most important variable mediating the relationship between SES and obesity is probably dieting and dietary restraint"

(p. 268). This supports the relationship found in the current study between eating past the point of feeling full and BMI, as discussed earlier in this discussion.

The relationship between gender and eating past the point of full identified in the current study is supported in the literature (McLaren, 2007; Savage et al., 2009; Sobal & Stunkard, 1989). Likewise, the relationship with BMI has also been identified (Johnson et al., 2012). However, previous studies in this area have generally been of females (Dykes et al., 2004; Savage et al., 2009; Stunkard & Messick, 1985) because of the traditional norms presented in previous literature showing females were more likely to diet and feel greater pressure to be slim, whereas men value having a larger body size (McLaren, 2007; Sobal & Stunkard, 1989). It could be argued that in 2012 and 2014, when the two Stormont Study surveys were administered, these gendered norms may have altered. In 1991 it was reported that across their lifetime 75% of females and only 47% of males had dieted (in a cohort of 2,107 males and 2,540 females across 32 workplaces) (Jeffery, Adlis & Forster, 1991). The advent of social media and men's health magazines may have resulted in a change in this norm, and there is research to suggest that, certainly in younger adults, these gender differences in societal pressures to look a certain way (and therefore the propensity for dietary restraint) are not significantly different (Holland & Tiggeman, 2016). However, it could be argued that the population of employees at the NICS are more likely to conform to the societal norms presented in most research on disinhibition, and restraint reported here because of the average age of participants being 44 in 2012 and 46 in 2014.

The findings of the current study are important as they add to an under-investigated area of workplace health. Understanding the factors that influence employees' eating behaviours at a point in time or over time can influence interventions to change them. While the appropriateness of directing an intervention to an individual based on their weight or age may have ethical implications (discussed in the next chapter), the appropriateness of directing interventions based on SES may be less contentious and easier for a workplace to facilitate. Workplaces may be more inclined to offer the same interventions to all employees for ease of administration or fear of being seen to lack inclusivity, but for those, such as the NICS, who have a rigid grade structure, the tailoring of health messaging to different tiers could be relatively easy to administer. This could be administered through the organisation's employee benefits offering or through tailored messages sent to the email addresses of different employee grades in the organisation. Often employee benefits are associated with an employee's grade in an organisation and form part of their employment contract, and therefore the advice offered through these differing means could be adjusted to the recipient. A limitation of this may be the widening of health inequalities in the business, as generally it is the higher paid more senior grades in the organisation who receive the most comprehensive health benefits, whereas some of the more manual or administrative grades may not be entitled to any health benefits. The human resources or occupational health function may therefore benefit from an understanding of these socioeconomic differences, so they can tailor their support.

5.6 Strengths and Limitations

The current chapter presents cross-sectional, prospective and longitudinal results from regression analysis of socioeconomic and demographic factors on the eating behaviours of employees of the NICS. This researcher could not find any previous studies presenting workplace data in this way, and the majority of previous literature on SES and eating behaviours is on community-based samples, making direct comparison challenging. A real strength of the current study was the inclusion of multiple measures of SES (education, salary band, and grade), as this revealed educational- and grade-related significance which would not have been apparent had only income been included. Likewise, the inclusion of multiple measures of eating behaviours allows for a broader review of relationships. The data collected through the Stormont Study allowed for longitudinal analysis of three of the eating behaviours to be carried out; most studies reviewed in the previous discussion section were cross-sectional in nature and, therefore, the current study allows for comparisons to be made over time, which is not always possible in workplace studies.

While the analysis is based on a large sample size of 6,091 employees in 2012 (22% response rate) and 6,206 responses in 2014 (22% response rate), the response rates are still low in comparison to the large employment base of the NICS. However, it has been argued that a response rate of between 20% and 25% are common in organisational and workplace wellbeing studies (Clemes et al., 2016). A further limitation of the analysis may be related to the characteristics of non-respondents to the Stormont Study surveys. Participation in health-related surveys has been reported to be lower for subjects who are in

poor health (with health problems) than for healthy subjects (with no/fewer health problems) which may lead to a healthy-volunteer bias (Etter & Perneger, 1997). This healthy-worker bias could have led to employees in poorer health not participating in the Stormont Study (for example those on long-term sickness absence) and thus over-representing healthy workers.

Cross-sectional analysis is limited as causal relationships cannot be confirmed between the variables under investigation. There were 220 questions in the full question set of the Stormont Study in 2012 and 165 in the 2014 question set. Given the variety of constructs covered, full attention may not have been given to the answering of each question. Recall-bias may also be a challenge, especially in the case of fruit and vegetable consumption. Descriptions were given to support participants in identifying what a portion of fruit or vegetables comprised. It has been previously found that employees at lower employment grades may under-report nutrient intake (Stallone et al., 1997), however this may be mitigated by the larger sample sizes in the current study (circa 6,000 respondents versus 869 respondents in the Whitehall II Study). A social-desirability bias could also be argued to be a limitation for the reporting of fruits and vegetables, however the average fruit consumption was two portions and the average vegetable consumption was also two portions at both T1 and T2, and therefore, given this falls below the recommended amounts, it is unlikely these have been over reported.

The limitations of cross-sectional analysis were addressed by including prospective analysis of all the eating behaviours and longitudinal analysis for those available at both data collection points. The longitudinal analysis identified that SES did not have a significant influence on fruit or vegetable

consumption or in the consumption of a healthy, well-balanced diet, in contrast with the cross-sectional analysis. A further strength of the current study was the inclusion of cost of food influencing purchasing behaviours, and eating past the point of feeling full in the 2014 data set was as a result of a literature review carried out following initial analysis of the 2012 data collection. The addition of these two eating behaviours adds to the broad picture of eating behaviours already captured in the data through measuring fruit and vegetable consumption separately and the measure of the consumption of a healthy, well-balanced diet. The cross-sectional analysis of the additional two measures limits causality and the population studied may limit generalisability. The studies do highlight the importance of demographic factors in the study of eating behaviours.

The use of single-item measures for the *cost of food influencing purchasing behaviours* and *eating past the point of feeling full* may also be a limitation of the current study. The research on disinhibition, restraint, and hunger demonstrates the complexity of the constructs (Bryant et al., 2007; Stunkard & Messick, 1984) and may question whether one item "how often do you eat past the point of feeling full?" allows direct comparison with data gathered from studies using the full scale measures such as Stunkard and Messick's 'Three Factor Eating Questionnaire' TFEQ (1984). However, given the constraints of adding extra questions into the 2014 question set (when more than 50 were removed between 2012 and 2014) the single-item constructs offered an opportunity to identify a 'snap-shot' of the interest area rather than as a basis for in-depth analysis (Houdmont et al., 2015). Likewise, there is an argument that single-item measures are useful when practical constraints of a

survey length is an issue (Fisher et al., 2016). Similarly, the question "what extent does the cost of food influence what you buy?" may not allow direct comparisons with the more complex measures of food cost where food diaries and purchasing information have been used to accurately determine dietary costs (Aggarwal et al., 2011; Rehm et al., 2015; Timmins et al., 2013). However, the single-item measure does mirror the findings of these more in-depth studies, supporting its validity.

Despite these limitations the large sample size, the number of different socioeconomic variables and eating behaviours examined in a workplace setting are strengths of the study.

5.7 Chapter Summary

The current chapter presents regression analysis for the eating behaviours of employees of the NICS, based on socioeconomic and demographic factors. Of the SES variables examined, only grade had a significant relationship with vegetable consumption over time. Income did not have a significant impact on the longitudinal analysis of fruit and vegetable consumption or the consumption of a healthy, well-balanced diet, suggesting that over time there are other factors that influence the behaviours. However, in cross-sectional analysis, SES was significant in all of the eating behaviours apart from fruit consumption and eating past the point of feeling full. Comparisons with previous literature is challenging, as most literature is based on community study rather than in the workplace; however, the current research is broadly supported in the community-based literature. What is apparent from the current study is the importance of demographic variables on the eating behaviours; age, gender, BMI, and number of dependants all had

varying significance in their correlations with the five eating behaviours. While age, gender, number of dependants and BMI were originally included to control for their influence, their influence in all three studies was significant. This is important as it may have practical implications for workplace interventions; tailoring interventions to address differences in behaviours for demographic groups may improve the effectiveness of interventions.

Age and BMI had a significant influence over most eating behaviours, more so than the socioeconomic variables that were intended as the focus of the study. Perhaps tailoring workplace interventions to modify eating behaviours for different age groups or weight statuses may elicit more effective results than a one-size-fits-all approach. The next chapter will therefore examine age and BMI in more detail. One-way ANOVA analyses will be used to explore the extent to which eating behaviours differ between age groups and BMI categories.

Chapter 6: Eating Behaviours by Age and BMI

6.1 Introduction

The regression analyses reported and discussed in the previous chapter highlighted the contribution of age and BMI to explaining the five eating behaviours considered in the current thesis. The three SES variables (education, salary, and grade) significantly contributed to the regression models for most of the eating behaviours in the cross-sectional analysis; however, in longitudinal analyses their contribution fell away, leaving only the aforementioned demographic variables significantly contributing to the models, with education and grade showing weaker significance for fruit and vegetable consumption respectively. These findings thus highlight the relevance of age and BMI to eating behaviour. In response, the current chapter further examines the role of these characteristics in relation to eating behaviour. Specifically, differences in eating behaviour by age and BMI are examined via a set of one-way ANOVA analyses. Findings indicate a host of significant differences on each index of eating behaviour by age and BMI. The results point to the scope for targeted interventions within the organisational setting. Such interventions are discussed in the context of the extant literature on tailored and targeted workplace health promotion activities. The current chapter aims to address two further research questions four, and five identified through the analysis presented in Chapters 4 and 5 and through the limitations identified in the literature review presented in Chapter 2: (5) Do eating behaviours differ between age groups? (6) Do eating behaviours differ between weight (BMI) groupings?

6.2 Methods

To investigate between-group differences in eating behaviours for age and BMI, analysis of variance (ANOVA) was carried out. The current chapter uses data from the 2014 Stormont Study (T2) and includes all five eating behaviours examined in the current study – eating past the point of feeling full, the cost of food influencing purchasing behaviours, the consumption of a healthy, well-balanced diet, fruit consumption, and vegetable consumption.

ANOVA is a statistical technique used to compare the mean score of three of more groups of participants on a dependent variable (Field, 2013). To make comparisons, the continuous variable of age was grouped into six categories of 18-24; 25-34; 35-44; 45-54; and 55 and over. Likewise BMI was grouped into five groups of U*nderweight* (≤ 18.4 kg/m²); *Healthy Weight* (18.5 – 24.9 kg/m²); *Overweight* (25 – 29.9 kg/m²); *Obese (I)* (30 – 34.9 kg/m²); and *Obese (II,III)* (35 kg/m² ≥).

6.3 Results

The current section presents the results of one-way ANOVA of demographic and personal characteristics, specifically age and BMI and eating behaviours. The sample size and participant characteristics are outlined in the descriptive results section in Chapter 4.

6.3.1 Age and cost of food influencing purchasing behaviour

A one-way ANOVA was applied to identify the extent to which the cost of food influencing purchasing behaviour differed by age. Results are shown in Table 6.1. The one-way ANOVA revealed a significant difference in the cost of food influencing purchasing behaviours among the six age groups F $(5, 5555) = 42.43$, $p < .001$.

Table 6.1

One-Way Analysis of Variance Summary Table comparing age groups on the cost of food influencing purchasing behaviours.

	n	*M*	*SD*	*F*
Age Group				
18 to 24	41	2.88	.78	42.43***
25 to 34	917	2.91	.97	
35 to 44	1347	2.80	.92	
45 to 54	2153	2.61	.91	
55 to 64	1062	2.39	.85	
65 and over	41	2.32	1.08	

*p < .05, **p < .01, ***p < .001.

Tukey post-hoc tests were performed to reveal which of the six age groups differed from each other, and are displayed in Table 6.1. Cost of food influencing purchasing behaviours for the 18-24 age group ($M = 2.88$, $SD = 0.78$) were significantly higher than for the 55-64 age group ($M = 2.39$, $SD = 0.85$, $p < .01$). Cost of food influencing purchasing behaviours for the 25-34 age group ($M = 2.91$, $SD = 0.97$) were significantly higher than for the 35-44 age group ($M = 2.80$, $SD = 0.91$, $p < .05$), the 45-54 age group ($M = 2.61$. $SD = 0.91$, $p < .001$), the 55-64 age group ($M = 2.39$, $SD = 0.85$, $p < .001$) and the 65 and over age group ($M = 2.32$, $SD = 1.08$, $p < .001$). Cost of food influencing purchasing behaviours for the 35-44 age group ($M = 2.80$, $SD = 0.91$) were significantly lower than for the 25-34 age group ($M = 2.91$, $SD = 0.97$, $p < .05$)

and were significantly higher than for the 45-54 age group ($M = 2.61$. $SD = 0.91$, $p < .001$), the 55-64 age group ($M = 2.39$, $SD = 0.85$, $p < .001$) and the 65 and over age group ($M = 2.32$, $SD = 1.08$, $p < .05$). Cost of food influencing purchasing behaviours for the 45-54 age group ($M = 2.61$. $SD = 0.91$) were significantly lower than for the 25-34 age group ($M = 2.91$, $SD = 0.97$, $p < .001$) and the 35-44 age group ($M = 2.80$, $SD = 0.91$, $p < .001$) and significantly higher than for the 55-64 age group ($M = 2.39$, $SD = 0.85$, $p < .001$). Cost of food influencing purchasing behaviours for the 55-64 age group ($M = 2.39$, $SD = 0.85$) were significantly lower than for the 18-24 age group ($M = 2.88$, $SD = 0.78$, $p < .05$), the 25-34 age group ($M = 2.91$, $SD = 0.97$, $p < .001$), the 35-44 age group ($M = 2.80$, $SD = 0.91$, $p < .001$) and the 45-54 age group ($M = 2.61$. $SD = 0.91$, $p < .001$). Finally, cost of food influencing purchasing behaviours for the 65 and over age group ($M = 2.32$, $SD = 1.08$) were significantly lower than for the 25-34 age group ($M = 2.91$, $SD = 0.97$, $p < .01$) and the 35-44 age group ($M = 2.80$, $SD = 0.91$, $p < .05$). In summary, cost influenced food purchasing behaviours most for employees aged between 25 and 34 and had less of an influence among older employees.

6.3.2 Age and eating past the point of feeling full

A one-way ANOVA was applied to identify the extent to which respondents ate past the point of feeling full differed by age. Results are shown in Table 6.2. The one-way ANOVA revealed a significant difference in the extent to which respondents ate past the point of feeling full among the six age groups $F (5, 5559) = 21.93$, $p < .001$.

Table 6.2

One-Way Analysis of Variance Summary Table comparing age groups on

eating past the point of feeling full.

	n	*M*	*SD*	*F*
Age Group				
18 to 24	41	2.88	.75	21.93***
25 to 34	918	2.86	.82	
35 to 44	1351	2.74	.79	
45 to 54	2148	2.61	.79	
55 to 64	1067	2.53	.77	
65 and over	40	2.68	.86	

*p < .05, **p < .01, ***p < .001.

Tukey post-hoc tests were performed to reveal which of the six age

groups differed from each other, the results are displayed in Table 6.2. Eating

past the point of feeling full in the 25-34 age group ($M = 2.86$, $SD = 0.82$) was

higher than in the 35-44 age group ($M = 2.74$, $SD = 0.79$, $p < .01$), the 45-54

age group ($M = 2.61$. $SD = 0.79$, $p < .001$) and the 55-64 age group ($M = 2.53$,

$SD = 0.86$, $p < .001$). Eating past the point of feeling full in the 35-44 age

group ($M = 2.74$, $SD = 0.79$) was significantly lower than in the 25-34 age

group ($M = 2.86$, $SD = 0.82$, $p < .01$) and significantly higher than in the 45-54

age group ($M = 2.61$. $SD = 0.79$, $p < .001$) and the 55-64 age group ($M = 2.53$,

$SD = 0.86$, $p < .001$). Eating past the point of feeling full in the 45-54 age

group ($M = 2.61$. $SD = 0.79$) was significantly lower than in the 25-34 age

group ($M = 2.86$, $SD = 0.82$, $p < .001$) and in the 35-44 age group ($M = 2.74$, $SD = 0.79$, $p < .001$) and significantly higher than for the 55-64 age group ($M = 2.53$, $SD = 0.86$, $p < .001$). Eating past the point of feeling full in the 55-64 age group ($M = 2.53$, $SD = 0.86$) was significantly lower than in the 25-34 age group ($M = 2.86$, $SD = 0.82$, $p < .001$), the 35-44 age group ($M = 2.74$, $SD = 0.79$, $p < .001$) and the 45-54 age group ($M = 2.61$. $SD = 0.79$, $p < .001$). In summary, from the age of 18 up to age 65, the tendency to eat past the point of feeling full reduces for each age bracket up until the age of 65 and over.

6.3.3 Age and vegetable consumption

A one-way ANOVA was applied to identify the extent to which vegetable consumption differed by age. Results are shown in Table 6.3. The one-way ANOVA, and a further Kruskal-Wallis analysis, revealed no significant differences in vegetable consumption among the six age groups $F (5, 5565) = 1.80$, $p > .05$.

Table 6.3

One-Way Analysis of Variance Summary Table comparing age groups on

vegetable consumption.

	n	M	SD	F
Age Group				
18 to 24	41	1.80	1.00	1.80
25 to 34	921	2.07	1.19	
35 to 44	1345	2.12	1.19	
45 to 54	2158	2.07	1.14	
55 to 64	1065	2.17	1.21	
65 and over	41	2.05	1.20	

*$p < .05$, **$p < .01$, ***$p < .001$.

6.3.4 Age and fruit consumption

A one-way ANOVA was applied to identify the extent to which fruit consumption differed by age. Results are shown in Table 6.4. The one-way ANOVA revealed a significant difference in fruit consumption among the six age groups $F(5, 5555) = 18.60$, $p < .001$.

Table 6.4

One-Way Analysis of Variance Summary Table comparing age groups on fruit consumption.

	n	M	SD	F
Age Group				
18 to 24	41	1.73	1.18	18.60***
25 to 34	922	2.07	1.30	
35 to 44	1350	2.20	1.42	
45 to 54	2150	2.41	1.50	
55 to 64	1060	2.59	1.47	
65 and over	38	2.63	1.60	

*p < .05, **p < .01, ***p < .001.

Tukey post-hoc tests were performed to reveal which of the six age groups differed from each other and are displayed in Table 6.4. Fruit consumption in the 18-25 age group ($M = 1.73$, $SD = 1.18$) was significantly lower than in the 45-54 age group ($M = 2.41$, $SD = 1.50$, $p < .05$) and in the 55-65 age group ($M = 2.59$, $SD = 1.47$, $p < .01$). Fruit consumption in the 25-34 age group ($M = 2.07$, $SD = 1.30$) was significantly lower than in the 45-54 age group ($M = 2.41$, $SD = 1.50$, $p < .001$) and in the 55-65 age group ($M = 2.59$, $SD = 1.47$, $p < .001$). Fruit consumption in the 35-44 age group ($M = 2.20$, $SD = 1.42$) was significantly lower than in the 45-54 age group ($M = 2.41$, $SD = 1.50$, $p < .001$) and in the 55-65 age group ($M = 2.59$, $SD = 1.47$, $p < .001$). Fruit consumption in the 45-54 age group ($M = 2.41$, $SD = 1.50$) was

significantly higher than in the 18-25 age group ($M = 1.73$, $SD = 1.18$, $p < .05$), the 25-34 age group ($M = 2.07$, $SD = 1.30$, $p < .001$), the 35-44 age group ($M = 2.20$, $SD = 1.42$, $p < .001$), and significantly lower than in the 55-64 age group ($M = 2.59$, $SD = 1.47$, $p < .001$). Fruit consumption in the 55-64 age group ($M = 2.59$, $SD = 1.47$) was significantly higher than in the 18-25 age group ($M = 1.73$, $SD = 1.18$, $p < .05$), the 25-34 age group ($M = 2.07$, $SD = 1.30$, $p < .001$), the 35-44 age group ($M = 2.20$, $SD = 1.42$, $p < .001$) and the 45-54 age group ($M = 2.41$, $SD = 1.50$, $p < .05$). In summary, fruit consumption increases with age.

6.3.5 Age and a healthy, well-balanced diet

A one-way ANOVA was applied to identify the extent to which respondents enjoyed a healthy, well-balanced diet differed by age. Results are shown in Table 6.5. The one-way ANOVA revealed a significant difference in the consumption of a healthy, well-balanced diet among the six age groups F $(5, 5537) = 5.4$, $p < .001$.

Table 6.5

One-Way Analysis of Variance Summary Table comparing age groups on the consumption of a healthy, well-balanced diet.

	n	*M*	*SD*	*F*
Age Group				
18 to 24	41	1.44	.71	5.4***
25 to 34	915	1.49	.66	
35 to 44	1344	1.51	.65	
45 to 54	2143	1.56	.66	
55 to 64	1061	1.61	.66	
65 and over	39	1.74	.55	

*p < .05, **p < .01, ***p < .001.

Tukey post-hoc tests were performed to reveal which of the six age groups differed from each other and are displayed in Table 6.5. The consumption of a healthy, well-balanced diet for the 25-34 age group ($M = 1.49$, $SD = 0.66$) was significantly lower than for the 45-54 age group ($M = 1.56$, $SD = 0.66$, $p < .05$) and the 55-64 age group ($M = 1.61$, $SD = 0.66$, $p < .001$). The consumption of a healthy, well-balanced diet for the 35-44 age group ($M = 1.51$, $SD = 0.66$) was significantly lower than for the 55-64 age group ($M = 1.61$, $SD = 0.66$, $p < .05$). The consumption of a healthy, well-balanced diet for the 45-54 age group ($M = 1.56$, $SD = 0.66$) was significantly higher than for the 25-34 age group ($M = 1.49$, $SD = 0.66$, $p < .05$). The consumption of a healthy, well-balanced diet for the 55-64 age group ($M =$

1.61, *SD* = 0.66) was significantly higher than for the 25-34 age group (*M* = 1.49, *SD* = 0.66, *p* <.001) and the 35-44 age group (*M* = 1.51, *SD* = 0.66, *p* <.05). In summary, the consumption of a healthy, well-balanced diet increases with age.

6.3.6 BMI and cost of food influencing purchasing behaviour

A one-way ANOVA was applied to identify the extent to which the cost of food influenced purchasing behaviour differed by BMI. Results are shown in Table 6.6. The one-way ANOVA revealed a significant difference in the cost of food influencing purchasing behaviours among the five BMI groups $F (4, 5431) = 6.60, p < .001$.

Table 6.6

One-Way Analysis of Variance Summary Table comparing BMI groups and the cost of food influencing purchasing behaviours.

	n	M	SD	F
BMI Group				
Underweight	48	2.77	.97	6.60***
Healthy Weight	1812	2.61	.91	
Overweight	2178	2.65	.91	
Obese I	895	2.70	.98	
Obese II,III	503	2.84	.97	

*p < .05, **p < .01, ***p < .001.

Tukey post-hoc tests were performed to reveal which of the five BMI groups differed from each other and are displayed in Table 6.6. Cost of food influencing purchasing behaviours for the underweight group ($M = 2.77$, $SD = 0.97$) was significantly lower than the obese (II, III) group ($M = 2.84$, $SD = 0.97$, $p < .001$) but was significantly higher than the healthy weight ($M = 2.61$, $SD = 0.91$, $p < .001$), overweight ($M = 2.65$, $SD = 0.91$, $p < .001$) and obese (I) groups ($M = 2.70$, $SD = 0.98$, $p < .001$). Cost of food influencing purchasing behaviours for the healthy weight group ($M = 2.61$, $SD = 0.91$) was significantly lower than for the overweight group ($M = 2.65$, $SD = 0.91$, $p < .001$) obese (I) group ($M = 2.70$, $SD = 0.98$, $p < .001$) and obese (II, III) group ($M = 2.84$, $SD = 0.97$, $p < .001$). Cost of food influencing purchasing behaviours for the overweight group ($M = 2.65$, $SD = 0.91$) was significantly

lower than for the obese (I) group ($M = 2.70$, $SD = 0.98$, $p < .001$) and the obese (II, III) group ($M = 2.84$, $SD = 0.97$, $p < .001$). Cost of food influencing purchasing behaviours for the obese (I) group ($M = 2.70$, $SD = 0.98$) was significantly higher than for the healthy weight group ($M = 2.61$, $SD = 0.91$, $p < .001$) and the overweight group ($M = 2.65$, $SD = 0.91$, $p < .001$). Cost of food influencing purchasing behaviours for the obese (II, III) group ($M = 2.84$, $SD = 0.97$) was significantly higher than for the underweight group ($M = 2.77$, $SD = 0.97$, $p < .001$), healthy weight group ($M = 2.61$, $SD = 0.91$, $p < .001$), overweight group ($M = 2.65$, $SD = 0.91$, $p < .001$) and obese (I) group ($M = 2.70$, $SD = .98$, $p < .001$). In summary, the cost of food influences purchasing behaviours more in the obese (II, III) and underweight categories than it does for the obese (I), overweight, and healthy weight groups and the cost of food influences purchasing behaviours more in the obese (I) and overweight categories than it does in the healthy weight group but less than the obese (II, III) and underweight groups.

6.3.7 BMI and eating past the point of feeling full

A one-way ANOVA was applied to identify the extent to which respondents ate past the point of feeling full differed by BMI classification. Results are shown in Table 6.7. The one-way ANOVA revealed a significant difference in the extent to which respondents ate past the point of feeling full among the five BMI groups $F_{(4, 5434)} = 77.72$, $p < .001$.

Table 6.7

One-Way Analysis of Variance Summary Table comparing Body Mass Index

(BMI) groups and the eating past the point of feeling full.

	n	M	SD	F
BMI Group				
Underweight	48	2.31	.83	77.73***
Healthy Weight	1810	2.45	.76	
Overweight	2179	2.70	.78	
Obese I	898	2.90	.78	
Obese II,III	504	2.97	.83	

*$p<.05$, **$p<.01$, ***$p<.001$.

Tukey post-hoc tests were performed to reveal which of the five BMI groups differed from each other. Eating past the point of feeling full in the underweight group ($M = 2.31$, $SD = 0.83$) was significantly lower than for the healthy weight group ($M = 2.45$, $SD = 0.76$, $p <.001$), the overweight group ($M = 2.70$, $SD = .78$, $p <.001$), the obese (I) group ($M = 2.90$, $SD = 0.78$, $p < .001$), and obese (II, III) group ($M = 3.08$, $SD = 0.85$, $p < .001$). Eating past the point of feeling full for the healthy weight group ($M = 2.45$, $SD = 0.76$) was significantly lower than for the overweight group ($M = 2.70$, $SD = 0.78$, $p < .001$), the obese (I) group ($M = 2.90$, $SD = 0.78$, $p < .001$), and obese (II, III) group ($M = 3.08$, $SD = 0.85$, $p < .001$). Eating past the point of feeling full for the overweight group ($M = 2.70$, $SD = 0.78$) was significantly lower than for the obese (I) group ($M = 2.90$, $SD = 0.78$, $p < .001$) and obese (II, III) group (M

= 3.08, SD = 0.85, p < .001). Eating past the point of feeling full for the obese

(I) group (M = 2.90, SD = 0.78) was significantly lower than for the obese (II,

III) group (M = 3.08, SD = 0.85, p < .001) and significantly higher than for the

underweight group (M = 2.31, SD = 0.83, p < .001), healthy weight group (M =

2.45, SD = 0.76, p < .001), and the overweight group (M = 2.70, SD = 0.78, p <

.001). Eating past the point of feeling full for the obese (II, III) group (M =

2.97, SD = 0.83) was significantly higher than for the underweight group (M =

2.28, SD = 0.83, p < 0.05), the healthy weight group (M = 2.45, SD = 0.74, p <

.001), the overweight group (M = 2.70, SD = 0.78, p < .001), and the obese (I)

group (M = 2.90, SD = 0.78, p < .001). In summary, as BMI increases, so does

the tendency to eat past the point of feeling full.

6.3.8 BMI and vegetable consumption

A one-way ANOVA was applied to identify the extent to which

vegetable consumption differed by BMI. Results are shown in Table 6.8. The

one-way ANOVA, and a further Kruskal-Wallis analysis, revealed no

significant differences in vegetable consumption among the five BMI groups F

$(4, 5438)$ = 2.38, p > .05.

Table 6.8

One-Way Analysis of Variance Summary Table comparing BMI groups and

vegetable consumption.

	n	M	SD	F
BMI Group				
Underweight	48	2.21	1.13	2.38
Healthy Weight	1812	2.16	1.17	
Overweight	2180	2.07	1.16	
Obese I	896	2.04	1.16	
Obese II,III	507	2.05	1.23	

$*p < .05, **p < .01, ***p < .001.$

6.3.9 BMI and fruit consumption

A one-way ANOVA was applied to identify the extent to which fruit consumption differed by BMI. Results are shown in Table 6.9. The one-way ANOVA revealed a significant difference in fruit consumption among the five BMI groups $F(4, 5428) = 2.63$, $p < .05$.

Table 6.9

One-Way Analysis of Variance Summary Table comparing BMI groups and fruit consumption.

	n	M	SD	F
BMI Group				
Underweight	48	2.27	1.69	2.63*
Healthy Weight	1815	2.35	1.38	
Overweight	2168	2.38	1.50	
Obese I	895	2.23	1.43	
Obese II,III	507	2.23	1.51	

*$p < .05$, **$p < .01$, ***$p < .001$.

Tukey post-hoc tests were performed to reveal which of the five BMI groups differed from each other. No between-group differences were identified.

6.3.10 BMI and balanced diet

A one-way ANOVA was applied to identify the extent to which respondents enjoyed a healthy, well-balanced diet differed by BMI. Results are shown in Table 6.10. The one-way ANOVA revealed a significant difference in the consumption of a healthy, well-balanced diet among the five BMI groups $F (4, 5411) = 53.25$, $p < .001$.

Table 6.10

One-Way Analysis of Variance Summary Table comparing Body Mass Index (BMI) groups and eating a healthy, well-balanced diet.

	n	M	SD	F
BMI Group				
Underweight	48	1.48	.74	53.25***
Healthy Weight	1812	1.68	.62	
Overweight	2162	1.57	.65	
Obese I	888	1.36	.68	
Obese II,III	506	1.32	.65	

$*p < .05, **p < .01, ***p < .001.$

Tukey post-hoc tests were performed to reveal which of the five BMI groups differed from each other and are displayed in Table 6.10. The consumption of a healthy, well-balanced diet for the underweight group ($M = 1.48, SD = 0.74$) was lower than the overweight ($M = 1.57, SD, = 0.65, p < .001$), and healthy weight ($M = 1.68, SD = 0.62, p < .001$) groups, but higher than the obese (I) group ($M = 1.36, SD = 0.68, p < .001$) and obese (II, III) group ($M = 1.32, SD = 0.65, p < .001$). The consumption of a healthy, well-balanced diet for the healthy weight group ($M = 1.68, SD = 0.62$) was significantly higher than for the underweight group ($M = 1.48, SD = 0.74, p < .001$), overweight group ($M = 1.57, SD = 0.65, p < .001$), the obese (I) group ($M = 1.36, SD = 0.68, p < .001$), and obese (II, III) group ($M = 1.32, SD = 0.65, p < .001$). The consumption of a healthy, well-balanced diet for the

overweight group ($M = 1.57$, $SD = 0.65$) was significantly lower than for the healthy weight ($M = 1.68$, $SD = 0.62$, $p < .001$) but higher than for the underweight group ($M = 1.48$, $SD = 0.74$, $p < .001$), the obese (I) group ($M = 1.36$, $SD = 0.68$, $p < .001$), and obese (II, III) group ($M = 1.32$, $SD = 0.65$, $p < .001$). The consumption of a healthy, well-balanced diet for the obese (I) group ($M = 1.36$, $SD = 0.68$) was significantly lower than for the obese (II, III) group ($M = 1.32$, $SD = 0.65$, $p < .001$), but higher than for the underweight group ($M = 1.48$, $SD = 0.74$, $p < .001$), the healthy weight ($M = 1.68$, $SD = 0.62$, $p < .001$), and overweight group ($M = 1.57$, $SD = 0.65$, $p < .001$). The consumption of a healthy, well-balanced diet for the obese (II, III) group ($M = 1.32$, $SD = 0.65$) was significantly lower than for the underweight group ($M = 1.48$, $SD = 0.74$, $p < .001$), the healthy weight ($M = 1.68$, $SD = .62$, $p < .001$), the overweight group ($M = 1.57$, $SD = .65$, $p < .001$) and the obese (I) group ($M = 1.36$, $SD = 0.68$, $p < .001$). In summary, the healthy weight group had the greatest consumption of a healthy, well-balanced diet, followed by the overweight, underweight, obese (I), and obese (II, III) groups respectively.

6.3.11 BMI, age, and cost of food influencing purchasing behaviour

A two-way ANOVA was applied to identify the interaction effect for the cost of food influenced purchasing behaviour between age and BMI. Results are shown in Table 6.11. The two-way ANOVA did not reveal a significant interaction effect between age and BMI for the cost of food influencing purchasing behaviours $F_{(16, 5396)} = .96$, $p = .50$.

Table 6.11

Two-Way Analysis of Variance Summary Table comparing BMI groups, age

groups, and the cost of food influencing purchasing behaviours.

BMI Group	Age Group	*n*	*M*	*SD*	*F*
Underweight	18 to 24	1	2.00	-	.96
	25 to 34	14	3.29	.91	
	35 to 44	12	2.67	1.07	
	45 to 54	11	2.27	1.10	
	55 to 64	10	2.80	.42	
Healthy Weight	18 to 24	26	2.73	.78	
	25 to 34	393	2.86	.94	
	35 to 44	471	2.71	.91	
	45 to 54	617	2.53	.86	
	55 to 64	301	2.28	.86	
Overweight	18 to 24	9	3.33	.87	
	25 to 34	300	2.91	.98	
	35 to 44	488	2.84	.90	
	45 to 54	878	2.60	.90	
	55 to 64	495	2.39	.83	

Obese I	18 to 24	2	3.00	.00
	25 to 34	124	3.02	1.02
	35 to 44	198	2.78	.95
	45 to 54	378	2.70	.98
	55 to 64	192	2.42	.93
Obese II,III	18 to 24	2	3.00	.00
	25 to 34	65	2.95	1.01
	35 to 44	142	2.97	.95
	45 to 54	219	2.77	.97
	55 to 64	73	2.67	.94

*p < .05, **p < .01, ***p < .001.

Partial eta squared was .002 for BMI and .008 for age indicating that the effect of age was four times greater than BMI on the cost of food influencing purchasing behaviours and only age reached significance ($p <$ .001). The adjusted r squared (adj r^2 = .04) indicated that only 4% of the variance in the cost of food influencing purchasing behaviours is accounted for by age and BMI.

6.3.12 BMI, age, and eating past the point of feeling full

A two-way ANOVA was applied to identify the interaction effect for eating past the point of feeling full between age and BMI. Results are shown in Table 6.12. The two-way ANOVA did not reveal a significant interaction

241

effect between age and BMI for eating past the point of feeling full $F_{(16, 5399)} = 1.27$, $p = .21$.

Table 6.12

Two-Way Analysis of Variance Summary Table comparing BMI groups, age groups, and eating past the point of feeling full.

BMI Group	Age Group	n	M	SD	F
Underweight	18 to 24	1	3.00	.	1.27
	25 to 34	14	2.00	.56	
	35 to 44	12	2.50	.67	
	45 to 54	11	2.36	.92	
	55 to 64	10	2.40	1.17	
Healthy Weight	18 to 24	26	2.85	.83	
	25 to 34	394	2.67	.79	
	35 to 44	471	2.46	.74	
	45 to 54	613	2.37	.73	
	55 to 64	302	2.27	.75	
Overweight	18 to 24	9	2.78	.67	
	25 to 34	300	2.94	.81	
	35 to 44	489	2.82	.77	
	45 to 54	875	2.63	.77	
	55 to 64	498	2.55	.74	

Obese I	18 to 24	2	3.00	.00
	25 to 34	124	3.19	.78
	35 to 44	199	2.93	.77
	45 to 54	380	2.81	.77
	55 to 64	192	2.84	.75
Obese II,III	18 to 24	2	3.00	.00
	25 to 34	65	3.11	.83
	35 to 44	143	3.09	.75
	45 to 54	219	2.92	.88
	55 to 64	73	2.73	.77

*$p < .05$, **$p < .01$, ***$p < .001$.

Partial eta squared was .006 for BMI ($p < .001$) and .003 for age ($p < .01$) indicating that the effect of BMI was two times greater than age on eating past the point of feeling full. The adjusted *r* squared (*adj r^2* = .08) indicated that 8% of the variance in the eating past the point of feeling full was accounted for by age and BMI.

6.3.13 BMI, age, and vegetable consumption

A two-way ANOVA was applied to identify the interaction effect between age and BMI and vegetable consumption. Results are shown in Table 6.13. The two-way ANOVA did not reveal a significant interaction effect between age and BMI for vegetable consumption $F (16, 5403) = 1.01$, $p = .44$.

Table 6.13

Two-Way Analysis of Variance Summary Table comparing BMI groups, age groups, and vegetable consumption.

BMI Group	Age Group	n	M	SD	F
Underweight	18 to 24	1	3.00	.	1.01
	25 to 34	14	1.93	.83	
	35 to 44	12	2.00	.95	
	45 to 54	11	2.91	1.51	
	55 to 64	10	2.00	1.05	
Healthy Weight	18 to 24	26	2.04	1.00	
	25 to 34	395	2.16	1.14	
	35 to 44	468	2.23	1.19	
	45 to 54	617	2.08	1.10	
	55 to 64	302	2.25	1.29	
Overweight	18 to 24	9	1.67	.50	
	25 to 34	299	2.04	1.24	
	35 to 44	489	2.06	1.16	
	45 to 54	880	2.07	1.14	
	55 to 64	495	2.12	1.16	

Obese I	18 to 24	2	1.00	1.41
	25 to 34	124	2.02	1.20
	35 to 44	197	2.05	1.21
	45 to 54	380	1.99	1.12
	55 to 64	192	2.18	1.16
Obese II,III	18 to 24	2	.50	.71
	25 to 34	67	1.91	1.32
	35 to 44	142	2.07	1.28
	45 to 54	220	2.07	1.18
	55 to 64	74	2.09	1.22

*$p < .05$, **$p < .01$, ***$p < .001$.

Partial eta squared was .002 for BMI ($p < .05$) and .001 for age ($p = .19$) indicating that the effect of BMI. The adjusted *r* squared (*adj r^2* = .00) indicated that the variance in vegetable consumption as accounted for by age and BMI was negligible.

6.2.14 BMI, age, and fruit consumption

A two-way ANOVA was applied to identify the interaction effect between age and BMI and fruit consumption. Results are shown in Table 6.14. The two-way ANOVA did not reveal a significant interaction effect between age and BMI for fruit consumption F (16, 5393) = .54, p = .93.

Table 6.14

Two-Way Analysis of Variance Summary Table comparing BMI groups, age

groups, and fruit consumption.

BMI Group	Age Group	n	M	SD	F
Underweight	18 to 24	1	1.00	.	.54
	25 to 34	14	1.93	1.21	
	35 to 44	12	2.17	1.70	
	45 to 54	11	2.55	2.21	
	55 to 64	10	2.70	1.77	
Healthy Weight	18 to 24	26	1.65	1.29	
	25 to 34	395	2.12	1.20	
	35 to 44	472	2.29	1.33	
	45 to 54	617	2.44	1.45	
	55 to 64	301	2.63	1.46	
Overweight	18 to 24	9	2.44	.726	
	25 to 34	300	2.07	1.391	
	35 to 44	488	2.18	1.447	
	45 to 54	872	2.49	1.581	
	55 to 64	491	2.58	1.452	

Obese I	18 to 24	2	1.00	.000
	25 to 34	124	1.93	1.30
	35 to 44	198	2.10	1.51
	45 to 54	379	2.26	1.37
	55 to 64	191	2.50	1.50
Obese II,III	18 to 24	2	.50	.71
	25 to 34	67	1.97	1.50
	35 to 44	143	2.05	1.45
	45 to 54	221	2.29	1.54
	55 to 64	72	2.69	1.51

$*p < .05, **p < .01, ***p < .001.$

The partial eta squared was .001 for BMI ($p = .21$) and .005 for age ($p < .001$), indicating that the effect of age was five times greater than BMI on the consumption of fruit. The adjusted r squared (*adj r²* = .02) indicated that 2% of the variance in fruit consumption is accounted for by age and BMI.

6.2.15 BMI, age, and balanced diet

A two-way ANOVA was applied to identify the interaction effect between age and BMI and the consumption of a healthy, well-balanced diet. Results are shown in Table 6.15. The two-way ANOVA did not reveal a significant interaction effect between age and BMI for the consumption of a healthy, well-balanced diet $F (16, 5376) = .94, p = .52$.

Table 6.15

Two-Way Analysis of Variance Summary Table comparing BMI groups, age

groups, and the consumption of a healthy, well-balanced diet.

BMI Group	Age Group	*n*	*M*	*SD*	*F*
Underweight	18 to 24	1	2.00	.	.94
	25 to 34	14	1.21	.80	
	35 to 44	12	1.50	.67	
	45 to 54	11	1.64	.81	
	55 to 64	10	1.60	.70	
Healthy Weight	18 to 24	26	1.50	.71	
	25 to 34	394	1.65	.60	
	35 to 44	471	1.68	.61	
	45 to 54	618	1.70	.62	
	55 to 64	299	1.70	.63	
Overweight	18 to 24	9	1.56	.73	
	25 to 34	296	1.46	.67	
	35 to 44	484	1.52	.63	
	45 to 54	871	1.61	.64	
	55 to 64	494	1.64	.66	

Obese I	18 to 24	2	1.00	.00
	25 to 34	123	1.22	.66
	35 to 44	197	1.31	.67
	45 to 54	375	1.37	.68
	55 to 64	190	1.50	.67
Obese II,III	18 to 24	2	1.00	.00
	25 to 34	66	1.26	.56
	35 to 44	143	1.26	.63
	45 to 54	219	1.35	.66
	55 to 64	74	1.43	.70

$*p < .05, **p < .01, ***p < .001.$

Partial eta squared was .005 for BMI ($p < .001$) and .003 for age ($p = .05$) indicating that the effect of BMI was greater than age on the consumption of a healthy, well-balanced diet. The adjusted r squared ($adj\ r^2 = .04$) indicated that only 4% of the variance in the consumption of a healthy, well-balanced diet was accounted for by age and BMI.

6.3 Discussion of Findings

The findings of the one-way ANOVA analysis of eating behaviours by age and BMI demonstrate significant differences. The cost of food influencing purchasing behaviours declined after the age of 35, and was least influential for the healthy and underweight groups. Fruit consumption increased with age, but no significant between-group differences were identified between BMI groups.

Eating past the point of feeling full reduced as age increases up to the age of 65, and as BMI increased, so too did the tendency to eat past the point of feeling full. Differences in vegetable consumption by age and BMI were not significant. Eating a healthy, well-balanced diet increased with age and people in the healthy weight category reported healthier more well-balanced diets than underweight and overweight groups, who in turn had healthier and more well-balanced diets than the obese groups.

Two-way ANOVA demonstrated no significant interaction effects between age and BMI for any of the eating behaviours suggesting that BMI is not related to age in the current sample and, therefore, the interaction effects for both age and BMI occur separately.

6.3.1 The influence of age on eating behaviours

Age had a significant influence on between-group differences for fruit consumption, eating past the point of feeling full, cost influenced food purchasing behaviours and the consumption of a healthy well-balanced healthy diet.

6.3.1.1 Main findings

Age was shown to be a significant determinant of eating behaviours in the current study. Table 6.1 demonstrates the influence of cost of food on purchasing behaviours. Employees aged 25-34 were most influenced by cost in purchasing behaviours, followed by the 18-24-year-old employees. After the age of 35, the influence of cost reduced for each age group. This is supported by the findings from the cross-sectional and longitudinal analysis presented in Chapter 5 and the epidemiology of eating behaviours presented in Chapter 4 which identified that age had a significant effect on the influence of food costs.

251

The current chapter supports the previous analysis, and demonstrates the age-related gradient in behaviour. Eating past the point of feeling full (Table 6.2) reduced for each age group from the age of 18-24 up to age 65 and over. Likewise, this finding is supported by the previously reported analysis in this thesis. It may be that health concerns, and a desire to eat healthily to reduce the likelihood or impact of illness, increases with age, thus encouraging older people to reduce their intake of food or be more mindful of how much they are eating. Dietary restraint may be used more by older groups, or even appetite may reduce with age, and there may also be other socioeconomic factors, as discussed in previous chapters, which influence this relationship.

Vegetable consumption was not significantly related to age in the current analysis (Table 6.3), however fruit consumption (Table 6.4) demonstrated a positive gradient with age with consumption increasing significantly for each age group from 18-24 up to 65 and over. This may be related to the finding in Table 6.5 that the consumption of a healthy, well-balanced diet increases with each age group. Older people may be more educated in the importance of healthy eating, generational differences in cooking habits may have an influence, or older age groups may have experienced more illnesses and diseases that necessitate/encourage a healthy diet. The proportion of unexplained variance in each of the eating behaviours examined demonstrates the complexity of eating behaviours, demonstrating that while age and BMI are significant in their influence, they are not the only factors that influence eating behaviours.

6.3.1.2 Comparison of findings with current literature

The findings of the current study are consistent with the literature on age and eating behaviours. In a qualitative investigation of food choice in a UK community study of working aged individuals, significant behavioural differences were found between age groups (Chambers et al., 2008). The authors argue that "the food choices people make may be determined by their circumstances and life stage" (Chambers et al., 2008, p. 364). The study used a self-report questionnaire administered alongside focus group interviews. In common with the current study, cost was more of a barrier to healthy eating by the younger age groups than the older age group. Likewise, the younger age groups were less likely to report they made healthy food choices than the older groups. Participants over the age of 30 reported purchasing more fruits and vegetables than those under 30. Participants ($N = 43$) were asked two questions relating to eating behaviour *Do you have a healthy diet?* and *How often do you eat unhealthy food?* (Chambers et al., 2008) in a questionnaire, and further questions relating to fruit and vegetable consumption were asked in the focus group discussions. The current study used a similar approach in using the self-report measure of *'Do you believe that you have a healthy, well balanced diet?'* however the sample size in the current study was significantly larger ($N = 5642$). Fruit and vegetables were included as one aggregate question in the Chambers et al. (2008) study, whereas the current study was able to identify differences between fruit consumption and vegetable consumption as they were included as separate constructs. No significant differences were found between groups for vegetable consumption, and while significance was seen between age and fruit consumption, this did not extend to significant

differences between groups. These differences in consumption warrant further investigation and suggest that fruit and vegetable consumption should be measured as separate metrics.

McLaren, in a review of 333 studies of SES and obesity, suggests that age may be an effect modifier in the relationship between SES and obesity (2007). A similar relationship was found in an earlier review of 144 studies examining SES and obesity (Sobal & Stunkard, 1989). This is an important consideration for the current study, which demonstrates that age had a significant influence on several eating behaviours. The eating behaviours examined in this study may influence weight and predictions of obesity, and therefore interventions to modify eating behaviours to reduce weight must be mindful of the age-related nuances in behaviour. It is also worth noting that a healthy, well-balanced diet is not always associated with a high cost, and while some individuals may be more sensitive to cost influencing their purchasing behaviours, many groups exhibit 'nutrition resilience' which is defined as "the ability to construct diets that are nutrient-rich, affordable and appealing" (Drewnowski & Kawachi, 2015, p. 193).

The between-group differences identified in the current study relating to dietary restraint are supported in community-based literature, however no workplace studies could be identified as a basis for comparison. In a small community study of 60 males, no significant differences were identified between age groups for disinhibition, however the younger group were more susceptible to hunger than the older age group. Stunkard and Messing's (1985) Three Factor Eating questionnaire uses three measures to understand eating behaviours – restraint, hunger, and disinhibition. In the current study, only one

measure was included – *how often do you eat past the point of feeling full?* This single item measure may incorporate factors relevant to all three of Stunkard and Messing's (1985) measures. Restraint could be defined as *not* eating past the point of feeling full; disinhibition *is* eating past the point of feeling full; and one may assume that experiencing hunger might indicate that the individual has not eaten past the point of feeling full, however it is still possible to be hungry after eating past the point of feeling full. The current study is important because of the large sample size ($N = 5642$) and the inclusion of both male and female participants. Much of the literature on dietary restraint and disinhibition is focused on females (Dykes et al., 2004; Savage et al., 2009) and on community cohorts (Tepper, Choia, & Nayga, 1997; Bryant et al., 2007). Further research in the workplace on both males and females would be beneficial to develop effective programmes to address overeating to improve employee health.

As discussed in the previous chapter, in many studies examining SES with eating behaviours (fruit and vegetable consumption, the cost of food influencing purchasing behaviours, and the consumption of a healthy diet), age is used as a control measure rather than as a dependent variable (Lahelma et al., 2009; Aggarwal et al., 2011; Morris et al., 2014) and therefore age-related nuances in eating behaviours are not reported in detail.

6.3.2 The influence of BMI on eating behaviours

BMI had a significant influence on cost of food influencing purchasing behaviours, eating past the point of feeling full, and the consumption of a healthy, well-balanced diet.

6.3.2.2 Main findings

BMI exerted a significant influence on the cost of food influencing purchasing behaviours (Table 6.6). Cost was a more significant influence for the obese (II, III) and underweight groups than the overweight and obese (I) groups; and cost of food was least influential for the healthy weight category. This may be because of several factors which may include differing purchasing behaviours, such as the consumption of fast-food, takeaways, and eating away from the home or dietary restraint, home cooking or personal taste. It is interesting that those who are least influenced by cost are of a healthy weight; this raises the question of whether cost can lead to undereating (and therefore underweight) or eating foods that are cheaper and less healthy leading to overweight and obesity. Those who were most obese were most influenced by the cost of food. It is not possible from the current analysis to identify why this relationship exists.

Eating past the point of feeling full demonstrated significant between-group differences for BMI (Table 6.7). A positive gradient in eating past the point of feeling full was evident with underweight employees least likely to eat past the point of feeling full and obese (II, III) most likely to eat past the point of feeling full. There are many factors that may influence the feelings of satiety, such as biological, sociological, or economic factors which may impact the gradient. A significant difference was found between BMI and fruit consumption, however no between-group differences were found in the analysis (Table 6.9) and no differences were found in vegetable consumption for BMI groups (Table 6.8). A significant difference in the consumption of a healthy, well-balanced diet was found with healthy weight individuals

reporting the healthiest diets. Underweight, overweight, and obese categories had a lower belief that they consumed a healthy, well-balanced diet than did the healthy weight individuals; and overweight employees believed they consumed a healthier diet than the underweight employees. These differences in healthy eating behaviours for different weight groups could be factors that led to the individual's weight status, however their weight status could have led to their propensity to eat in a certain way. This will be discussed in further detail in the following section.

6.2.2.3 Comparison of findings with current literature

Individuals in the obese (I) and obese (II, III) BMI categories were more likely to report that cost influenced their purchasing behaviours than those in the overweight and underweight categories, and those of healthy weight were least likely to report that cost influenced purchases. There is limited research in this area to use as a basis for comparison. In a systematic review of 153 eating behaviour studies BMI was generally used as an outcome rather than a determinant of eating behaviours (Mesas et al., 2011). This is consistent with other community studies on eating behaviours or health, which include BMI, but not as an outcome measure (Tohill, Seymour, Serdula, Kettel-Khan, & Rolls, 2004). Obesity, in its simplest form, is the consumption of excess calories and/or an under-exertion of physical activity (Schulte et al, 2007). Obesity has been considered as a 'disease of the poor' with a higher propensity for overweight and obesity in individuals of lower socioeconomic groups (Drewnowski, 2009). Theoretically, based on the BMI (and the Law of Thermodynamics) obese individuals would need to consume significantly more calories than their normal weight colleagues in order to maintain their

body weight and therefore the extra cost associated with this larger volume of food may indeed increase their sensitivity to the cost of food. Conversely, the indviduals in these weight categories may be unable to afford healthy options in the shops and purchase foods higher in fats and sugars, of lower cost, but with higher calorific values, thus maintaining or increasing their weights.

The current study raises the question as to whether eating behaviours are an outcome or a determinant of BMI. Do obese individuals eat in a certain way because they are obese, or do the eating behaviours that they engage in make them obese? Or both? Understanding the direction of the relationship may enable programmes to target overweight and obesity to be more effective. It is worth noting too that the mechanism that drives obesity is not always related to hunger or overconsumption of food, or even genetics, general health, or disability. The emotional and psychological determinants of eating are equally important in this relationship and arguably significant in the workplace. Research suggests that exposure to stress can encourage the consumption of more energy-dense foods often containing more fats and sugars, and occupational stress is associated with a higher BMI (Schulte et al., 2007). Could the working environment at the NICS have contributed to the weight status of the 1,300 or so individuals who were obese at the time of the study, or could it be the environment in which these individuals live? It is likely that the determinants are too complex for an occupational health study to ascertain. It is also important to note the prediction that by 2020 seven out of 10 people in Britain will be overweight or obese and therefore this is not an issue specific to employees of the NICS (Wang et al., 2011). However, research suggests that individuals who are overweight or obese experience bias

and stigmitisation in the workplace (and in society), whether consciously or driven by unconscious biases that may contribute to discrimination, bullying, and limiting career prospects (Schulte et al., 2007). It has also been shown that some individuals may make discriminatory judgements about obese people in the workplace, such as suggesting they lack self-discipline, are lazy and less competent; these judgements have been seen to impact an overweight persons chances of getting a promotion and their earning potential (Puhl & Brownel, 2001). Further research may benefit from identifying workplace issues that may contribute to weight gain or a higher weight status in order to address the root cause in workplace interventions to improve health. A further recommendation may be for the workplace to assess whether unconscious bias does indeed exsist in the hiring and promotion of overweight and obese individuals.

No studies directly investigating the relationship between the consumpton of a healthy, well-balanced diet and BMI could be found as a basis for comparison, however logic might indicate that those of healthy weight should have the healthiest diet, which the current study found. An unhealthy diet may lead to weight gain, just as an unhealthy diet may lead someone to be underweight. But it could be argued that someone who is overweight or obese may be more likely to believe their diet is unhealthy than someone who is of a healthy weight. An individual of healthy weight may consume very few fruits and vegetables and have a diet high in saturated fats and sugars, but because their weight is classified in the healthy range this may influence their perspective leading them to believe they must have a healthy diet because they have a healthy weight. It is important to note that although

the between-group differences reported for BMI and the consumption of a healthy, well-balanced diet are significant, they are still small. Future studies of BMI would benefit from investigating individual beliefs in the consumption of a healthy, well-balanced diet. In a workplace setting, if an individual already believes they are eating healthily they may be unlikely to attend a workplace weight loss course. Therefore, workplace practitioners need to be mindful of setting up interventions that do not exclude people based on their beliefs, and rather include them based on their behaviours. The current study uses single-item measures of healthy eating behaviours which are based on self-report; the completion of food-diaries might be helpful to determine whether an individual's self-reported belief that they consume a healthy, well-balanced diet is supported by evidence (albeit self-reported) in a food diary, and therefore give a stronger indication of whether they may benefit from workplace support to eat more healthily.

The current study identified that overweight and obese participants were more likely to report eating past the point of feeling full than those of healthy weight or underweight status. Stunkard and Messing's (1985) Three Factor Eating Questionnaire (restraint, disinhibition, and hunger) was used in the Whitehall II study of British civil servants (Dykes et al., 2004). Significant relationships between both hunger and disinhibition and body-size and weight were identified, suggesting that individuals who continue to eat when they are satiated tend to have a greater weight and size. This supports the current study with the finding that overweight and obese participants report eating past the point of feeling full more than healthy weight participants. This is further supported by research by Bryant et al. (2007); their review of disinhibition

studies found a positive relationship between BMI and disinhibition – as BMI increased, disinhibition decreased. Similarly, in a community-based study, a relationship was found between diet quality and restraint – individuals with the highest levels of dietary restraint consumed the greatest volume of healthy foods (defined as chicken, fish, and green salad in the study) (Tepper, Choi, & Nayga, 1997). This suggests that a healthy diet must include an element of *not overeating* (restraint) and individuals should watch their food quantity as well as quality. In the current study, individuals in the overweight and obese BMI categories did not report eating a healthy, well-balanced diet as much as healthy weight participants, and the overweight and obese participants also report eating past the point of feeling full more often than those of a healthy weight. This demonstrates the complexity of eating behaviours and suggests that a workplace programme designed to address multiple eating behaviours may be more successful than one that only addresses one behaviour such as healthy eating.

Only limited studies directly investigating the relationship between BMI and fruit and vegetable consumption could be found in the literature (Tohill et al., 2004; Charlton et al., 2014). In a review of epidemiologic studies on the relationship between fruit and vegetable consumption, inconsistent evidence was found between weight status and fruit and vegetable intake (Tohill et al., 2004). The review included 16 studies of adults (15 cross-sectional and one prospective), eight of which reported a significant association between fruit and vegetable consumption, fruit consumption, or vegetable consumption, which showed that as BMI increased the consumption of fruits and vegetables decreased. The direction of the association between

higher intakes of fruits and vegetables and weight status did not vary by category (fruit; vegetable; fruit and vegetable) and was generally found to be more significant in females than in males. The authors recommend further studies with BMI as an outcome rather than control measure in investigations with fruit and vegetable intake; they also suggest that intervention studies would clarify the influence on fruit and vegetable intake on weight loss (Tohill et al., 2004). The current study supports the main findings of the review by Tohill et al. (2004) demonstrating an inconsistent relationship between BMI and fruit and vegetable intake. The current study also supports the limitations of the Tohill et al. (2004) review, in that BMI in the current study was initially included as a control in the relationships between socioeconomic variables and eating behaviours, before analysis suggested that BMI was a significant variable in its own right. The findings contrast with a review of 246,995 Australian adults which identified that BMI differences in fruit and vegetable consumption were different for males and females (Charlton et al., 2014). They found that overweight and obese women were more likely to consume more fruits and vegetables than those of normal weight, wheras overweight men were less likely to meet fruit and vegetable recommendations than normal weight men. This supports the gender-related differences in fruit and vegetable consumption reported in previous chapters, but not the findings of the current study. However, the Australian study was a community-based study of individuals only over the age of 45 and results were reported for each gender rather than combined. This therefore may make comparison with the current study more challenging, as despite the mean age of participants in the NICS

study being 46, it did include a significant number of employees under this age.

6.3.3 Practical implications for targeting workplace health promotion activities

The influence of age and BMI has been discussed in the context of the cost of food influencing purchasing behaviours, eating past the point of feeling full, the consumption of a healthy, well-balanced diet, fruit consumption, and vegetable consumption. Between-group differences were found in both age groups and BMI groups for all eating behaviours of employees of the NICS who took part in the Stormont Study, except for vegetable consumption. In the context of the workplace, why do these differences matter? The current study findings present several considerations for the targeting of workplace health promotion activities. A one-size-fits-all approach to health behaviour modification in the workplace may be challenging when different groups of individuals have slightly different behaviours based on their demographic or personal characteristics. This suggests that health promotion activities should be targeted at these differences to achieve maximum benefits. However, health promotion activities aimed at modifying eating behaviours at different age and BMI groups may represent a practical, as well as an ethical, implementation challenge to the workplace. It has been suggested that the most effective and targeted health promotion campaigns are those that focus on collecting evidence on behavioural motivations, barriers to behavioural changes, and the communication of solutions that consider these behavioural differences (Chambers et al., 2008), but the current study suggests that these behavioural motivations may also, in part, be influenced by demographic factors.

Although targeting workplace health interventions at specific demographic groups may be controversial, this author argues that when done in a sensitive way, this may elicit a positive outcome. Many large organisations use online health promotion websites to encourage employees to take up healthier lifestyles. Some of these web applications enable employees to answer questions to receive a 'health score' based on various lifestyle factors, such as eating behaviours, hydration, alcohol intake, physical activity, smoking, and stress. Many of these applications will also request basic demographic and biometric information for reporting purposes, and for reporting back individual health information to an individual with comparisons for someone of their age or gender. This information is more likely to focus on their predispositions for certain diseases or potential for ill-health, rather than the tailoring of behavioural recommendations. While the health messages seen by employees are often then tailored to the lifestyle questionnaire, they are not always tailored to the demographic questions. By tailoring messages to both, employees may be given access to the advice and support most relevant to them. It could be argued that those employees most likely to access a web application may be healthier than the general population in an organisation and may be more willing, or ready, to change behaviours, but practitioners may concede that there will always be individuals hard to reach in a workplace and successfully changing the behaviours of a few and being able to demonstrate the benefits of change may persuade the more difficult to reach employees to engage. It could also be argued that older workers may be less likely to access information in this format. Although based on the findings of the current study of eating behaviours and age, whereby the younger age groups report less

healthy eating behaviours than the older employees, the younger age groups may benefit more from eating behavioural change interventions.

It is also important to consider the ethical impact of targeting specific personal characteristics of individuals to change their behaviours. It has been reported previously that some workplace interventions may inadvertently increase inequalities (McGill et al., 2015). Likewise, the individuals who sign up to interventions may be of a higher SES and have higher economic means by which to make lifestyle changes (Beauchamp et al., 2014). The 'healthy worker' effect, whereby individuals with poor health are less likely to respond to a survey than those of better health may also be true of workplace interventions (Etter & Perneger, 1997). However, it could be argued that the targeting of interventions may serve to reduce inequalities as long as the correct groups are targeted. It may not be practical to target specific BMI or age groups in the workplace. The costs of an intervention, or the desire to engage with as many employees as possible may make it impractical.

The long-term effectiveness of workplace interventions in changing behaviours has only limited evidence (Allan et al., 2017; Anderson et al., 2009; Maes et al., 2011). The methodological challenges of carrying out interventions in the workplace has resulted in significant differences in the set-up and evaluation of interventions, and therefore their comparison and replication in other workplaces. When the cost savings of an intervention, or the return on investment, can not be articulated (most notably to the finance director) it may be challenging to get investment in the workplace to implement a programme. More consistency in the design of workplace healthy eating interventions may allow for more robust evaluation and for a stronger

business case to be made for investment, if evidence for effectiveness can be demonstrated. The current chapter presents differences between age and BMI groups of employees of the NICS, but further studies in the workplace are required to test the generaliasability of findings and, therefore, the appropriateness of targeting interventions based on these findings.

Eating behaviours are influenced by more than just the employee's personal and demographic factors. As discussed in the previous chapters, SES also has an impact. So too do other psychological, cultural, social, and economic factors (Lahelma et al., 2009). Interventions that focus on modifying the cost of food, for example in the workplace canteen, (McGill et al., 2015) or using 'choice architecture' in the placement of foods in the canteen to make healthier foods more visible (Boers et al., 2017) may be more effective in changing behaviours. Employees in the current study were more likely to be sensitive to the cost of food when purchasing foods if they were overweight or obese than of healthy weight, which suggests that interventions that address the cost of food in the workplace may be just as effective as healthy eating education targeted to specific weight groups.

6.4 Strengths and Limitations

The strengths and limitations of the Stormont Study have been discussed in both Chapters 4 and 5 in relation to response rates and the challenge of generalisability of analysis on a defined group of employees from the NICS. The pros and cons of the design of the questionnaire and the questions related to eating behaviours have also been discussed. The large sample size, range of employees in terms of demographics and SES, and breadth of questions are all strengths of the current research.

The use of BMI as an effective measure of healthy weight is much debated. It is the most commonly used measure of obesity, yet debate surrounds its efficacy (Burkhauser & Cawley, 2008). Women have been reported to be more likely to underreport their weight and men to overreport their height, thus biasing BMI downwards (Ng et al., 2014). Critics of BMI as a measure of healthy weight suggest that it does not account for muscle mass and therefore individuals who have a high muscle mass may be classed as overweight and obese when they are in better health than those of a healthy weight. For example, in firefighters or professional sports people who strive for a low body fat percentage and high muscle mass, BMI may not be the most accurate measure, as it does not account for the differences between the weight of adipose tissue and lean muscle mass. It is unlikely that these concerns would be aplicable to the majority of employees of the NICS, as despite the variety of roles employed, the majority do not require high levels of muscle strength. The use of waist circumference, waist-to-hip ratio, underwater weighing, total body fat, or percentage body fat are alternatives to the use of BMI (Burkhauser & Cawley, 2008), however the practicality of using these alternative in large workplace or community-based studies is limited. Given the self-report nature of an online questionnaire, the method for assessing weight status needs to be easy for the participant to complete; entering weight and height may be subject to self-report bias, but it is an accessible means of measurement. As has been demonstrated in the literature review in the current thesis, BMI is the most commonly used measure of weight status and therefore, despite its limitations, offers an easily administered measure comparible with the majority of other studies in this field.

It is possible that the findings of the one-way ANOVA analysis are mediated or influenced by other external factors. While between-group differences were observed between BMI and age groups, these differences could be attributed to other factors, for example, the age gradient in cost of food influencing purchasing behaviours. It is possible that different age groups cluster to certain living environments based on their family status, the cost of housing, and the local amenities. The differences seen between age groups are potentially borne through environmental and social differences between the age groups rather than the age itself. Likewise, the fact that higher BMI groups are more likely to eat past the point of feeling full may be a result of the cost of food influencing purchasing behaviour. For example, employees with a higher BMI may have a higher BMI because they struggle to afford healthy foods and eat cheaper, processed foods that do not maintain satiety. It is important that the findings of the current chapter are treated with caution and assumptions not made without further testing the results in future workplace studies.

The potential strengths and limitations of targeting healthy eating interventions to age or BMI groups have been discussed in detail in the previous section. In summary there are mixed arguments to the practicality and efficacy of such an approach in the workplace. The use of targeting through the subtler means of an algorithm on a behaviour change wellbeing website, based on self-reported demographic and health information, may be the most effective, and ethical, means to apply the findings of the current chapter to a workplace intervention.

Despite these limitations, the use of a set of one-way ANOVA to understand the between-group differences for age and BMI, on the eating

behaviours of a large sample in the workplace adds to an under-researched area in workplace health. The discussion offers practical suggestions for future studies and workplace interventions to further investigate the relationships identified.

6.5 Chapter Summary

The current chapter examines the role of demographic and personal characteristics in relation to eating behaviour. Specifically, differences in eating behaviours by age and BMI are examined via a set of one-way ANOVA analyses. Findings indicate a host of significant differences on each index of eating behaviour by age and BMI. Many of these findings are supported by previous research in this area. The results suggest there is a scope for targeted interventions within the organisational setting. Such interventions are discussed in the context of the extant literature on tailored and targeted workplace health promotion activities and suggestions made for future study in this area.

The epidemiology of healthy eating behaviours presented in Chapter 4, the cross-sectional, prospective, and longitudinal regression analysis of SES and demographic factors presented in Chapter 5, and the one-way ANOVA presented in the current chapter examining between-group differences of age and BMI and eating behaviours, all highlight the complexity of eating behaviours. Chapter 7 presents a qualitative study, in a large, recently privatised organisation, of higher SES employee perceptions of the barriers and facilitators of healthy eating at work to develop potential answers to the questions raised through the quantitative analysis.

Chapter 7: Qualitative Study – Barriers and Facilitators to Healthy Eating for high socioeconomic status employees in a Private Sector Organisation

7.1 Introduction

The aim of the current chapter is to consider further the findings of the quantitative analysis detailed in previous chapters, and explore perceived barriers and facilitators to healthy eating in an exploratory study in the workplace. Qualitative analysis presents an opportunity to bring to life quantitative data and explore themes and understand meanings that are not possible in quantitative analysis. SES (measured by salary, education, and job grade), demographic factors (including gender, age, and number of dependants), weight (measured by BMI) and eating behaviours (fruit consumption, vegetable consumption, the consumption of a healthy, well-balanced diet, the cost of food influencing purchasing behaviour and eating past the point of feeling full) were all considered in the quantitative analysis detailed in previous chapters. Age, gender, and number of dependants emerged as significantly influential factors on eating behaviours; and while SES was predominantly found to be a significant factor in cross-sectional analysis, it was the demographic variables that maintained their influence in longitudinal analysis.

The quantitative data offers insights into the relationships between the variables of interest in the current study, but it does not allow for conclusions to be made as to why those relationships exist, or what the drivers might be. To explore these findings further exploratory interviews were carried out in a workplace setting, in a group of high SES/manager grade employees, to

understand the facilitators and barriers to healthy eating; in addition, qualitative data related to the eating behaviours examined in the previous chapters was gathered. The findings of the qualitative study, and the associated literature review, are presented in one chapter, rather than in the form of multiple chapters in which the quantitative study is presented. This is because the literature review and analysis contained in this chapter were developed as a result of the analysis presented in the previous chapters and warranted separate presentation following the discussions presented in the quantitative analysis. Chapter 7 addresses the final research question proposed in Chapter 2; (7) *What are the perceived barriers and facilitators to healthy eating at work?*

The literature review presented in Chapter 2 highlighted a lack of research in the workplace focused on SES and eating behaviours, which this thesis seeks to address. Much of the research in this area is based on community samples which may not allow direct comparison with the workplace. The quantitative analysis in the current thesis demonstrates relationships between both SES and sociodemographic factors and eating behaviours in the workplace. Given the purpose of the thesis is to inform future research in this area it is important to understand what helps and what hinders employees to eat well at work, in addition to understanding the personal factors that may influence them. Therefore the current chapter presents an exploratory study to inform further study and interventions designed to modify behaviours.

7.2 Method

The quantitative data analysis carried out on the NICS data set presented a series of relationships between SES and demographic factors and

eating behaviours in the workplace. The importance of SES and age and weight status on eating behaviours has been discussed in detail in the previous chapters, but no conclusions can be drawn as to why those relationships may exist from the current question set. In order to explore these relationships in more detail, qualitative analysis was used, based on semi-structured interviews, to assess attitudes to healthy eating in a workplace, with a similar structure to that of the NICS.

7.2.1 Qualitative research

Qualitative analysis presents an opportunity to understand and interpret the meaning of the quantitative analysis carried out in previous chapters. Braun and Clarke (2013) argue that qualitative data offers a unique perspective into individual meanings. "Reality, meaning and experience for people often tend to be messy and contradictory; qualitative research can 'embrace this messiness'" (Braun & Clarke, 2013, p. 24). As the previous chapters have demonstrated, the relationships between eating behaviours and individuals are complex; by testing the themes identified through quantitative analysis, it may be possible to achieve a greater depth of understanding into these relationships and perhaps into methods to improve eating behaviours at work.

There are many benefits to qualitative research. It enables the exploration of lived experiences and provides a richness of data, offering explanations for trends seen in quantitative data. Pluye and Hong (2014) suggest that "in public health, stories have the power to change policies, and statistics traditionally provide a strong rationale to make changes" (Pluye & Hong, 2014, p. 30). This is true of occupational health interventions –

qualitative data can add a 'human' quality to research and persuade an organisation to act on findings.

One of the main benefits of exploring eating behaviours through both quantitative and qualitative research, through mixed-method design, is triangulation; the validity of findings is enhanced through the breadth of data. Eating behaviours are a complex phenomenon, especially when explored in a workplace context, and a mixed-method design can provide stronger inferences, a more complex and complete piece of research, and a richer explanation of findings (Robson, 2011). However, in order for this method to be beneficial, the rationale of the approach and rigorous integration of findings is needed to ensure the study comes together as one coherent design (Bryman, 2004).

7.2.2 Study context

It was not possible to carry out a qualitative study on the NICS as the project champion at NICS had retired in 2016. It was therefore decided to carry out the study on an alternative organisation.

Royal Mail Group (RMG) is a large private sector organisation responsible for delivering letters and parcels to 29 million addresses in the UK. RMG is the UK's oldest postal service, being established in 1516. In 2016, RMG's 140,000 employees and fleet of 48,000 vehicles in the UK handled 1.2 billion parcels and 14.9 billion letters (Royal Mail Group, 2017). RMG was privatised in 2013, however the business structure reflects that of the public sector organisation it was in the years preceding privatisation. The grades, income bands, and educational levels closely reflect that of the NICS, making it an appropriate workforce to further explore the issues investigated in the

previous quantitative studies, and identify barriers and facilitators to healthy eating in the workplace. RMG has a diverse workforce ranging from lower paid administrative and post sorting roles to senior executive and professional roles. RMG has two trade unions representing the majority of its employees.

The researcher (at the time of the analysis) was group head of occupational health and wellbeing at RMG and therefore had access to the workforce for analysis. In this role the researcher was responsible for managing health risk in the organisation (predominantly musculoskeletal and psychosocial risks) and promoting wellbeing opportunities across the workforce, through health promotion programmes. All of the employees who took part in the research were aware of the researcher's job role, though most were not directly known to the researcher. The role of the researcher in the organisation meant that there was a risk of reflexivity bias in the interviews; however, the ease of access to the workplace to carry out interviews a pragmatic decision was taken to proceed despite this potential limitation. Permission was granted by RMG for the researcher to access employees to participate in the study. A letter from Dr Shaun Davis, director of safety, health, wellbeing and sustainability to confirm authorisation, is enclosed in the appendices (Appendix 5).

7.2.3 Ethics

The study proposal was reviewed and received a favourable ethical opinion from the research ethics sub-committee of the division of psychiatry and applied psychology, School of Medicine, University of Nottingham (Appendix 6). Participants signed and returned a participant consent form (Appendix 3), and were reminded prior to the interview that they could

withdraw at any time during the interview and up to 2 weeks afterwards. Participants were informed of the confidentiality, and anonymity, of the interviews, and on the security and storage of their data (Appendix 2). Participants were reminded that they did not have to answer all questions posed during the interview and could ask the interviewer a question at any time.

7.2.4 Recruitment

A sample size of around 20 participants was agreed with the organisation, however this would be dependent on interest from employees in the organisation to take part. This sample size was deemed suitable in light of previous qualitative research. For instance, a thematic analysis of coding quality of life for multiple sclerosis patients found that thematic saturation was reached at 12 interviews. Further interviews were beneficial for refining the codes, but no new themes emerged (Ando, Cousin, & Young, 2014). In a review of qualitative researchers' approaches to sample size, it was found that the appropriate sample size depends on a wide variety of factors, but in a homogenous group, 12 interviews may be an appropriate number to reach saturation (Guest, Bunce, & Johnson, 2006). Therefore, thematic saturation may be reached before the completion of the planned 20 interviews.

Permission was granted by the organisation and an initial briefing provided to the business 'Health Governance Board', which included senior operational managers, members of human resources, and members of the trade unions. The board was supportive of the approach and the trade unions raised no challenges. An invitation to participate was sent, via a weekly health-related newsletter email, to 290 inboxes (Appendix 1). Typically, the newsletter was

further cascaded across teams in the organisation, with an estimated reach of some 5,000 individuals. The main purpose of the newsletter 'Wellbeing Weekly' was to highlight a topical health or wellbeing initiative or issue and provide a brief overview of the topic and sources of support. Access to communication channels with further reach in the organisation was not possible and therefore the invitation went to a relatively homogenous sample of management grades in the organisation. Communication and access to lower SES groups in the organisation was challenging due to the operational demands of their roles and limited email access and therefore it was decided to focus on higher SES employees as a sample of convenience. Sixteen individuals volunteered to take part in the study within a week of the Wellbeing Weekly email containing the information on the study and advert for participants. Each participant was sent a follow-up email containing the participant information sheet and the participant consent form. Interviews were arranged via email and an appointment was added to the participants' work calendar as a reminder of the agreed time and date. Only one individual who volunteered to take part in the study did not respond to follow up emails to schedule the interview.

7.2.5 Data collection

Interviews were arranged over a two-week period in March 2017. The interviews were scheduled into participants' diaries with the researcher's phone number, so they knew who was calling. The interviews were recorded using a phone-based 'RecorderGear' Bluetooth wireless mobile phone call and voice recorder (Model PR2000) which enabled interviews to be directly saved via integrated USB onto a computer for transcription. Each employee was

informed both prior to, and at the start of the interview, that the conversation was being recorded.

The first section of the interview involved the collection of demographic information, which included gender (recorded in the field notes rather than asked of the participant), age, highest academic qualification held, whether they lived with anyone (to establish number of dependants), whether they consider themselves a healthy weight, and a brief description of their role at RMG. The second section of questions concerned the participants' knowledge of healthy eating. A series of questions relating to fruit and vegetable consumption were posed: "Have you heard of the Government recommendations to eat 5 or more fruit and vegetables each day?", "Do you find it easy to decide what a portion of fruit and vegetables is according to intake guidelines?" and "Where have you gained information on portion sizes?" General knowledge about healthy eating was assessed through "What would you say a healthy, well-balanced diet looks like?" and "Would you say that you eat a healthy, well-balanced diet?" Findings from the quantitative analysis suggested that both cost of food influencing purchasing behaviour and eating past the point of feeling full were both influenced by demographic and socioeconomic factors; participants were asked to what extent these two variables influenced them and why. Participants were also asked whether their dependants (if they said they had children) influenced their eating behaviours. The final area of discussion considered whether participants felt it was easy to eat healthily when they had a full, or part, time (busy) job and what their employers could do to help employees eat more healthily. Participants were asked to consider whether the workplace did have a role to play in influencing

employees health behaviours, and what more employers and Government could do to encourage people to make healthy choices.

The interview questions were used as a guide to aid the flow of the conversations, but where a topic sparked a particular interest or area of discussion this was allowed to continue, and follow-up and clarification questions asked.

7.2.6 Data analysis

Interviews were conducted via telephone and the recorded audio files were transcribed by a professional transcription service. The transcripts were then checked against the recordings to remove identifying features and to check accuracy. The qualitative data analysis software NVivo 11 (QSR International) was used for the thematic analysis (Braun & Clarke, 2006) of the anonymised transcripts. The aim of the analysis in this chapter was to give a broad overview of the data and therefore thematic analysis was used; thematic analysis "is a method for identifying, analysing and reporting patterns (themes) within data" (Braun & Clarke, 2013, p. 6). Braun and Clarke's six-step process was used to conduct the thematic analysis. Phase 1 involved the reading and re-reading of transcripts to search for meanings and patterns in the data. Phase 2 generated the initial list of ideas in the data and areas of interest which led to the production of codes: "Codes identify a feature of the data (semantic content of latent) that appears interesting to the analyst" (Braun & Clarke, 2006, p. 18). Phase 3 is the refinement of the identified codes into broader themes and sub-themes. Phase 4 involved the further refinement of themes to ensure that the coded data fit the identified theme forming a coherent pattern, in addition to an overall review of the entire data set to ensure that the themes accurately

reflected the data set as a whole. Phase 5 involved "'define and refine' – identifying the 'essence' of what each theme is about (as well as the themes overall), and determining what aspect of the data each theme capture" (Braun & Clarke, 2006, p. 22). Phase 6 is the production of the report and the selection of quotes from participants to illustrate the themes.

In addition to the use of Baum and Clarke's (2006) six step thematic analysis process, the research aims of the overall thesis, and therefore the limitations of the extant literature discussed in Chapter Two, informed the analysis. A mixture of deductive and inductive analysis was employed in the current study. The majority of themes, and sub-themes, were derived from the data rather than a-priori. However, some of the questions asked on specific eating behaviours produced themes similar to that of the questions asked. The research questions addressed in the quantitative analyses contained in this thesis enabled the identification of deductive themes, whereas the research question solely investigated in the current chapter, enabled inductive themes to arise from the data. The research questions addressed in the quantitative analysis were: (2) Is SES, as measured by education, salary band and grade, associated with eating behaviours? (3) Is SES as measured by education, salary band, and grade, associated with obesity (measured by BMI)? (4) Are demographic factors associated with eating behaviours? (5) Do eating behaviours differ between age groups? and (6) Do eating behaviours differ between weight (BMI) groupings?. The final research question was only addressed in the qualitative analysis – (7) What are the perceived barriers and facilitators to healthy eating at work? It was important to incorporate all the research questions in the designing of the semi-structured questions in order to

ensure the limitations identified in the literature review in Chapter 2 were discussed.

Interviews are a common method of data collection in qualitative research, however there are competing schools of thought as to how to analyse the generated data. 'Quasi-statistical approaches' use phrases or word frequencies to determine the importance of the content. 'Thematic coding' is a generic approach not always linked to a theoretical perspective, the 'grounded theory approach' is often used for the development of theories from the data based on the researcher's interpretation of the meaning of the text, and 'discourse analysis' considers the language used in an interview and the underlying theoretical background (Robson, 2011). Given the nature of the topic being studied in the current chapter, and the desire to allow themes to be deduced from the data, thematic analysis provides the most appropriate form of analysis.

Telephone interviews enable researchers to benefit from the advantages of interview-based surveys, with the reduction in the time, cost, and logistics of running face-to-face interviews (Robson, 2011). The researcher carrying out the interview has a direct impact on the quality of the data generated through their skill, personality, and experience, for example, and through socioeconomic aspects such as class, ethnic origin, age, gender, and whether the interviewee knows the interviewer – these aspects may influence the extent to which the participant co-operates or the potential bias that may result (Robson, 2011). Tracy (2010) argues that the abundance of methods for the analysis of qualitative research illustrates how complex the concept is, but as long as basic principles are followed, high quality research can be produced:

"(a) worthy topic, (b) rich rigor, (c) sincerity, (d) credibility, (e) resonance, (f) significant contribution, (g) ethics and (h) meaningful coherence" (p. 839).

Whittemore, Chase, and Mandle (2001) set out four criteria to consider when evaluating qualitative research: Credibility, authenticity, criticality, and integrity. A study can be argued to be *credible* if it truly reflects the experiences of participants and *authentic* if it is conducted with a reflective awareness of the researcher's preconceptions. The criteria of *criticality* and *integrity* relate to the potential for many different interpretations that can be made, dependant on the assumptions and knowledge background of the investigators. The current study meets these criteria as it was conceived from quantitative analysis in an under-researched field – most studies on eating behaviours come from community samples rather than from the workplace and, therefore, the research presented a unique opportunity to gather data from the workplace. While the researcher was known to participants through her work in promoting wellbeing in the organisation, there was a risk that participants would offer answers with a positive bias towards healthy behaviours. In order to mitigate this risk, the rationale and objectives of the study were clearly explained to participants to ensure they answered honestly to help further the research in the area. In order to test the validity and flow of the question set, two pilot interviews were held; no changes were made to the question set and format as a result.

Braun and Clarke argue that subjectivity bias, the biases of the researcher that arise from their experiences and identities, should not be eliminated from research but should be effectively contextualised so that the reader is aware of the perspective context (2013). The current researcher, JG,

is a white, middle class, female who has worked in health promotion for over ten years and through her role as head of occupational health and wellbeing appeared in a number of newsletters, internal videos, articles and external media talking about wellbeing in the workplace. In addition to the concept of personal bias, subjectivity bias may also be present in the context of the research (where the participants come from or work), reactions of the participants to the researcher (prior knowledge of the job role, desire to answer the questions in a way they perceive as helpful or correct to the researcher) or grounded in their internal view of the world or unconscious biases (Braun & Clarke, 2007).

Initial thematic analysis was carried out by the researcher who conducted the data collection, and discussion between the researcher and her primary supervisor helped to clarify themes to ensure the integrity of the approach and that the potential subjectivity biases did not compromise the analysis. The primary supervisor reviewed the identified themes independently to ensure that these reflected the textual themes, rather than potential biases of the researcher. A further two reviews of the data, ensuring reflexive and reflective appraisal of the data, were carried out by the researcher to refine the themes and sub-themes down to the themes presented in the results section of this chapter.

7.3 Results

A total of 16 employees agreed to be interviews and 15 took part. All 15 employees seemed relaxed throughout the interviews, and only one took part in the interview outside of the workplace, which may have meant there were background distractions. Carrying the interviews out over the telephone

ensured that employees were interviewed from a range of geographical locations in the UK. The mean interview length of the 15 interviews was 23 minutes and 42 seconds. With the exception of one interview, all participants were able to allocate time in their working day and found a quiet place to take part in the interview. One individual's job role meant she was unable to take part in the interview during the working day and a time was arranged at a convenient time at the weekend.

7.3.1 Participant characteristics

The participants' characteristics are outlined in Table 7.1. Participants ranged from the age group 18-24 to 45-54, with the majority of participants over the age of 35 (which aligns to the overall demographic make-up of RMG's workforce). Seven males and eight females took part in the study with females overrepresented as a proportion of the total workforce (87% of RMG's workforce is male). Six of the participants had no dependants and eight believed they were overweight. Data are not available to assess the educational obtainments of the RMG workforce as a whole, however the participants of this study represent an educated sample of employees with nine employees having a School Certificate, O Level, GCSE, A Level, SCE Higher, or National Diploma/Certificate as their highest academic achievement and six educated to degree level or higher. Grade was derived from the employee description of their role and researcher knowledge of the business, and an estimate of income assigned to each role. Mean organisational salary and grade data could not be obtained for use in the current study as a basis for comparison, however the current sample represent a higher paid, and more senior, sample of the workforce.

Table 7.1

Socioeconomic, demographic and personal factors of participants.

Sample Characteristics	Interviews
Gender	
Male	7
Female	8
Age	
18 to 24	2
25 to 34	1
35 to 44	6
45 to 54	6
55 to 64	0
65 and over	0
Number of Dependants	
0	6
1-2	8
≥3	1
BMI	
Healthy Weight	7
Overweight	8
Obese	0
Socioeconomic Status	
Education	
No academic qualification	0

	School Certificate, O Level, GCSE, A Level, SCE	9
	Higher, National Diploma/Certificate	
	Undergraduate Degree, Postgraduate Degree	6
Salary Band		
	£10,001-£30,000	0
	£30,001-£55,000	10
	£55,001-£80,000	4
	£80,001 and over	1
Grade		
	Manager	10
	Senior Manager	4
	Director	1
Cost of food influence purchase?		
	Yes	5
	No	10
Eat past feeling full?		
	Yes	6
	No	9
Recent Weight Loss		
	Yes	6
	Unknown	9
Easy to eat a healthy, well-balanced diet?		
	Yes	2
	No	13
Easy to identify a portion of fruit and vegetables?		

Yes	7
No	8

Additional information was recorded in the field notes including participants who often ate past the point of feeling full ($n = 6$), the cost of food influenced their purchasing behaviours ($n = 5$), it is easy to identify a portion of fruit and vegetables ($n = 7$), and eating a healthy, well-balanced diet when working is easy ($n = 2$). Six of the participants had experienced recent weight loss and spoke in detail about how this was achieved in the interviews.

7.3.2 Overview of findings

Table 7.2 presents an overview of the themes and sub-themes identified through thematic analysis of the qualitative data.

Table 7.2

Themes identified as barriers and facilitators to healthy eating in a workplace setting.

Main Theme	Sub-theme	Description	Participants answered	Number of references
Knowledge	Ease of identifying a portion of Fruit and Vegetables	Participant's opinion on the interpretation of the Government's '5-a-Day' message.	15	25
	Individual definition of 'Healthy Eating'	Participant's perception of what a healthy day or meal looks like to them.	15	22
	Source of knowledge on healthy eating	Knowledge gained from school, the media or the workplace that has led to their perception of healthy eating.	6	7
Behaviour	Cost of food influencing purchasing behaviours.	The extent to which participants felt money influenced what they ate.	14	25

	Cost of food at work influencing purchasing behaviours.	The cost of food in the workplace canteen or vending machine may be a barrier or facilitator to healthy eating.	7	8
	Children influencing purchasing behaviours.	The extent to which having dependants may influence foods purchased and eaten.	9	16
	Habit of eating past the point of feeling full.	The frequency of over-eating and reasons behind the behaviour.	13	18
	Motivation to eat a healthy, well-balanced diet.	The intrinsic and extrinsic motivations of individuals that influence the desire to eat healthily.	14	23
Access	Access to healthy foods in the workplace.	The availability and choice of healthy choices in the workplace canteen and vending machines.	14	39
	Preparing food in advance.	Planning and shopping for meals in advance outside of work and preparing a packed lunch or snacks to bring to work.	10	19
	Access to exercise facilities and opportunities at work	Access to gyms and flexibility in taking the time to exercise in the working day.	7	11

Workplace Culture	Job roles requiring long hours and frequent travel.	Some roles involve long days, considerable commuting and stays in hotels away from home.	10	21
	Taking a break at lunchtime.	Lunch or a mid-day break taken away from the desk.	11	29
	Challenge of workplace temptation.	Colleagues bringing cakes to share at work or biscuits in meetings.	4	4
	Leadership behaviours.	Senior managers and directors setting the example for the teams on healthy eating and breaks.	3	3
Responsibility	Employer has a responsibility to promote good health.	Employer duty of care to employees to facilitate good health	15	39
	Government could do more to promote and encourage good health.	Government subsidies, promotions and responsibility to improve health.	15	32

Table 7.2 details the five main themes generated through thematic analysis from which participants' perceptions of the barriers and facilitators to healthy eating in the workplace could be identified:

1. Knowledge

2. Behaviour

3. Access

4. Workplace culture

5. Responsibility

7.3.2.1 Knowledge

7.3.2.1.1 Ease of identifying a portion of fruit and vegetables

There were mixed views on identifying a portion of fruit or vegetables. All participants were familiar with the UK Government's '5-a-day' promotion. It is worth noting that there was extensive media coverage in the weeks prior to the majority of the interviews on a recommendation to eat 10 portions of fruit and vegetables a day, and some of the participants alluded to this (BBC, 2017). Seven participants said that it was easy to identify a portion and eight said it was difficult. No trends were observed for the distribution of responses in relation to SES or demographic or personal factors.

There was consensus among participants that it is easier to identify a portion of fruit than one of vegetables:

> *I think it can be quite difficult to understand because it's easy I think with fruit and things like that because that's an apple, that's a banana, that's a portion. But I think it's more difficult with vegetables because is it a spoonful of something and how do you work that out?*

Depending on what type of fruit and vegetable it is, I would probably struggle to say what a portion of strawberries was, or a portion of blueberries. Obviously a portion of apple is an apple itself I would suggest.

Some participants had more of an understanding of portion size. Six of the participants who reported weight loss believed that knowledge had been gained through dieting or striving to eat a healthy diet:

I think it's relatively simple once you start looking, but I found the way of doing that was to look at what my diet was, look at what the packaging guidance was, etc., and then try and work that out, but also take some of the reference material and almost weigh it out and say, "Right, that's a portion."

7.3.2.1.2 Individual definition of 'Healthy Eating'

Most participants felt that healthy eating was a matter of balancing nutritional components in their diets:

So I think you've got to have a balance of protein, vegetables and some carbohydrates, and limit the amount of fat and sugar…

Some of the participants who had recently lost weight described a balanced diet in the context of the diet they were on. One participant described her experience on the Slimming World diet:

[I] never used to really eat as much fruit and veg as I do now – all fruit and veg is what they call free food, so you can have as much of that as you want a day so it encourages you to eat more of that for snacking and stuff to fill you up.

7.3.2.1.3 Source of knowledge on healthy eating

All the participants described what healthy eating meant to them. Their knowledge of healthy foods had come from a variety of sources. Media was the most common source of healthy eating knowledge, with information from the workplace and from medical professionals, and education from diet plans also referenced.

> *It's probably come from the television, from the media, probably a little bit, probably when my children were younger, and when I was pregnant you get those kind of things highlighted to you, don't you?*
> *I know, people talk about diets all the time, so I look on the internet. But it does tend to be mainly the media, so the press, magazines and news reports quite frankly, you know, when you get experts talking on TV. Also I just think we're lucky, we work in an organisation where it is quite easy to find that information.*

Some participants did not feel they had enough knowledge of healthy eating and did not believe that it was easy to find:

> *I don't think enough of it is really well advertised for people to know exactly what they need to eat, so how many a day and what's healthy.*

7.3.2.2 Behaviour

7.3.2.2.1 Cost of food influencing purchasing behaviours

Five of the participants reported that cost influenced their purchasing behaviours and 10 said that it did not; this was not related to the grade or income levels of the participants. Some participants felt that ready meals and pre-packaged foods were often more expensive than buying the ingredients to make a healthy meal:

I would say my husband and I, we always try and buy good quality ingredients; so we would try and buy organic and we would try and buy free range things, so we're not cost driven, and in actual fact what would put me off some of the ready meals is that they are quite pricey, so actually to make something up is actually more cost effective most of the time, even if you buy a better quality ingredient, it's still more cost effective to make it yourself than to buy a ready meal to put in the microwave or the oven.

Some of the participants purchasing behaviours were driven primarily by health and therefore they were prepared to spend more on products if they believed them to be healthier.

I'm prepared to pay more for food if I think it's healthier.

Three of the participants alluded to organic foods and a belief that these were healthier – two of them bought them and the other felt that the cost was excessive:

I don't tend to buy organic sort of fruit and vegetables just mainly because of the price, but I still tend to buy quite a lot of fruit and vegetables even though it's more expensive than say like premade dinners and stuff.

The majority of participants took a pragmatic view to cost. While they were not prohibited from buying certain foods because of cost they were keen to achieve value for money and not spend excessively on food when they did not need to.

There's an element of you eat what you can afford, but generally speaking you don't go for the top of the range because you don't need to.

7.3.2.2.2 Cost of food at work (canteen) influencing purchasing behaviours

Some participants felt that the cost of food at work was prohibitive to healthy eating. Access to healthy foods in workplace canteen facilities was limited and generally cost more.

I think the prices are expensive, comparatively expensive. You can go to the pub and eat and get a drink for a lot less than what you pay for at some of our sites at the moment. So that can influence whether I'll have a full meal there.

The cost issue was less because of affordability and more to do with value for money

I am a little bit tight, you know, so when I'm in the canteen and I've got a choice of a cheese sandwich for £1.60 or a more healthy sandwich for £2.50, I have to admit it does impact, it does make a difference.

Participants felt that access to fruit at work was limited and overpriced. Many commented it was cheaper to purchase a chocolate bar than it was to buy an apple.

They've got fruit but the fruit's really expensive what they want to charge! It's like 70p for an apple or a banana! And I think 70p, it's ridiculous!

7.3.2.2.3 Children influence purchasing behaviours

Nine of the participants had children living at home with them. There were differing reports on the influence of children on purchasing behaviours. For some parents they avoided shopping with their children to prevent 'pester power' influencing the content of their basket.

No, I do all my shopping online because then you don't get led astray. A top tip somebody said to me once, if you work full time and you've got children you're wasting your time if you go to the supermarket, and I completely agree.

Other parents cooked separately for their children as they had different tastes in food or ate at different times.

She doesn't influence what we eat. So I would say quite often she has a different meal from what we have, and sometimes my husband and I disagree about this, but I'd prefer she eats the same things as us...

One parent acknowledged that eating separately often led to him eating the children's leftover food.

So it's the old age thing, you don't like to see waste and the fact that you feed the kids earlier and you're hungry because you're waiting for your tea, if there's anything left on their plates, that tends to disappear.

Other parents commented that their children were a positive influence on them in terms of diet because of food education at school.

The kids are really good actually, so the kids come home from school and I think their education at school is pretty good around this, so you know, they will – they'll say themselves, you know, dad, you know, you haven't had any fruit today dad. So I do get a bit of guilt from my kids.

7.3.2.2.4 Habit of eating past the point of feeling full

Only six of the participants stated they often eat past the point of feeling full. However, many of the participants who had recently lost weight, or who were participating in a weight loss programme, mentioned their desire to lose weight had made them aware of regulating their portion size and they attributed their past weight to eating past the point of feeling full.

The majority of participants commented that the tendency to eat past the point of feeling full was influenced by their up-bringing and parental encouragement to clear the content of their plates.

I think definitely because you were brought up to clear your plate and not waste food.

One participant noted that the size of plates had changed over the course of her life and suggested that bigger plates resulted in a bigger portion size.

If I go to my mum's house, her dinner plates are probably the same size as my side plates. So if I have dinner on my dinner plates, they're absolutely huge, and it looks pretty heavily laden.

A couple of participants said that they only ate past the point of feeling full in company. One gave the example of eating extra calories at work.

When I'm socialising I have little willpower and when it's a treat then I just think I should treat myself and that's often when I've over ate.

Participants with children commented that often their busy lifestyle led to overeating as they were always rushing from activity to activity and did not take the time to pause and recognise when they were full.

So everything is in a rush and we try and do this as often as we can where we sit down at the family table, but all too often, it's a rush mentality where you're taking the kids to cubs or some other activity or you're going out or you've got something else on, you're rushing it down. So all too often you're not giving yourself time to think that you're full or for your brain to register the fact that you're full.

7.3.2.2.5 Motivation to eat a healthy, well-balanced diet

The majority of participants (aged 35 and over) commented that age and the risk of ill-health was a significant factor in their motivation to eat a better diet and live a healthier lifestyle.

I think it's more sort of the health risks you hear. Like for example I've heard that – if you gain a lot of weight around your stomach area in particular there is a higher risk of diabetes and that tends to be where I gain weight a lot.

The two youngest participants (both female) however were less motivated by health concerns and more about appearance:

I don't think it was health reasons, it was probably pure just, like, vanity.

For me it's probably been societal pressure to look a certain way. And that I always feel healthier. I think probably the thing that started it is after my first year at uni I looked back at some pictures of myself and realised how unhealthy I'd become.

7.3.2.3 Access

7.3.2.3.1 Access to healthy foods in the workplace

Most of the participants associated access to healthy foods at work with access to a canteen. This was seen by many as a hindrance to healthy eating, with limited choice, healthy foods costing more (where they were available) and vending machines not stocking healthy options. However, some participants acknowledged that the canteens at their offices were trying to encourage employees to make healthy choices and some healthy options were available.

> *I think when I go to the canteen, what I see is I see lots of sugary snacks, I see lots of unhealthy cooked options and there might be some salad but it's not pleasant looking and it doesn't give me any want to eat it.*

> *I think we tend to be relatively good for sandwich choice but they tend to be quite heavy fat fillings.*

It was acknowledged that availability of healthy options varied depending on which canteen you were visiting and whether the canteen had undergone modernisation:

> *I think in some of the ones, some of the restaurants that have had the refurb, certainly at the breakfast they do some really good stuff now. As well as having the breakfasts they also have these, kind of like, the fruits don't they, and the yoghurts, where you help yourself. So I think that's quite good. But that's few and far between. But now, for most of the sites it's so hard to be healthy, and it's an expensive inconvenient choice.*

Locating healthy food choices was not always easy whether that be through a lack or promotion or through choices not being easy to find:

I would like to see more options in terms of salad bars and soups. Soup is a great thing. There are some really good sites that are really renowned for their soup and they don't push that enough.

Usually you can hunt out a piece of fruit if you need it – you have to fend past the crisps and the chocolate, and there might be a bowl with a couple of apples, an orange and a banana in, if you're lucky.

A couple of the participants acknowledged the challenge in the business of supporting the nutritional needs of a diverse workforce. Some employees who access canteen facilities may be doing manual work, on their feet for their working day, and others may spend their day sedentary and therefore energy intake requirements will be significantly different.

You've got a balance of workforce where you have got people doing a very manual, physical job and they do – that's their necessary fuel, but actually for us that's been sitting on our backsides for most of the day – it's very easy when you're tempted to get half a chicken and then, you know, a big side order with it of whatever's going and that's not necessarily the healthy option.

If you're going to use a company like [catering company] then they need to be incentivised completely differently – they need properly subsidising, not to be making a profit but providing a service, because we're fuelling our people in the same ways we're fuelling our vans, and if we put crappy diesel you know, with no additives in it, into our vans, you know, the engines would wear out much sooner, and yet we're prepared to allow our people to eat rubbish because it's what [catering company] can produce cheaply.

Some employees accessed the vending machines when no canteen was available or time was limited to go out and purchase a meal. Those who wanted to snack healthily tried to avoid using the machines.

If I go to some of my sites where there is no staff restaurant, there's vending machines, and in those vending machines is crisps and chocolate, and there might be a token gesture [breakfast biscuit], which is not, like, that's not even healthy is it? You know, you look at the ingredients in those and they're worse than the chocolate bars.

7.3.2.3.2 Preparing food in advance

Most participants believed that healthy eating was best achieved through being organised and preparing food in advance.

When I'm office-based, I can manage it quite well because I limit what I have in the house and what I bring to work, my own lunch and stuff like that and my own in between snacks or anything, I bring it all with me so I'm not tempted to eat the wrong things.

If I plan it properly, and you know, make a breakfast, so I'd do a spinach omelette and I have that ready in a beaker that I can microwave at work round about 8/9 o'clock and do a lunch whether it be a soup, a nutritious soup and some fruit, I will feel better for doing that, not just in my head but physically feel better.

Preparation was important for some participants outside of work to make it easier to eat a healthy diet.

I do plan my meals well because I do like to eat quite decent quality food, so I need to plan exactly what I'm buying to keep the cost down but to sort of achieve that quality as well.

So I think the problem, personal problem I've got is it's a lack of

planning in my diet, certainly when I'm up early and travelling away.

Time was cited as the main barrier to being able to prepare healthy

foods in advance or eat well during the working week.

But it's the actual control of it. So this week, I got home at whatever

time, 8 o'clock one night and I was travelling back down again at 6/7

o'clock in the morning, I didn't have the time then to prepare what I

would've eaten the following day.

7.3.2.3.3 Access to exercise facilities/opportunities

Seven of the participants talked about access to exercise facilities or

opportunities as an important way of employers supporting healthy behaviours

at work. There was consensus that healthy eating and exercise should be

combined for a healthy lifestyle

I just think it's always, you know, combining food and exercise at the

same time and making sure that people see that there are greater

benefits when the two go hand in hand.

Employers can support their employees by encouraging (and

promoting) activity during the day or through subsidised or accessible exercise

facilities.

I think we could do more to encourage us to be active and be less

sedentary at our desks, even if it's take ten minutes in your lunch – take

a lunch break because I'm terrible for just sitting at my desk to eat my

lunch, so take ten minutes and walk round the building or something…

One participant suggested looking at the workplace infrastructure in

order to improve health:

I'd probably say just encourage people to exercise more, I think standing desks would be a great idea, obviously I know it's difficult to change all the desks and all the offices, but even just the option to have them.

7.3.2.4 Workplace culture

7.3.2.4.1 Job roles requiring long hours and travel

For many of the employees interviewed in this study, their job roles require significant travel and this has an impact on their diets.

I think when you're busy, you tend to grab and snack or things that are unhealthy rather than take something that's healthy, so I'd have always had a packet of crisps mid-morning or a bar of chocolate or a biscuit, probably a biscuit or two biscuits, and then feel rubbish because it probably pushed my sugars up and down really quickly.

I work quite long hours, so I would end up staying here quite late and then you get hungry and you feel you need something sugary, so you would go and have a chocolate bar because you feel you need to have something to treat yourself because you're staying here and psychologically you think I need a treat…

Travelling and staying away from home also acted as barriers to healthy eating:

If you're travelling for long periods of time, there's a boredom element and I know I'm a terrible one for eating when I'm bored. So not necessarily because I need any kind of nutrition!

I can tell, you know, this week I've stayed away a couple of nights and you know, I've not eaten at the right times and probably the right food

because I've not prepared it myself. So at the moment, you're feeling quite lethargic and quite clear that I need to go out for a run and just get some endorphins going around my body.

For an employee who spent the majority of her time at work travelling, the days when she was able to work from home facilitated healthy eating:

But on the days where I am working from home, I find it a lot easier to sort of make a smoothie and a balanced meal and have my water and things. So I think when I'm busier I find it harder to really sort of have that balanced diet.

One of the participants regularly worked in the same office and worked standard hours. She found that work helped her to maintain a healthy diet.

I find it harder to stick to healthy eating at weekends, because I think when I'm at work – it's become such a routine and my brain is almost divided up by those little snacking intervals that I don't really – there's nothing that I actually crave while I'm at work, it's kind of built into my day that that's what I do, that's when I eat. So I find it much easier to stick to it at work.

7.3.2.4.2 Taking a break at lunchtime

A common theme expressed in the interviews was for employees to work through lunchtime, sometimes skipping food, or eat at their desks. However, most of the participants who commented on this did not feel that employees should be prevented from eating at their desks, rather they should be given the freedom to choose whilst being encouraged to benefit from a break.

I don't usually tend to leave my desk at lunchtime, I just get what I want, make it and come back and sit at my desk and have it.

I mean there's clearly things that you could do, we could turn round and make policy decisions that, you know, you do not have meetings over lunchtime and you will break and you will move from your desk and we could enforce it. From a personal point of view I'd rather they didn't because whilst I know there's benefit there in that, the only reason I'm working through my lunch is because I've got an awful lot to do and I don't want to spend my evening doing it.

Meetings overrunning or running through lunchtime was another aspect of workplace culture that made healthy eating more challenging.

I've been in meetings where they just keep running on and then by the time they're finished the canteen is closed and you think how am I going to get something to eat? And before you know it, you're at a vending machine looking at a packet of crisps and a chocolate bar. That again comes down to a bit of self-discipline and then either we keep the meetings on track and make sure that we have half an hour or the meeting will overrun. But always saying we will have that half an hour. I think that there's many benefits to having that, not just healthy eating and the health benefits that way, but also with social networking and the benefits that come out of getting to know your colleagues better. And I think also the mental break from work is beneficial.

Even if an employee had planned to have a lunch break, this could be overruled by a colleague eager to schedule a meeting:

I will quite often find that people would book conference calls in at twelve or one o'clock because they know the morning meetings have finished or the afternoons have finished or you're going from one venue to another so you're likely to have some downtime [and therefore miss lunch].

Participants reported differing experiences in their different areas of the business, with some areas having differing cultural norms influencing lunch breaks:

When I used to work in [location] as a junior manager, it would be more of a case that you're away from your desk for an hour because you've gone down to the gym and you know, you've done your exercise and that forces you to have a healthy option afterwards and you felt a lot better for it. And you didn't work any more hours because you took the dinner break but it really does do the trick. Could I ever think of a case if I was working in [new location] where I'd come out of a meeting, I've got an hour and a half to my next meeting, I'll just go to the gym. I won't. I'll just clear my inbox.

Some offices however set the example and don't allow employees to eat at their desks, encouraging them to take a proper lunch break.

I think they can help because if you think about somewhere like [location], there are strict rules where you can't eat at your desk, like, proper meals, so you can have snacks and stuff, but you can't have anything like a sandwich or anything that you need cutlery for at your desk, and they're quite strict on that, so everybody has half an hour for

their lunch, and the canteen is really full, and everybody always has

that otherwise if you don't have that then you don't get your lunch.

7.3.2.4.3 Challenge of workplace temptation

Four of the participants spoke of the challenge of temptation in the workplace; mostly in meetings when someone has brought some biscuits or sugary snacks in to share.

> *I don't tend to overeat when I'm at home, it'll be at work when I've had*
>
> *my lunch and someone's brought round a cake because it's their*
>
> *birthday and I'm like oh yeah, lovely!*
>
> *– before I was in an office with all of my team and everyone just kind of*
>
> *brought in chocolates all the time! So with that, things like that and*
>
> *people bringing stuff they've made at home, it kind of encourages you*
>
> *to eat not as healthily, as opposed to say – I think I personally eat*
>
> *healthy when I'm on my own at work than I do if I was with other*
>
> *people.*

The issue was even more of a challenge for employees whose jobs required them to meet with external organisations:

> *I've been in a few supplier meetings now where they bring out biscuits*
>
> *and then they put on a buffet lunch and the one the other day – they had*
>
> *nice sandwiches but then they had pork pies and sausage rolls and I*
>
> *was like oh my goodness, trying to avoid the pastries, and then cakes!*

7.3.2.4.4 Leadership behaviours

Three senior participants, in terms of grade (one director level and two senior management level), commented on leadership behaviours and acknowledged that more could be done to model healthy behaviours and

support employees to make healthy choices. These employees were in the 45-54 age category.

> *[Leadership]– that in Royal Mail would be the trick, it would be to start to say you know, we really expect our senior leadership population not just to be healthy, to behave in healthy ways, to eat healthily, to exercise, and perhaps to work shorter hours and to make use of gym facilities when they're there to do so very visible, even if you prefer to join a gym near your home actually go to one at work, because seeing the boss in you know Lycra, you know, doing something, is the kind of thing that makes people know that it's appropriate to do that early in the morning, or at your lunch break or whatever. That's the modelling behaviour, is the way that you change people, change their attitudes.*

The behaviours set by senior leaders in meetings often set the tone when attendees came to lead their own team meetings:

> *Even when we're in meetings, it's just the way it is –, it's as a senior member – we've got a meeting, a full packed agenda. People have travelled an hour or more to get to the meeting and then we'll say right, we'll have a quick 10 minutes to get a sandwich and then we'll pop back in the room and do your emails and that's just completely the wrong behaviours. That message then gets down to you as a leader and then your team as a team that are led by you, again showing the wrong leadership behaviours.*

7.3.2.5 Responsibility

7.3.2.5.1 Employer has a responsibility to promote good health

All the participants in the study felt that the employer had a responsibility to encourage the take up of healthy behaviours at work and make it easier for employees. Participants saw this through the financial eyes of an employer, through cutting the costs of sickness absence, as well as through the potential of improved employee engagement and individual health benefits for employees.

I think we have a role to play as part of our duty of care for individuals because we have to take everything into consideration. We look after their well-being whilst at work. It's in our remit to promote a healthy lifestyle to maintain the longevity of their well-being throughout their roles.

…how many days do we lose by people being unwell because – even the fact, again, since I've lost weight and I've eaten healthier, I've not had as many colds, I've not had as many stomach problems and discomfort. All those things have an effect on my general wellbeing and health is so much better in the last year than it's been I'd say for maybe the past 10 years.

Some employees felt that RMG made access to information on healthy eating easy for employees:

I just think we're lucky, we work in an organisation where it is quite easy to find that information.

Others felt that investing in healthy eating advice and making it accessible would facilitate healthy eating:

Its investment, it's as simple as saying you know, you invest, you decide what strategy you want for your people, you explain to them repeatedly

why it's important to eat healthily – you make it easy, you make it

attractive for them. And part of the way that you make it attractive for

them is you actually make it the cheapest option and the most

accessible option.

One participant added that there was a line between giving people

information and freedom of choice:

I think the employer has got a responsibility to keep their employees

healthy, or at least encourage them to be healthy. Obviously I don't

think they should be too invasive with it, but I do think they have a

responsibility to maintain a healthy employee base.

7.3.2.5.2 Government could do more to promote and encourage healthy

eating

All participants felt that the Government had a role to play in

encouraging positive health behaviours:

I think the Government should have sort of more of a proactive role in

maybe like television adverts and things like that in terms of campaigns

around healthy eating, diabetes, all these sort of health issues, because

you don't necessarily tend to see it unless say for example you go to the

doctors and see a random leaflet on something.

I do think the Government does have a role to play, again probably for

the similar one for the workplace, where you want to reduce illnesses

that can be avoided because of obesity and things like that. And I do

think it's really interesting how – there is a fitness movement sweeping

at the moment, and a lot of healthy eating stuff.

There were mixed views in the interviews as to how to incentivise health behaviours. Some felt that financial incentives such as a sugar tax on fizzy drinks would be most beneficial in changing health behaviours:

It's always about money, really, stuff like that that actually affects people personally in terms of their finances and stuff, I think that works better than putting a leaflet out saying we should be eating five pieces of fruit, or whatever.

Whereas others felt that incentives should be proactive in the form of discounted access to activities or subsidised nutrition schemes:

There are certain incentives, certainly for the clinically obese where they get free gym membership or free swimming. Whether or not that can be more incentivised or even the fruit side of things, maybe a taxation as they've talked about for sugary drinks. So if they're going to take that, should they put a subsidy against certain other foods, you know, fruit and veg? Take it back to when I was a kid with milk, kids got free milk. I think they still do up to a certain age, get free milk at school. So why wouldn't that be the case of fruit and veg?

7.4 Discussion of findings

The current chapter considered further the findings of the quantitative analysis carried out in previous chapters, and barriers and facilitators to healthy eating in the workplace. Thematic analysis identified five main themes, each containing multiple sub-themes: (1) Knowledge; sub-themes (a) ease of identifying a portion of fruit and vegetables, (b) individual definition of 'Healthy Eating', and (c) source of knowledge on healthy eating. (2) Behaviour; sub-themes (a) cost of food influencing purchasing behaviours, (b)

cost of food at work (canteen) influencing purchasing behaviours, (c) children influencing purchasing behaviours, (d) habit of eating past the point of feeling, and (e) motivation to eat a healthy, well-balanced diet. (3) Access; sub-themes (a) access to healthy foods in the workplace, (b) preparing food in advance, and (c) access to exercise facilities/opportunities. (4) Workplace culture; sub-themes (a) job roles requiring long hours and travel, (b) taking a break at lunchtime, (c) challenge of workplace temptation and d) leadership behaviours. (5) Responsibility; sub-themes (a) employer has a responsibility to promote good health and (b) Government could do more to promote healthy eating.

7.4.1 Main findings

A total of 15 interviews were carried out on RMG employees from a range of roles within the organisation and geographical locations. All participants were manager ($n = 10$), senior manager ($n = 4$) or director ($n = 1$) grades in the organisation and earning in excess of £30,000 a year and therefore represent a high SES convenience sample of employees, rather than a representative sample of RMG employees. Nine participants had GCSE or A Level (and equivalents) qualifications and six were educated to degree or postgraduate level. Eight participants were female and the mean age group of participants was 35-44 (with a range of 18-24 to 45-54 age categories).

Only minimal trends were observed in the interviews based on socioeconomic group (education, salary, or grade), likely due to the narrow SES group studied, where those individuals of higher income and grade were more cognisant of the importance of leadership in encouraging positive health behaviours in the workplace. Workplace culture emerged as an important theme and those employees who travelled and worked long hours for their

311

roles expressed greater challenges in eating healthily at work than those who worked more standard hours in a fixed work location. This strongly influenced access to healthy eating opportunities as those who felt they had no time often did not prepare food in advance and were more reliant on accessing food at work. Given the participants were widely dispersed across the UK, they had different experiences in the quality, cost, and accessibility of healthy foods in canteens or vending machines.

All the participants were aware of Government fruit and vegetable guidelines to eat '5-a-day'; with seven employees agreeing that it was easy to identify a portion of fruit and vegetables. The majority of participants felt they had a clear understanding of what a healthy diet looked like, with the majority stating they achieved it; however, 13 participants stated that they did not think it was easy to eat a healthy, well-balanced diet.

Three main sources of knowledge on healthy eating were identified in the media, schools, and the workplace, with the media being the most influential. Age, gender, and grade differentials could be seen in the motivations to eat a healthy diet with the two youngest female participants with management level roles more motivated by appearance and weight than the avoidance of ill-health, whereas the older participants stated their motivations were more around weight maintenance and the avoidance of ill-health. However, given the small sample size, it is not possible to attribute the findings to specific demographic or socioeconomic trends or beliefs.

None of the interviewees directly identified personal responsibility as a determinant of positive health outcomes. This may be attributable to the focus of the interview being specifically on the workplace and the wording of the

question. However, six of the participants talked about recent weight loss achievements, with one participant having lost six stone. Participants talked about a range of methods used to lose weight – but all with the core components of eating less and exercising more. Some had joined slimming clubs and others had used fitness and diet tracking apps to assist them. All these achievements were outside of work, rather than being through programmes or advice accessed in the workplace. It is likely that this group of individuals took part in the research because of their interest in, and experience of, healthy eating and weight loss. However, the experiences of weight loss shared by participants meant that they had some strong opinions as to why they had put on weight and what work could do to better support them.

All interviewees felt the workplace has an important role to play in encouraging employees to eat healthily and take more exercise. A strong theme emerged of workplace culture and the tendency of employees to take their lunch at their desks or in meetings. While some participants suggested methods of promoting healthier eating should include more choice in the canteen and vending machines, and promotional posters to raise awareness about healthy eating, others felt that greater leadership was needed from senior management in the organisation to advocate taking breaks and eating away from the desk. This encouragement was also suggested to extend to exercise and normalising exercise at work – whether by going to the gym at lunchtime or leaders in the business setting the example by exercising before or after work. It could be argued then that some healthy eating programmes in organisations may have limited effectiveness if, ultimately, the culture and behaviours in the

organisation as a whole are not changed, this will be explored further in the final chapter.

Those employees who travelled for their job roles believed that this was a barrier to healthy eating. The lack of a consistent routine day-by-day meant that planning meals in advance or bringing a packed lunch was not always possible. Some expressed the feeling that when they had put in a long day at work, and worked long hours, they felt that they needed to reward themselves with something tasty, often a higher calorie snack or meal. One of the participants, who worked in the human resources team, noted that many senior managers in the organisation worked away during the week often staying in hotels with no facilities to make their own breakfast or evening meals; their suggestion was to use apartments hotels so that employees could access more home comforts (and potentially eat healthier) while they were away. Workplace canteens were frequently brought up as a barrier to healthy eating with healthier options often costing more, when they were available. However, a couple of participants had good experiences of the canteens at their offices and believed that healthy choices were readily available for employees who chose to make them. For five of the participants, cost was a driver of their behaviours, often expressed less as a necessity but more for the desire to get good value for money.

One participant disliked paying a higher price for a healthier sandwich and would buy the unhealthier, cheaper sandwich because it was better value for money.

Participants felt that the Government had a role to play in encouraging healthy eating; however the recommended method of doing so differed among

participants. The majority advocated more promotion via TV and media (a number referenced the Change4Life campaign and Public Health England's 'One You'). Some felt that messages should be harder hitting similar to the stop smoking campaigns and others advocated higher taxation on unhealthy foods. There was consensus that encouraging people to eat healthily was not an easy task and a range of incentives and promotions would be needed to have an impact. Participants with children ($n = 9$) believed that their children influenced what they purchased, with some suggesting that their children encouraged them to eat healthier because of the healthy eating classes they had participated in at school. This suggests that Government campaigns to encourage healthier eating do not always need to be directed to adults to have an impact.

7.4.2 Comparison of findings with current literature

The current qualitative research was carried out in a group of high SES employees as an exploratory study. Much of the existing literature on barriers and facilitators to healthy eating at work is based on convenience samples or self-selecting employees volunteering to take part in the research. Very few studies qualify the SES of employees and therefore direct comparison with the current study, of high SES employees is challenging. Facilitators and barriers to healthy eating were investigated in a qualitative workplace study in Barnsley, UK (Pridgeon & Whitehead, 2013). A total of 23 participants were interviewed from a stratified sample of job grades across two public sector organisations, representing a broader SES group than the current study. Management and clerical staff, in addition to catering staff, took part in interviews to gather the views of not only catering service users, but the staff

who deliver the catering service. Four main themes, and multiple sub-themes, were identified through the interviews. (1) Workplace structure and systems; sub-themes (a) changes in workforce demographics, (b) facilities and staff, (c) work-life balance and (d) catering service to be run as a business. (2) Cost, choice, and availability of food; sub-themes (a) cost-benefit of healthy food, (b) food and drink access in the workplace, and (c) vending in the workplace. (3) Personal versus institutional influences; sub-themes (a) personal autonomy and responsibility, and (b) institutional responsibility. (4) Food messages and marketing; sub-themes (a) education, (b) family influences and (c) advertising and promotion. Findings were similar to the current study; staff felt that the canteens (and vending machines) needed to offer healthier choices at a better price; there was also a feeling that the canteen catered towards more manual occupations and had not evolved to take into account changes in job roles in the organisation. Often staff did not take lunch breaks because, culturally, when work volumes were high they worked through. This study gathered the perspective of catering staff who argued that the canteen was run as a commercial entity and therefore catered to what they believed would sell; there was a belief that healthy food would not sell. Participants felt that individuals should take responsibility for their own health rather than the workplace intervening, but there was also a belief that as a public sector organisation (NHS) they should be setting a good example to patients. While the sample size and demographics may limit the generalisability of findings, this study offers a unique perspective from both employees and catering staff and the findings reflect those found in similar workplace studies (Nicholls et al., 2016),

as well as the current study, where the management findings of the Nicholls et al (2016) study broadly concur with the high SES group

The workplace was found to have a negative influence on the dietary intake of nurses in a review of 26 workplace studies (Nicholls, Perry, Duffield, Gallagher, & Pierce, 2017). Five quantitative and 21 qualitative studies, published between 2000 and 2016, were included in the review. The majority of studies reported mainly barriers, rather than facilitators, to healthy eating. Shift work, low staffing levels, long work hours, and short – or too few – work breaks were all reported as barriers to healthy eating by nurses. Nurses reported that they often skipped meals, were unable to eat at regular times and often ate junk food; this was compounded by limited availability of healthy food options at work and irregular break times. Nurses who worked night shifts reported that they often snacked through their shift rather than eating a complete meal. In common with the current study, the availability of healthy foods in cafeterias was often limited and it was usually more expensive than unhealthier options. Nurses also reported that when they did prepare their food in advance and brought it to work there was limited space to store or prepare their food, which discouraged them from preparing food in advance. Three of the studies in the review looked at the social work environment and the influence of colleagues on food choices. Nurses frequently ate together with both positive and negative results. Sometimes this meant that they encouraged each other in their diets and exercise and other times they would influence each other to share unhealthy foods. In common with the current study, colleagues bringing in workplace temptations in the form of cakes often resulted in overeating and a colleague feeling 'guilty' if they refused. The studies in the

317

review may be limited by the lack of data on facilitators to healthy eating in the workplace, however it can be argued that facilitators are often the mirror image of barriers and are therefore implied. In order for interventions to be developed to address barriers to healthy eating, it is important to understand what enables and encourages employees to eat well at work. Whilst it could be argued that nurses may not be directly comparable to high SES employees, the themes identified reflect those found in the current study, suggesting perhaps that the effects of the workplace may have a stronger effect on behaviours than do the SES group the individual is aligned to.

Perceived barriers and facilitators to healthy dietary choices, and exercise, were investigated in a group of 121 employees from a public sector organisation using both categorical and open-ended survey questions (Donaldson-Feilder et al., 2017). Thematic analysis identified six themes for facilitators of healthy dietary choices: "(1) change of job characteristics, (2) reducing unhealthy eating habits, (3) guidance and support around healthy eating, (4) better facilities available for staff, (5) resolution of health issues and (6) lifestyle changes" (Donaldson-Feilder et al., 2017, p. 668) and six themes for barriers to healthy dietary choices: "(1) working patterns, (2) job characteristics, (3) availability, (4) health issues, (5) personal motivation and perception of food and (6) family issues" (Donaldson-Feilder et al., 2017, pp. 667-668). The themes identified in the Donaldson-Feilder et al. (2017) study are similar to those identified in the current study – although the participants of the current study felt that they had access to enough information on healthy eating through the workplace, but that their job characteristics and access to healthy foods at work were barriers. Managers were asked further questions on

what the organisation could do to help their teams be more phycially active and help them manage their weight more effectively (Donaldson-Feilder et al., 2017). Four themes were identified: (1) promote and encourage take up of wellbeing inititaives, (2) improve provision for employees, (3) adjust job characteristics, and (4) improve support for employees. The current study did not specifically ask whether the participants were line managers, although the sample does represents manager grades in the organisation. The findings from Donaldson-Feilder et al., (2017) mirror the beliefs expressed by the more senior participants interviewed in the current study.

Employee perceptions of the impact of work on health behaviours were explored in a workplace qualitative study consisting of interviews with 24 employees in a multinational company in the UK (Payne, Jones, & Harris, 2012). Participants held a range of roles within the organisation, at different occupational levels; 10 participants were female, the mean age was 35, and 12 participants had children. Thematic analysis was used to analyse the interview data to enable a flexible, non-theoretically bound, technique to identify patterns in the verbatim data (Payne et al., 2012). Four main themes were identified through the interviews in addition to a number of sub-themes. (1) The work environment; sub-themes (a) policy, (b) convenience and temptation, and (c) workplace cultural norms. (2) Business events; sub-themes (a) routine, (b) convenience and temptation, and (c) workplace cultural norms. (3) Being busy at work; sub themes, (a) time, and (b) tiredness. (4) Work stress; sub-themes (a) bad days, and (b) good days. In common with the current research, perceptions on access to healthy food options in the staff canteen were mixed. Unhealthy foods were felt to be 'too convenient' and access to healthy options

limited; however, some employees believed that the canteen enabled them to access a proper meal each day that they would not have had otherwise. Similar to the findings in the current study, those employees who travelled for work found that their 'normal' routine was disrupted. In addition to disrupted eating patterns, participants also reported disrupted sleep and exercise routines. In common with the current study participants reported feeling the need to 'reward' themselves after a particularly stressful or challenging day at work with unhealthy foods, for example a chocolate bar. Employees who were particularly busy reported eating more unhealthily, however some participants reported eating less as they simply didn't have time. There is limited research investigating barriers to healthy behaviours in a workplace setting and therefore this study offers a new perspective on barriers to healthy behaviours specific to workplace populations (Payne et al., 2012). It also demonstrates that some perceived barriers can lead to healthier behaviours, for example those experiencing more workplace stress often reported exercising more and conversely some perceived 'good' days at work could lead to increased alcohol consumption. The study focuses on holistic healthy eating behaviours rather than specific aspects, such as fruit and vegetable intake, and therefore the findings may be limited given the complexity of eating behaviours reported in previous chapters. And as with many qualitative studies of this nature, it details the opinions of a narrow group of employees in one workplace and may not be generalisable to the population as a whole. Despite this limitation, the study offers a unique insight into a range of health behaviours in the workplace setting (Payne et al., 2012) and supports the current findings in high SES employees.

Understanding of fruit and vegetable consumption guidelines was investigated in a community-based study of 28 individuals between the ages of 19 and 55 (Rooney et al., 2016). Low consumers of fruit and vegetables, as determined by an initial questionnaire, took part in six semi-structured focus groups and completed questionnaires. While participants were aware of guidelines for consumption, they were not clear on what constituted a 'portion' of fruit and vegetables, and that this meant consuming a variety of different types. Vegetables were seen to be more challenging to define given their composite nature in some cooked dishes, fruit was thought to be easier to define. Better labelling on food packaging was suggested as a method to guide consumers to healthier choices, and more awareness campaigns from the Government were thought to be beneficial for educating the public. This is in contrast to the current study which found that it was often packaging of foods that had educated participants in fruit and vegetable portion sizes; however, participants concur that health campaigns in the media would improve awareness and understanding of guidelines. Participants suggested that even if it was easy to identify what a portion was this would not necessarily lead to an increased consumption, as this would not overcome the barriers of preparation time and existing routine (Rooney et al., 2016). Participants had gained their knowledge of fruit and vegetable portion sizes through the media, from school, and from food packaging. One limitation of the study, in its comparison with workplace studies, is 17 of the participants were students and therefore their knowledge of healthy eating may differ from that of individuals of working age. The fact that 17 of the participants were students also suggests that the participants are all of a higher educational level in relation to the general

population. Findings are not expressed by socioeconomic level or demographic information (such as age or gender), and therefore SES comparisons with the current study cannot be made. BMI was reported in the study and the focus-group containing the highest proportion of working adults ($n = 5$) had the highest BMI average out of the six focus groups, however this was not discussed in relation to reported perceptions on fruit and vegetable intake. The mean age of participants was 21 and therefore may limit the generalisability of findings, especially in relation to workplace studies. Despite these limitations, the study does demonstrate that understanding of recommended fruit and vegetable consumption is mixed and media campaigns to improve awareness may be beneficial; however, it does not necessarily follow that increasing knowledge of portion sizes will lead to an increased consumption.

One barrier to consumption of fruit and vegetables (reported extensively in previous chapters in this thesis) is cost. In an Australian community-based study of 2,474 adults, perceptions and beliefs regarding the cost of fruit and vegetables and whether they were barriers to consumption were investigated (Chapman et al., 2017). Email invitations were sent to 30,179 adult residents in New South Wales; only 17.5% of those clicked on a link to the survey, and of those 3,301 responded to take part in the Community Service on Cancer Prevention with 2,474 completing the nutrition related questions. Only 44% of respondents were meeting the Government recommendations for fruit consumption 29% of respondents reported that cost was a barrier to eating more fruit; however, 35% reported habit was a barrier to eating more fruit, 35% reported a preference for other foods over fruit was a barrier and 32% reported that the perishability of fruit was a barrier. Similarly,

90% of respondents were not meeting the Government's recommendations for vegetable consumption. Only 14% of respondents saw cost as a barrier to consumption; a belief that they were consuming enough vegetables was reported as a barrier for 34% of respondents, 28% reported preference for other foods over vegetables was a barrier, and habit was reported as a barrier by 26%. Perceptions on the affordability of fruit and vegetable consumption differed between age groups, with older groups perceiving affordability as less of a barrier than younger groups, and with household income groups, with lower income households perceiving affordability to be a greater barrier than higher income households. Participants who perceived that fruit and vegetables were not affordable in the shops where they purchased most of their food were less likely to meet Government daily recommendations for fruit and vegetable consumption. There was no association between actual expenditure on fruit and vegetables and the perceived barriers to consumption. The study benefits from a large sample size and from assessing both perceptions and actual consumption of fruits and vegetables. Given the low participation rate (17.5%) it could be argued that self-selecting bias could have been present whereby those who took part may have had a special interest in nutrition or answered the questions in a socially acceptable manner (Chapman et al., 2017). The study was carried out on a community sample in Australia where the Government recommendations for fruit and vegetable consumption are higher than for those in the UK; in Australia the recommendation is to eat at least two servings of fruit and five servings of vegetables a day, this may limit the generalisability of findings in comparison to the current study; it could be hypothesised that given the UK Government fruit and vegetable

recommendation is lower, a higher percentage of respondents in the study may have achieved the UK recommendation as opposed to the Australian recommendation (Chapman et al., 2017). The current study did not find cost to be a significant influencer in food purchasing decisions from necessity, due to the high SES group studied, however value for money was important to participants and suggests that cost can be influential at multiple SES levels in an organisation.

In a mixed-methods study of 93 individuals, recruited from both employees and alumni of a United States university, participants were asked to complete two daily surveys over the course of 5 days to record their feelings on barriers and facilitators to healthy eating and exercise (recorded as free-text in the survey) and their self-reported eating behaviours during the 5-day period (collected at the initial and final survey points as a quantitative survey) (Mazzola, Moore, & Alexander, 2016). A total of 84 individuals completed the initial survey and 70 completed all surveys during the week. As with the current study the identification of themes in the qualitative elements of the study followed both an inductive and deductive approach using both the literature in the area to inform the themes and allowing them to be identified from the data (Braun & Clarke, 2013). In line with the current study, workplace temptations (such as sharing cakes or snacks in the office), heavy workload, social influences, and a lack of healthy choices available were reported as the primary barriers to healthy eating at work (Mazzola et al., 2016). Planning food in advance and readily available healthy food choices at work were reported as facilitators to eating healthily (in support of the current study). While the study was limited because of the narrow demographics of the

participants (77.4% female), all university employees and alumni, and the incentivised participation, it was unique in that it recorded a day-by-day account of participants' facilitators and barriers to healthy eating over the course of a working week. Daily fluctuations in actual food consumption were closely aligned to the reported barriers/facilitators encountered each day which emphasises the importance of understanding workplace barriers and facilitators in addressing eating behaviours at both work and home (Mazzola et al., 2016).

A community-based quantitative study of 5,900 individuals across five European countries found that perceptions of barriers to healthy eating influenced dietary behaviours (Pinho et al., 2017). Self-reported 'lack of willpower' was reported as the strongest barrier to the consumption of many healthier foods (fruit, vegetables, fish, breakfast, and home-cooked meals) and as a strong predictor of the consumption of fast food, sweets, and sugar-sweetened beverages. Vegetable intake was strongly linked to the barriers of time, willpower, price, and taste, and the barrier of time was a strong predictor of missing breakfast. Both age and sex were significant effect modifiers between the perceptions of barriers to healthy eating and actual eating behaviours. Younger people who reported that they found healthier food unappealing were less likely to consume fruit (52%) and vegetables (59%) every day. This effect was strengthened by gender, with females with perceived barriers to healthy eating less likely to consume vegetables than males. Other identified barriers were 'having a busy lifestyle' and 'price of healthy foods' – these influenced the consumption of vegetables, fruit, breakfast, fast food, and home cooked meals. In common with the current study, the preparation of home cooked meals had a strong relationship with

time-related barriers, but those who did prepare food at home reported having a healthier diet. Differences in the relationship between perceived barriers to healthy eating in the consumption of fish were found between household size – in three-person households (assumed to be a household with a child) the barrier of 'taste preference of family and friends' was found to be more significant than in smaller households. In the current study, children were found to be both barriers and facilitators to healthy eating. The sample size and analysis of barriers and facilitators to healthy eating with both healthy and unhealthy foods are a strength of the study; however, because of the quantitative nature of the study, participants were limited to responding to the barriers to healthy eating included in the survey and therefore additional barriers and facilitators, which may have had more significance, could not be expressed (Pinho et al., 2016).

In a community-based focus group study of 43 people in the UK, older participants, aged over 60, were more likely to consider the health implications of food choices whereas those aged between the ages of 18-30 were less likely to consider this link (Chambers et al., 2008). Participants aged between 18 and 30 stated that cost was a barrier to healthy eating. Participants (both male and female) under the age of 30 were more likely to consume unhealthy foods than those aged over 60. The focus groups expressed support for Government subsidising of healthier foods, with strongest support from younger age groups, whereas older people were less supportive of Government intervention with one participant stating "the information should be easily available, but it shouldn't be the job of the government telling us what to do in ordinary everyday life" (Chambers et al., 2008, p. 363). All age groups agreed that the

key to health was balance – achieved through moderation and variety in diet and regular exercise. Female participants aged between 31 and 59 and the over 60s stated that planning was critical in facilitating a healthy diet through preparing meals in advance. Participants were recruited from a local community sample and therefore may limit generalisability to workplace studies, and to the high SES group investigated in the current study (Chambers et al., 2008).

Participants of the current study had suggestions for both workplaces and the Government to facilitate healthy eating behaviours. The availability and cost of healthy foods in the workplace canteen were seen as barriers to consumption; therefore interventions to improve consumption could address these. Participants identified that the change in the business from a manual workforce to a more sedentary one meant that the food types and quantity were not appropriate for the staff. In a US study of 25 workplace cafeterias serving 308 employees, some menu items were provided in two sizes – a regular portion and a new smaller portion size to assess whether when given the choice employees would select the lower calorie meal (Vermeer, Steenhuis, Leeuwis, Heymans, & Seidell, 2011). Consumption was assessed through self-report questionnaires and cafeteria sales data. The sales of small meals in comparison to large meals was 10.2% which was supported by questionnaire data. This demonstrated that employees did consume the smaller portion sizes – generally employees who reported dietary restraint consumed the smaller meals more frequently, so too did those reporting a lower level of education and a higher BMI. Females were more likely to select the smaller portion size than males. Those employees who saw the smaller portion as a means to achieving a

healthy weight were more likely to select it. This suggests that simply changing portion sizes in a workplace canteen may not be effective as this choice may be dependent on a number of intrinsic and extrinsic motivations. The study was limited as it did not record whether those employees who consumed the smaller meal, snacked more during the rest of the day (data did suggest that 19.5% of employees who bought the smaller meals often-to-always bought more products that average) and therefore did not adjust their daily calorie intake as a result of the intervention. Therefore, there is no evidence to suggest that adjusting portion sizes in a worksite cafeteria will have a long-term significant impact on health.

Interventions that aim to encourage healthy eating behaviours in the workplace may have varied acceptance by those at whom they are aimed (Bos, Van der Lan, Van Rijnsoever, & Van Trijp, 2013). In a qualitative study of eight semi-structured interviews and four focus group discussions it was found that beliefs relating to healthy eating and interventions were related to the consumer acceptance of those interventions (Bos et al., 2013). "Low levels of acceptance towards an intervention cause consumers to adopt or strengthen an attitude that is contrary to the desired behaviour, thereby increasing resistance to perform the desired behaviour" (Bos et al., 2013, p. 2). In common with the current study, participants felt that Government has a role to play in encouraging people to participate in healthy behaviours. However, the majority of participants felt that taxation on unhealthy foods was unfair and information such as traffic-light labelling on foods (to help people make healthier choices) would not be effective for all. Participants believed that nutrition education should begin in schools so children have the knowledge, from a young age, to

make healthy choices. Some of the parents in the current study had commented that their children had received healthy eating information at school and this had an influence on the family's eating behaviours. The study may be limited in terms of generalisability as it is on a narrow sample of 39 Dutch individuals recruited through an agency to take part in the research, and therefore the sample may have self-selected to take part because of an interest in eating behaviours, and the majority of participants took part in four focus group discussions ($n = 31$) which may have resulted in some social-desirability bias in the views expressed (Bos et al., 2013). Eating behaviours were discussed in general rather than asking about specific food consumptions, such as fruit and vegetables, as the current study did. Despite these limitations, the use of both interviews and focus-group discussions and the investigation of perceptions of interventions to improve eating behaviours have interesting implications on the design of interventions to improve behaviours.

In the current study, the workplace culture around taking lunch breaks had a significant influence on behaviours. One-third of employees, in a 2011 survey of 2,000 office workers, reported that they felt pressurised by their line managers to work through lunch and two-thirds of employees in the same survey said they often did not have time to even take their legal allowance of a 20-minute break at lunchtime (BUPA, 2015). In a study of lunch break autonomy, 103 employees (87 female) working in administration roles at a US university were asked to complete a daily survey of lunch break activities and daily fatigue levels at the end of each day (as reported by both the employee and observations by co-workers) (Trougakos, Hideg, Cheng, & Bel, 2014). Findings suggest that spending lunch time with work colleagues resulted in an

elevated post-work fatigue level than spending lunchtime relaxing, however the relationships were moderated by autonomy. Therefore if employees had chosen how to spend their lunch break, this resulted in less fatigue. The researchers suggest that "it should not be taken for granted that employees actually have the liberty to use their breaks as they see fit" (Trougakos et al., 2014, p.415). What employees do during their lunch break and the extent to which they have had the autonomy to make that decision is important; if an employee choses to work through lunch because they want to get a piece of work done this may be less fatiguing than being pressured to do so by colleagues or management. A limitation of the study is the focus only on lunch breaks as some employees may take other recovery breaks throughout the day rather than one long lunch break (Trougakos et al., 2014).

7.4.3 Strengths and limitations

The current study offers insights into the facilitators and barriers to healthy eating in a workplace setting. It acts as an exploratory study that identifies the need for larger-scale research, incorporating wider SES participation, in this area. Research in this area is limited; qualitative research in the workplace has been carried out investigating understanding of fruit and vegetable intake guidelines (Rooney et al., 2016), age and gender influences on food choices (Chambers et al., 2008), drivers and barriers to healthy eating in public sector workplaces (Pridgeon & Whitehead, 2012) and a review of qualitative (and quantitative) studies investigating barriers and facilitators to healthy eating in nurses (Nicholls, Perry, Duffield, Gallagher, & Pierce, 2016). Barriers and facilitators to nutrition and exercise behaviours (Mazzola, Moore, & Alexander, 2015) and employee perceptions of the impact of work on health

behaviours (Payne, Jones, & Harris, 2012) have also been explored in the workplace via surveys and in community-based studies (Chapman et al., 2017; Pinho et al., 2017). Therefore, the current research offers a unique insight into a range of eating behaviours – fruit and vegetable consumption, the consumption of a healthy, well-balanced diet, eating past the point of feeling full, and cost-driven eating behaviours both at home and at work and the importance of access, culture, and encouragement in the workplace to better enable employees to make healthy choices at work.

One limitation of the current study may be the small sample size of 15 respondents; however, thematic saturation was reached at which point no new themes emerged. This is similar to other qualitative studies where thematic saturation was reached at 12 interviews, where further interviews were carried out, but no new themes emerged (Guest et al., 2006; Ando, Cousins, & Young, 2014). It could be argued that the homogeneity of the sample limits the generalisability of the findings. While there were differences in income levels, job types, and educational obtainment in the group, these were smaller than in the findings reported in the quantitative data from the Stormont Study reported in previous chapters. While this may be the case, the findings still represent a broad range of opinions and both between- and within-group differences in beliefs around barriers and facilitators to healthy eating were identified.

A further limitation of the study is the narrow SES of the participants – all were well educated, and were in management or above roles and therefore represent a narrow SES group This will limit the generalisability of findings and therefore further study with a broader range of SES groups is recommended to better investigate the findings of the previous quantitative

chapters. A comparison study investigating the findings of the quantitative studies and barriers and facilitators to healthy eating in the workplace in a low SES group would complement the current research and allow for greater generalisability of findings and application in a workplace setting. Gender was relatively evenly split in the participant group, and the age of participants reflected the average age of employees in the organisation, but because of the small cohort it was not possible to draw conclusions based on these demographic factors. BMI was investigated in previous chapters and addressed in the current chapter by asking participants if they believed they were of a healthy weight. This approach may have limited accuracy because of individual perceptions of healthy weight status, however this is unlikely to differ from underreporting in BMI (Ng et al., 2014) and therefore consistent with the quantitative studies reported in previous chapters.

The invitation to participate in the current study was sent out as part of a health-related email newsletter and therefore readers of the newsletter likely had an interest in health. Those who volunteered to take part generally had a good knowledge of healthy eating and were interested in the research. While this could be seen as a limitation, it could be argued that the knowledge and experience of healthy eating enriched the data collection because of the wide range of views on workplace culture collected and the suggestions for both employers and the Government on encouraging individuals to improve their health behaviours. Given the findings collected in previous chapters from the quantitative analysis, the qualitative data collected enriches these findings and offers suggestions for the development of research in this area and for designing workplace interventions to improve health behaviours. The current

research did not assess theories of behaviour change in analysis and future research may benefit from a knowledge of stage of behaviour change or intrinsic motivations that may influence behaviours, and thus answers, in participants.

A further limitation of the study is the potential subjectivity bias as a result of the researcher's role as head of occupational health and wellbeing in the organisation. Participants may have taken part in the research in order to help the researcher, if she was known to them, and potentially could have answered the questions in a way that they felt would be helpful for the research as opposed to being objective. This bias was addressed through the clear participant information and briefing given prior to each interview, through personal reflexivity in the critical review of themes and the consistency of answers and themes identified suggests that this was not an issue. However, a further study in a workplace where the researcher is not known to the participants would be beneficial to ensure replication of results and minimisation of subjectivity bias.

7.5 Chapter Summary

The current chapter examines facilitators and barriers to healthy eating in a workplace setting, specifically, understanding of fruit and vegetable intake recommendations, definition of a healthy diet, cost influencing eating behaviours, eating past the point of feeling full, and the influence of children on eating behaviours were all investigated through semi-structured interviews. Fifteen interviews identified five core themes: (1) Knowledge, (2) Behaviour, (3) Access, (4) Workplace Culture, and (5) Responsibility. The findings develop the findings of the quantitative studies reported in previous chapters

and are supported by other limited studies in the workplace setting. The current

chapter offers insights that can be applied to intervention studies designed to

improve healthy eating behaviours in the workplace.

Chapter 8: Conclusion and Reflections

The current research presents the relationships between SES and demographic factors, and five eating behaviours, in a public sector organisation. Cross-sectional analysis demonstrated the significance of education, salary, and job grade on eating behaviours for all eating behaviours studied. The demographic factors of age, gender, and number of dependants and the personal factor of weight status, measured by BMI demonstrated their significance in both cross-sectional and longitudinal analysis. These findings were developed further through qualitative analysis, in a recently privatised organisation, to understand employee perceptions of the barriers and facilitators to healthy eating in the workplace.

8.1 Research Summary

The thesis set out to explore SES – measured by education, salary band, and grade – and age, gender, number of dependants, and BMI and their relationship with three eating behaviours – fruit consumption, vegetable consumption, and the consumption of a healthy, well-balanced diet. Multiple measures of SES have been used in previous research and a broad consensus suggests that a combination of measures should be included in analysis (Lallukka et al., 2007). Education, income, and grade are the most commonly used measures of SES (Lahelma et al., 2004). Through the review of literature on SES, obesity, and eating behaviours, two further indices of eating behaviour were identified. The two questions '*does the cost of food influencing what you buy?*' and '*do you eat past the point of feeling full?*' were added to the 2014 survey. Both questions were identified as significant standalone measures of eating behaviour, but also as potential mediators in the relationships between

the other eating behaviours and SES (Drewnowski, 2009; McLaren, 2007; Sobal & Stunkard, 1989). It has been widely reported that dietary decision making may be determined by the cost of food (Timmins et al., 2013) with those of lower SES more sensitive to the cost of foods (Darmon & Drewnowski, 2007; Drewnowski, 2009; Lallukka et al., 2007; Timmins et al., 2013). The sensitivity to price may be determined by a perception that healthier foods are more expensive or by the reality experienced when buying foods (Drewnowski, 2009). Disinhibition and dietary restraint are other areas that emerged in the initial literature review as important factors in eating behaviours. Dieting, eating past the point of feeling full (disinhibition), and the use of restraint in eating may mediate the relationship between SES and obesity (Sobal & Stunkard, 1989). The propensity to eat past the point of feeling full may also have a socioeconomic gradient, where those of higher SES groupings may employ more restraint in eating, diet more, and show lower disinhibition than those in lower SES groups (Stunkard & Messing, 1984; Dykes, Brunner, Martikainen, & Wardle, 2003). The cost of food influencing purchasing behaviours and eating past the point of feeling full were therefore added to the 2014 Stormont Study question set.

Much of the research on SES and eating behaviour is based on community-based studies. The research identifies that those in lower socioeconomic groups generally have poorer diets than those in higher SES groups (Drewnowski, 2009; McLaren, 2007) and consume fewer fruits and vegetables (Lallukka et al., 2007; Backman, Gonzaga, Sugerman, Francis, & Cook, 2011; Nagler et al., 2013). The findings of the current study were

consistent with the previous research finding a significant relationship between eating behaviours and SES through cross-sectional analysis.

Age and BMI were significant factors in the descriptive epidemiology of eating behaviours as well as in cross-sectional, prospective, and longitudinal analysis of SES and eating behaviours. Therefore, these variables were selected for further analysis. Analysis of variance (ANOVA) was carried out to examine between-group differences in age groups and BMI groups and findings emerged consistent with the current literature. Younger age groups were more sensitive to the cost of food, as age increased the propensity to eat past the point of feeling full decreased, and fruit consumption and the consumption of a healthy, well-balanced diet increased with age (but vegetable consumption showed no significance). Obese and overweight individuals were more likely to be influenced by the cost of food than healthy weight individuals, and as weight status increased so too did the tendency to eat past the point of feeling full. Also, those of a healthy weight were most likely to report that they consumed a healthy, well-balanced diet.

While the quantitative analysis presented interesting findings, no inferences can be made as to why these relationships exist. It was therefore decided to carry out a small qualitative investigation to understand the barriers and facilitators to healthy eating at work. A small sample of high SES individuals from a variety of job roles and locations in a large recently privatised organisation participated in semi-structured interviews. Five main themes emerged from the systematic review: (1) Knowledge, (2) Behaviour, (3) Access, (4) Workplace Culture, and (5) Responsibility. Individual healthy eating knowledge varied and came from a variety of sources, including the

workplace, school, and from the media. Some participants had a tendency to eat past the point of feeling full, but utilised restraint in order to manage their weight. Having children was seen as both a barrier and facilitator to healthy eating. The cost of food was generally not a barrier to healthy eating, but the desire for value for money in purchasing was. Access to healthy foods at work was often seen as a challenge, with canteens and vending machines offering too few, and often more expensive, healthy options. Participants generally felt that preparing food in advance was a key facilitator to eating healthily whether at work or at home. Workplace culture was seen as both a barrier and facilitator to healthy eating. The culture of the workplace, and an individual's workload, often determined whether it was appropriate to take a lunch break and those employees who travelled for their jobs and worked long hours were presented with more barriers to making healthy food choices. Those who were based in an office environment were often faced with cakes and biscuits brought in by colleagues for meetings or celebrations and the challenge of self-control. Employees felt that both employers and the Government had important roles to play in encouraging healthy eating behaviours.

The current thesis suggests that given behavioural differences exist in eating behaviours across socioeconomic and demographic groups, it may be appropriate to implement interventions to address health behaviours that are targeted at the specific traits attributable to those groupings. The findings also suggest that while eating behaviours may be determined by individual socioeconomic or demographic characteristics they may also be further influenced both positively and negatively by the workplace itself. Work practices and ethos, in addition to the design of workplaces and their catering

facilities, must be addressed in order for healthy eating interventions designed to modify behaviours to be effective. Employees are all different and therefore may respond to different healthy eating cues and messaging in order to modify their behaviour. This challenge aside, the workplace represents an ideal opportunity to encourage adults to take up healthy eating behaviours and promote good health.

8.2 Strengths and Limitations of Current Study

Many of the strengths and limitations of each of the quantitative and qualitative studies conducted in this thesis have been described in detail within their respective chapters, and therefore will only be summarised in this overall conclusion.

A strength of the current research is the role of the researcher in the development of the 2014 questions on healthy eating. The literature review presented in Chapter 2 highlighted the importance of cost and restraint in eating behaviours. The two review papers by Sobal and Stunkard (1989) and McLaren (2007) highlighted both factors as important in the review of community based studies. Given the lack of workplace studies examining both constructs, along with more general eating behaviours (healthy diet and fruit and vegetable consumption), the researcher was able to make the case for their inclusion in the 2014 Stormont Study.

A potential limitation of the quantitative studies presented in the current thesis is *common method variance* (CMV), also known as the *monomethod bias*, whereby the reliance on self-report survey data may lead to an over-estimation of the strength of relations between findings (Spector, 2006). It has been argued that this variance in findings may be attributable to

the method of measurement used, rather than to the constructs themselves (Podsakoff, McKenzie, Lee, & Podsakoff, 2003). CMV may occur through social desirability bias, when participants inflate their answers to those they perceive to be more socially acceptable answers, or if two of the variables under investigation share common sources of bias and therefore this may magnify the CMV in the analysis (Spector, 2006).

The current study addressed the issue of CMV through the use of a mixed-methodology of cross-sectional, prospective, and longitudinal studies, in addition to a qualitative study (Spector, 2006). Future research may further address the issue of CMV through the use of a diary study – for example employees could record their food intake and expenditure through a 7-day food diary. This would allow fruit and vegetable intake amounts to be recorded, an objective view of whether the participant has a healthy, well-balanced diet to be made, and actual expenditure on foods to be collected and perhaps a record of whether the individual felt that they had eaten past feeling full following each meal. This method would address CMV but there is a potential for recall bias to affect the accuracy of data and for a study of the size of the Stormont Study with more than 6,000 participants the administrative challenge of collecting and analysing more than 6,000 food diaries may negate the benefits of carrying out a self-report survey (Robson, 2011).

It has been argued by Spector that CMV is not a significant issue for research as has been previously stated in the literature (2006). Spector argues that problems with self-reported measures are mitigated with three arguments. Firstly, not all self-reported studies identify significant results and therefore CMV is not as common as generally presented. For example not all the

variables presented in the descriptive results presented in Tables 4.2 and 4.3 are significant, and therefore it could be argued if these have not been inflated by CMV why should we assume other correlations have been? Secondly, variables with the potential for bias (through social desirability or negative affectivity) do not generally lead to an over-estimation of correlation as the bias (if it occurs) may be limited to only a few variables. For example, in the current study social desirability bias may occur through responses to the eating behaviours, but it is unlikely that participants will over-inflate their responses to their education, salary, job grade, age, gender, number of dependants, or weight status; but even if some participants did in a large sample size it may only result in a small inflation in correlation. Thirdly, the use of monomethod correlations does not necessarily result in a higher inflation in results than multi-method correlations suggesting that the method of measurement, the constructs used, or the individual traits may all impact potential research biases (Spector, 2006). Based on the arguments presented by Spector (2006) it is therefore unlikely that CMV significantly biased the results of the current study.

This thesis represents an under researched area in workplace health and therefore makes a unique contribution to the literature. Much of the research into SES and eating behaviours is on community samples rather than in a workplace setting; therefore the current study, with a large sample size, aims to fill this gap in the literature. A strength of the study was the use of five eating behaviours in the analysis. Most research limits the definition of healthy eating to one or two measures. By including five – likely overlapping – constructs, the current thesis presents a fuller picture of the complexity of eating.

Employees who reported that they ate a healthy, well-balanced diet, may have reported that they did not achieve the UK Government's recommendation for '5-a-day', and therefore it should not be assumed by default that fruit and vegetable consumption is a key indicator of an individual's perception of their tendency to eat healthily. Similarly, it would be unwise to assume that just because someone finds the cost of food influences their eating behaviours that they will not purchase healthy foods. The qualitative study in this thesis suggests that people may be driven by a value for money and may feel that in purchasing and preparing foods they can improve that value for money. For example cooking from scratch may be more cost efficient than buying ready-meals, but for a time-poor individual or family the time involved may be seen as more of a cost. Each eating behaviour was measured by a single-item measure which may have its limitations, but in the context of workplace research, having single-item measures meant that a wider variety of constructs could be investigated in one survey, preventing survey fatigue and perhaps encouraging completion.

A further strength of the quantitative study was the inclusion of multiple measures of SES. The inclusion of education, salary, and grade allowed the investigation of a wider view of SES. The limited response rate to the Stormont Study of 22% in 2012 and 22% in 2014 may also be limitations and self-selection bias, whereby healthier individuals may have chosen to complete the study could have been evident. However, given the large sample sizes of 6,091 in 2012 and 6,206 in 2014 this may have mitigated the effects of the low completion rates. Likewise, the survey collected a range of data, not only health information, and therefore people may not just have chosen to have

taken part on the basis that it was a health questionnaire. The cross-sectional analysis of eating behaviours is limited as causal relationships could not be confirmed with the variables in the study, and the significant relationships between eating behaviours and SES variables were not consistently maintained through to longitudinal analysis. Given the cost of food influencing purchasing behaviours and eating past the point of feeling full questions were added only added in the 2014 data set, only cross-sectional and prospective analysis could be carried out. However, their inclusion in the analysis was a strength of the study as their importance emerged from a review of the literature and including them in the question set meant it was possible to analyse them for a working population.

The study context is imported to consider as the quantitative findings relate to a narrow field of study, i.e. employees of the NICS which may limit generalisability. Likewise, the sample used in the qualitative study was small ($n = 15$) and may not be representative of the views of RMG employees as a whole, as a homogenous SES group was studied. The majority of employees did not believe cost was an issue in eating healthily and some referenced organic foods as a proxy for healthy eating, as opposed to whether they could afford to buy healthy foods more generally. The qualitative analysis may also have been limited by self-selection bias given it was promoted through a workplace wellbeing newsletter, and therefore those who took part must have had an interest in the area to have opened and read the invitation. The additional limitation of subjectivity bias may also have been present in the role of the researcher in the organisation, however a reflexive approach to thematic analysis was taken to minimise bias. Future studies may benefit from a

comparison of the results with a low SES group in addition to an investigation

in a workplace where the researcher is not known to participants. Despite this

limitation however, the participants who volunteered to take place in the

current study may have been able to offer more knowledge and experience on

the barriers and facilitators to healthy eating in the workplace because of their

interest in the area.

Despite these strengths and limitations, and the more detailed

discussions presented with each of the results sections, the current study

demonstrates the importance of socioeconomic and demographic factors in

eating behaviours in the workplace. By further exploring these relationships

through semi-structured interviews, greater understanding can be attributed to

the results of the quantitative analysis and more detailed suggestions for

workplace interventions recommended.

8.3 Application of Findings

This thesis focused on SES and eating behaviours in the workplace.

The research suggests that significant differences in eating behaviours exist

between socioeconomic and demographic groups in the workplace. This has

interesting implications for workplace interventions aimed at improving the

health of employees, as it suggests information may benefit from being tailored

to individuals to achieve sustainable changes in behaviour. As discussed in

Chapter 4 the primary application of the findings of this research could be in

the planning of interventions to improve eating behaviours at work.

It is important to understand the context of eating behaviours in the

workplace before designing interventions to modify them. Contextual

interventions consider the spectrum of economic, physical, socio-cultural, and

political dimensions that may influence behaviours (Schneider et al., 2017). In the context of Northern Ireland, there may be specific political, physical, socio-cultural, and economic influences that may have shaped the eating behaviours of the employees who took part in the Stormont Study. Additionally, as demonstrated by the quantitative analysis in this thesis, a variety of socioeconomic and demographic factors have been shown to be associated with healthy eating behaviours. The effect sizes reported are generally small which indicates that other factors not considered or discussed in the thesis may have an influence too. Considerations around smoking status, alcohol intake, and physical activity may also play a part in eating behaviours at work. The qualitative chapter of this thesis offered insights into the facilitators and barriers to healthy eating at work. The research suggests that the workplace can be both a help and a hindrance to eating well, and indicates that a healthy intervention that was targeted only to an employee's age and BMI might be unsuccessful, despite the significant between-group differences reported in Chapter 6. This is because the intervention does not operate in isolation, and practitioners need to ensure that the set-up of the workplace is such that it does not contradict the healthy behaviours being encouraged. Encouraging employees to eat more fruits and vegetables may be undermined if they cost twice as much as a chocolate bar in the canteen.

Theory, derived from studies like those contained in this thesis, can be used to inform interventions. From the identification of constructs to be targeted (for example based on age or weight status), selecting the most appropriate participants to take part (younger adults or overweight and obese individuals) and identifying which behaviour needs to be targeted (for example

fruit and vegetable intake) theory may lead to more effective interventions (Webb, Joseph, Yardley, & Michie, 2010). It could be argued that despite the clear advantages of using theory in designing interventions, many workplace interventions are not designed with theory in mind (Michie & Prestwich, 2010). Using theory to identify which constructs are most likely to be related to a behaviour may identify the most suitable targets for intervention. "Changing constructs that cause behaviour will, theoretically, lead to behaviour change" (Michie & Prestwich, 2010, p. 3). Whilst the current study explored potential determinants of eating behaviours through a SES and sociodemographic lens; it may be beneficial to tailor interventions using these factors in addition to tried and tested theories of behaviour change.

Whilst models of behaviour change are concepts, rather than representations of behaviour, designed to create a simplistic overview of determinants and drivers of behaviour; their use is important in standardising intervention design in order to allow replication and testing of results (Darnton, 2008). It could be argued that the findings of the current study, coupled with a behaviour change theory may elicit a more significant change in behaviour than simply tailoring an intervention based on SES or socio-demographics. The views expressed in Chapter 7 by high SES employees of a private sector organisation may be influenced by their stage of behaviour change. For example if questions were asked to identify what stage participants were at in the Transtheoretical Model of behaviour change (TTM) interventions to change eating behaviours may be more effectively tailored. Interventions designed to address smoking behaviours and stress management have both been effectively designed using the TTM (Velicer, Prochaska, Fava, Norman

& Redding, 1998). The authors argue that the TTM allows for effective recruitment into behaviour change intervention programmes by identifying readiness for change – this in turn can lead to higher retention rates in interventions, more effective measurement of progress in the intervention and a better assessment of the outcome (Velicer et al., 1998). In relation to workplace healthy eating interventions this could ensure maximum return on investment in the intervention by ensuring that the intervention is tailored. If the SES and sociodemographic characteristics of employees were known at each stage of behaviour change, even greater potential for tailoring may be possible. Likewise if information were collected on individuals in relation to their planned behaviour, their behavioural; normative and control beliefs surrounding a behaviour, more effective tailoring (and evaluation) of the intervention may be possible (Ajzen, 2006). For example if individuals do not want to eat fruit and vegetables then an intervention designed to increase consumption in the workplace will not be effective, no matter how well tailored the intervention is to their SES or socio-demographic characteristics. Likewise an intervention that makes fruit and vegetable more accessible (through placement, price and variety) in the workplace it may boost an individual's sense of control (and potentially pressure from subjective norms) and therefore an intervention tailored towards the SES and sociodemographic factors identified in the current study may be more effective.

The Behaviour Change Wheel (BCW) has been successfully applied to workplace settings (Munir et al., 2018). The BCW could be applied to the future research, using the findings of the current research and through the development of an intervention designed to change eating behaviours in the

workplace. The BCW could be used in focus group discussions to understand capability, motivation and opportunity in the workplace to change eating behaviours and then enablement, education and training could be identified as the intervention functions most relevant to changing the behaviour. Communication/marketing, guidelines, environmental/social planning and service provision can then be identified as the policy categories needed to inform the eating behaviour intervention based on the BCW.

Ethical considerations around targeting interventions to BMI or age groups must be considered through equality legislation. The British Psychological Association (BPA) Code of Ethics outlines four guidance principles that must be adhered to when carrying out psychological research discussed in Chapter 3 (respect, competence, responsibility, and integrity) (The British Psychological Society, 2009). The UK Equality Act (2010) was established to protect people from discrimination both in the workplace and in wider society, and sets out a requirement that people will be treated equally regardless of their protected characteristics – age, disability, sex, sexual orientation, gender reassignment, marriage and civil partnership, race, and religion (UK Government, 2017). Therefore it raises the question of whether it is appropriate to target a programme specifically at someone's age. Would a workplace feel comfortable setting up a healthy eating programme specifically for people aged 40-50, for example? The answer is probably not. An ethical way of using the age-related differences in healthy eating behaviours may be through marketing; rather than directing the intervention at the age group, the solution could be marketing information at the traits emerging from the age profile. Age is a protected characteristic through the Equality Act (2010) and

by tailoring healthy eating information given to employees through a wellbeing website to their age group, there is a danger that this could be discriminatory. In order to prevent this, the same information/programmes could be offered to all age groups, but the order in which they are prioritised to the employee could be adjusted by age so that the most appropriate advice or programme is given. For example younger employees may be more receptive to hear about healthy choices in fast food restaurants or access to Instagram inspiration for healthy diets, whereas culturally these may not appeal to older age groups.

By working with a specialist behaviour change website, or health provider that uses a wellbeing platform, the current research could be applied to the information delivered to users through the wellbeing website, or app, to tailor it to their demographics and answers to an online health behaviour questionnaire. If this could be aligned with goal setting on the website, so that individuals can measure their progress, the success of the website and information given could be tracked and evaluated. In some organisations there may be access to occupational health provision and employee assistance programmes, but in others the reliance will be on public health provision. For example, if an employee fills in the online health behaviour questionnaire and it identifies that they would benefit from improving their diet and increasing their physical activity levels, the individual may need more specialised support than the wellbeing website can provide. If this is the case, the website may need to signpost them to further support. This could be provided by the workplace or suggestions of where to get support from public health could be given.

Employees who feel that their health is private information and do not wish to share that information with their employee will be unlikely to sign up to a workplace wellbeing website. This is not an easy challenge to overcome. Assuring employees that their individual information will not be shared with their employer and allowing them to access the website (or app) from a private computer or phone may help. Consideration needs to be given to different values and beliefs held by individuals in the presentation of information on the wellbeing website. This links into the Equality Act and ensuring all individuals are treated fairly. Therefore, images on the website and healthy eating information and advice needs to reflect the diverse group of individuals who may use it. For example tips on eating healthily should be given in an inclusive way so that the ideas can be applied to a range of eating styles and cuisines. Ensuring that case studies and imagery is inclusive will aid engagement across cultures in an organisation, as the use of role-modelling in behaviour change may only be effective if the individual can see themselves in the images presented to them

Workplace practitioners must be conscious of their own subjectivity and unconscious biases in the design of interventions in the workplace. Practitioners may be guilty of designing interventions based on their view of the world, material resources and tastes, rather than taking an objective view of the workplace and the appropriateness of intervention design. The current research indicates the importance of cost of food in purchasing behaviours and practitioners must be mindful in considering affordability in the recommendations made by interventions. Many employee reward structures within organisations are designed based on the hierarchy of an organisation –

those employees in high SES positions are often able to access private medical insurance, annual medical checks and other health benefits, while those in lower SES positions are not given access. From the viewpoint of an experienced practitioner this seems counterintuitive given higher sickness absence rates and illnesses are often seen in lower job grades in an organisation. This is not to say that those in higher SES groups do not get sick, but arguably that their higher material resources allow them better access to healthcare and healthy behaviours and the addition of these additional rewards may not have the same significance for higher grades than they would if they were to be applied to lower grades in the organisation. If organisations were more cognisant of health inequalities, and SES and sociodemographic determinants of health behaviours, they may re-evaluate the design of their employee reward packages and re-distribute their spending to lower SES groups where greater effectiveness may be seen in improving health and thus reducing sickness absence and improving metrics such as employee engagement, job satisfaction, retention and productivity.

The recent advent of 'healthy building', advocates designing workspaces and offices with the health of employees and building users as the most important factor of the building. This may be appropriate for large private sector organisations with funds to invest in new real estate, but future research could consider how small- and medium-sized businesses, which may not be able to afford to refit or rebuild their offices into healthy workspaces, can benefit from the new discoveries in healthy building. Likewise, what about individuals who are unemployed? Is the healthy building movement going to further increase the socioeconomic divide in health behaviours and outcomes

such as obesity? Large private sector organisations may have the funds to invest in this area, but for smaller businesses and public sector organisations, this may be a step too far, thus widening health inequalities. This is why further academic research examining health behaviours in the workplace and the varied interventions designed to address them is critical in gathering the evidence base to make these interventions the norm with proven returns on investment encouraging even the smallest of organisations to invest. Eating behaviours, just like other health behaviours, are complex and the workplace offers an audience and an environment in which to encourage health behaviour changes. In turn, the economic benefits to the workplace of improving employee health may encourage further investment. This workplace investment should then free up valuable public health resources to address the health behaviours of young, elderly, and unemployed members of society in attempt to stem widening public health inequalities.

8.4 Reflection

The PhD process has enabled me to develop both academically and professionally over the course of my studies. I was fortunate that I had experience in the delivery of health behaviour change programmes in both organisational and community settings prior to the PhD. This experience helped shape the direction of the early literature review; but it was the literature review that went on to shape not only the direction of the PhD but my frame of reference for professional practice.

My career in health began as a personal trainer. The majority of my work was one-to-one but I also ran some group based classes, including both exercise and weight loss. Given my own significant weight loss years earlier

my empathy, combined with my knowledge, helped a significant number of individuals to lose weight and reach their goals. I enjoyed working with groups of people and when an opportunity arose to work for a local authority in health promotion I was keen to take it. My role as *health activator* for Rushcliffe Borough Council was part funded by the council and part funded by the NHS and had specific targets to engage with the local community in various health-related behaviours. I gave talks on healthy eating, exercise, alcohol and smoking in community groups, workplaces and schools. I also led *MEND* the programme for obese and overweight children and their families and *Spring into Shape,* a weight-loss course I designed for colleagues in the council. The MEND programme was well monitored with pre- and post-questionnaires and we were able to track results up to a year after the course ended (for two of the courses we ran). The *Spring into Shape* programme was run over a twelve week period, and data demonstrated a positive effect for the majority of participants but no long-term measurement was possible. The purpose of the one-off talks on healthy eating was to reach as many people as possible. Circa 500 people attended the various talks I gave, which focused on the Eatwell Plate, but despite pre- and post- questionnaires being completed by participants of the talks no real evaluation could be carried out as to their impact. It was during my third year working for the council that I began my MSc in Workplace Health and Wellbeing at the University of Nottingham.

It was during the first module on the MSc, the Management of Workplace Health, on researching the first essay that I came across of workplace health intervention called the Global Corporate Challenge (GCC). The GCC was a 16 week challenge where organisations around the world

entered teams of seven employees to walk on a virtual journey around the

world by monitoring their step count each day. Employees were encouraged to

get active and consider both their sleep and nutrition to manage their daily

energy. Data was collected and analysed both at an organisational and team

level and nationally, so changes to behaviours could be tracked over time.

Many employees entered the GCC each year and therefore they could track

their changes over the longer term. My experience working for the local

authority and from the first MSc module attracted me to the GCC as it was one

of the first well researched workplace health programmes I had seen. I emailed

the GCC and expressed my interest and was offered an interview to join the

team in business development. I travelled all over the UK (and managed clients

in Europe and Africa) and had the opportunity to speak to hundreds of

different organisations about their approaches to health and wellbeing at work.

For some organisations the GCC was their only workplace health programme

and for others it was part of a number of benefits and interventions offered to

employees.

Following the completion of my MSc in Workplace Health and

Wellbeing the opportunity arose to apply for a scholarship to join the team of

researchers investigating the outputs of the Stormont Study. When I had first

started out at the GCC I was naïve to the complexity that workplace health

practitioners operated in. Working at the GCC opened my eyes to the

budgetary challenges, the challenge of proving return on investment for health

programmes and the challenge of managing a diverse set of health risks whilst

implementing wellbeing programmes. As I began my extensive reading on

socioeconomic status and obesity in order to develop my PhD study, I began to

develop more of an appreciation of the complexity of planning and designing interventions to address complex behaviours, when workplace populations are often so diverse in demographics and socioeconomic status. Whilst my work in community health had often been quite targeted to specific groups, in workplaces this is often more of a challenge as it is harder to group employees into SES or demographic groups, and to specifically target behaviours. More often than not workplace health interventions are centred on providing general information to all.

The process of studying for the PhD became challenging early on in my studies when I started a new job as group head of occupational health and wellbeing at Royal Mail, the UK's postal service. In some ways working on the PhD was an antidote to the long hours and frustrations of implementing health and wellbeing risk management and promotion programmes for an employee base of 140,000 people.

I really believe I have my PhD studies to thank for my success in my role at Royal Mail. At first I was daunted by the complexity of the organisation but my studies had instilled in me the importance of evidence based strategies to address health risks. Over my three years in the role I worked with a company that provided a wellbeing website to the business to develop a health risk tool to better understand the health behaviours of employees in order to be more targeted in addressing them. As the importance of demographic factors emerged in my quantitative data analysis, I began to wonder in large organisations if a one-size fits all approach to health promotion could ever be successful? The salaries of the Executive Board members in comparison to a cleaner or data entry clerk, are far removed and the foods they buy (whether

through cost or taste) could be quite different. The success of the wellbeing website we implemented at the Royal Mail was down to the ability of participants to set individual goals and see articles and advice tailored to their goals rather than just a sea of general health information some of which may or may not be relevant. While I certainly cannot take credit for the wellbeing website itself, understanding how we could promote it to employees to help them achieve their goals and use the data to design health interventions came from my PhD studies.

Through the data analysis of the Stormont Study the demographic variables emerged as factors just as important as the socioeconomic ones. But the limitation of quantitative data collection was that it could not tell me why. Fortunately Royal Mail were supportive of my studies and allowed me to carry out a small qualitative investigation to try to understand some of the factors in the workplace that may facilitate or act as barriers to healthy eating. Royal Mail used to be a public sector company before its privatisation in 2013 and therefore acted as a good comparator for the Northern Ireland Civil Service. Although the diversity of individuals who came forward to take part in the study was limited in terms of socioeconomic status, the study still offered some interesting insights to the challenges of remaining healthy at work and some colour to the quantitative data. Gathering a wide cohort of participants for the study was challenging. The main challenge was in communication. Whilst the majority of Northern Ireland Civil Service roles had access to work computers and email addresses, the same could not be said of the significantly larger Royal Mail where most employees in manual occupations do not have work email addresses. All the volunteers therefore were of higher SES groups

in the organisation with email access. Those who took part in the study

emailed the researcher directly following the distribution of the newsletter, and

while they were geographically dispersed, I was unable to capture the barriers

and facilitators to healthy eating for the largest employee group in the

business, lower SES, and arguably the most at risk of ill-health from poor

eating behaviours. Despite not being able to access this group in the study the

health inequalities identified in my literature review significantly influenced

my work as a practitioner. It made me address my own internal biases and

wonder how many of us practitioners view the world through our own frame of

reference and forget that not everyone has the same background and resources

available to them. I now consider interventions in terms of inclusion, as well as

health.

The findings of the qualitative study were informative, as the

quantitative study had identified the significance of demographic factors such

as age and BMI in eating behaviours in the workplace, the qualitative study

identified yet more potential barriers to healthy eating. Access to healthy foods

in the canteen, travel and long hours and workplace culture all emerged as

significant barriers to a healthy diet. From my own personal experience as an

employee in a variety of organisations workplace culture is a significant factor

in health behaviours. In my business development role for the workplace

health programme, we were encouraged to go for a lunchtime walk every day

to improve our health! This is something I have continued to do to the present

day, the behaviour having been very much instilled in me. Even in the two

corporate roles that have followed that role where I often see many employees

sat at desks at lunchtime eating their lunch and not moving I have continued

my lunchtime walk and try to encourage others to join me! Friday cakes are a significant issue in my current job role – and it takes a significant amount of willpower not to succumb to the treats! This often negates the benefits of bringing in my healthy packed lunch. In my previous job I spent three to four nights a week staying in a hotel and trying to make healthy choices was not always easy. I often think, if I find it challenging to eat healthily at work, as a health professional, how hard must it be for others who are less health conscious?

I had intended to remain in my role at the Royal Mail until I had completed my PhD studies, however a new opportunity arose. My reading on the subject of socioeconomic status and eating behaviours so often strayed into obesogenic environment research and the fact that it is not always just individual health behaviours that inform health outcomes but where we live. While I did not cover this in detail in the thesis this sparked an area of interest that led to me moving into the construction industry. The more I read, the stronger my belief that by designing living accommodation, hospitals, towns, shops, schools and so on, to promote good health the easier it should be to enable individuals to make healthy decisions. I became associate director of health and wellbeing for Mace Group a global construction, consultancy and facilities management company. While the primary purpose of my role is to identify health risks across the global business and promote wellbeing opportunities, I feel like I am in the right company at the right time; the healthy building movement is taking hold across many developed countries as developers and businesses consider designing with health and aesthetics in mind. I hope that I can encourage organisations to build offices that promote

good health – using choice architecture to make healthy foods more accessible, designing buildings that consider exercise opportunities, thinking about the ambiance of the office through light, air quality and plants and interactive spaces that encourage collaboration. Surely individuals who work in such environments should have a stronger chance at good health?

My first action in my new job was to get Board approval to carry out an organisational survey of psychosocial risk and health behaviours so that we can introduce targeted interventions to improve health behaviours in the business, and measure their effectiveness over time. Studying for the PhD has taught me that learning never stops and even though I will soon leave academia to focus on my work as a practitioner, I will always view my work through an academic lens. I am collaborating with universities and giving MSc students the opportunity to carry out their dissertations on the Mace wellbeing programme. This will help the next generation of academic practitioners, further the literature in the area and provide Mace with insights to continue to develop the programme.

Future research should consider how small and medium sized businesses who may not be able to afford to refit or rebuild their offices into healthy work spaces can benefit from the new discoveries in healthy building, if this is the potential future direction of workplace health. Likewise what about individuals who are unemployed? Is the healthy building movement going to further increase the socioeconomic divide in health behaviours and outcomes such as obesity? Large private sector organisations may have the funds to invest in this area, but for smaller businesses and public sector organisations this may be a step too far, thus widening health inequalities.

This is why further academic research examining health behaviours in the workplace and the varied interventions designed to address them is critical in gathering the evidence base to make these interventions the norm with proven returns on investment encouraging even the smallest of organisations to invest. Eating behaviours, just like other health behaviours, are complex and the workplace offers an audience and an environment in which to encourage health behaviour changes. In turn the economic benefits to the workplace of improving employee health may encourage further investment. This workplace investment should then free up valuable public health resources to address the health behaviours of young, elderly and unemployed members of society in attempt to stem widening health inequalities. Whilst my thesis covers only a narrow field of health research it has widened my knowledge and interest in both occupational health psychology and public health, and health inequalities, and will hopefully make me a better practitioner.

8.5 Summary

This thesis presents a mixed-methods approach to the understanding of relationships between SES (education, salary, and job grade), and demographic (age, gender, and number of dependants, and BMI) factors and eating behaviours in a workplace setting in 2012 and 2014. Fruit consumption, vegetable consumption, and the consumption of a healthy, well-balanced diet were included in both sets of analysis and following a review of the literature two further questions were identified as important and included in the 2014 data collection; the cost of food influencing purchasing behaviour and eating past the point of feeling full. Three sets of quantitative analysis were applied to the eating behaviours of employees of the NICS to illustrate the descriptive

epidemiology of eating behaviours, investigate cross-sectional, prospective, and longitudinal relationships between variables and understand one-way analysis of variance for BMI and age to identify between-group differences. The analysis confirmed the findings of previous studies identifying that SES has a significant relationship with eating behaviours in cross-sectional analysis. Longitudinal analysis resulted in a diminishment in the significance of SES variables, but identified the importance of demographic variables in both cross-sectional and longitudinal analysis. Age and BMI demonstrated significant between-group differences in one-way ANOVA, suggesting that workplace interventions to improve eating behaviours may benefit from targeting to different age or BMI groups.

A small qualitative follow-up study was carried out in a large, recently privatised, organisation. Interviews were carried out with 15 employees to understand employees' knowledge on healthy eating and ascertain the perceived barriers and facilitators to healthy eating in the workplace. Thematic analysis identified five key themes from the interviews and workplace culture was identified as the most significant driver of behaviours at work.

The findings from the current study suggest that interventions in the workplace may benefit from being targeted to specific at-risk groups in order to achieve maximum success in changing behaviours. However, workplace interventions will only be successful if the workplaces they are carried out in consider the environment in which people work, access to and cost of foods at work and the culture and design of work. Further research is recommended to explore SES and demographic factors and eating behaviours in the workplace

and to design interventions based on the findings, in order to improve the

eating behaviours of the working population.

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Appendices

Appendix 1. Invitation email sent to potential participants (qualitative study).

Appendix 2. Participant information template (qualitative study).

Appendix 3. Participant consent template (qualitative study).

Appendix 4. Interview guide (qualitative study).

Appendix 5. Organisational consent for study (qualitative study).

Appendix 6. Ethical approval for study (qualitative study).

Appendix 7. Example coded transcript.

Appendix 1: Invitation email sent to potential participants (qualitative study).

Good morning,

Wellbeing Weekly newsletter….(content to be added)

And finally…I am a final year student at the University of Nottingham studying part-time for a PhD. My studies are outside of, and unconnected with, the Royal Mail, however I will be carrying out a small study in the Royal Mail, as part of a wider study, to better understand health and work. I am interested in understand the eating behaviours of employed adults and exploring how the workplace can help and hinder employees to eat healthily. If you are interested in taking part in a 30 minute telephone interview (that will be recorded and your details kept anonymous) and would like more information please email me at msxjg@nottingham.ac.uk.

Have a great day!

Judith

Judith Grant
Group Head of Occupational Health and Wellbeing
Royal Mail Group Safety, Health and Environment, Assurance
Nottingham Mail Centre
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Confidential Information: *This e-mail message is for the sole use of the intended recipient (s) and may contain confidential and privileged information. Any unauthorised review, use, disclosure or distribution is prohibited. If you are not the intended recipient, please contact me by reply e-mail and destroy all copies of the original message.*

Appendix 2. Participant information template (qualitative study).

PARTICIPANT INFORMATION

Division of Psychiatry & Applied Psychology
School of Medicine, Faculty of Medicine & Health Sciences

Project Title: Employee perceptions on eating a healthy well balanced diet. Is it easy to make healthy food choices at work and at home?

Researcher: Judith Grant msxjg@nottingham.ac.uk
Supervisor Jonathan Houdmont jonathan.houdmont@nottingham.ac.uk

Ethics Reference Number: 208

We would like to invite you to take part in an anonymous research study conducted by Judith Grant, (PhD student and Group Head of Occupational Health and Wellbeing at Royal Mail) within the School of Medicine at the University of Nottingham. Before you decide if you wish to take part, it is important you understand the purpose of the research and what it will entail. If you would like more information regarding this study, please contact us through the contact details above. It is your choice to take part in this study.

I am a PhD student at the University of Nottingham and I am studying part time, outside of, and unconnected with my full-time role at the Royal Mail.

I am conducting interviews with employees to understand how the workplace can both help, and hinder, healthy eating. The aim of the interviews is to gather individual understanding of healthy eating advice and discuss how workplaces may help or hinder an employee in making healthy food choices and how it may be able to support employees to eat more healthily.

Who is being asked to take part, and why?

You have been invited to take part in the research as you are a Royal Mail employee who has expressed an interest, or whose business area has expressed an interest, in the research being carried out. Twenty Royal Mail participants will be interviewed as part of this research. The research is being conducted in Royal Mail as a large employer in the UK – the research is focused on how UK workplaces could play a role in improving knowledge and access to healthy foods and will not cover specific questions on Royal Mail practices. However, an anonymised summary from the interviews will be provided to the Safety, Health and Environment department at Royal Mail following completion of the study.

What will I be asked to do?

You will be asked to take part in a 30 minute phone-based interview (or a face-to face interview if you are based at Nottingham Mail Centre). You will be asked some general questions about your age, gender, whether you have any children, when you left school/university, whether you would consider yourself to be a healthy weight and to

Version 1.1   1

388

describe the job that you do, you have the right to decline to answer any of these questions. You will then be asked a series of questions about your eating behaviours – such as fruit and vegetable intake – and how you feel the workplace could better support you to eat healthily.

The interview will be recorded for the purposes of transcribing and reviewing the findings. Your participation is voluntary, and you may change your mind about being involved, or decline to answer a particular question, or stop the recording at any time, and without giving a reason.

Will the research be of any personal benefit to me?

There are no direct benefits of taking part in the study, however your participation will provide information on healthy eating behaviours of employees which will contribute to the research in this area. Research in this area aims to understand why people eat in the way that they do, and to design programmes that may help people improve their eating behaviours and health.

What will happen to the information I provide?

All data collected is anonymous. All personal details/references will be removed when the interview is transcribed. Neither the researcher nor the Royal Mail will be able to identify individuals. The recording of the interview will be transcribed by the researcher (or approved transcriber) and will be uploaded to a password protected database. All data will remain confidential; data will be processed and stored in accordance with the Data Protection Act. The data will be destroyed on completion of the PhD study (anticipated 2018).

What will you do with the data?

The anonymous data collected will inform a chapter in my PhD thesis. The study may also be published as a journal article. Upon completion of the study a summary of the findings will be made available to all participants via email if requested, and the full thesis will be available upon completion of the PhD study.

If you wish to withdraw your interview from the study contact msxjg@nottingham.ac.uk within 2 weeks of the interview and the transcription of your interview will be removed. After 2 weeks it will not be possible to withdraw your interview from the study.

If you have any questions or concerns, please don't hesitate to ask. I can be contacted before and after your participation at Judith.grant@royalmail.com or msxjg@nottingham.ac.uk.

THANK YOU FOR YOUR PARTICIPATION

If you have any queries or complaints about this study, please contact the student's supervisor in the first instance. If this does not resolve the query to your satisfaction, please write to the Administrator to the Division of Psychiatry & Applied Psychology's Research Ethics Committee (MS-DPAPEthics@nottingham.ac.uk, +44 (0)115 8232214) who will pass your query to the Chair of the Committee

Appendix 3. Participant consent template (qualitative study).

PARTICIPANT CONSENT

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Division of Psychiatry & Applied Psychology
School of Medicine, Faculty of Medicine & Health Sciences

Project Title: Employee perceptions on eating a healthy well balanced diet. Is it easy to make healthy food choices at work and at home?

Researcher: Judith Grant msxjg@nottingham.ac.uk

Supervisor   Jonathan Houdmont jonathan.houdmont@nottingham.ac.uk

Ethics Reference Number: 208

- Have you read and understood the Participant Information?   YES/NO

- I agree to take part in an interview that will be recorded? YES/NO

- Do you know how to contact the researcher if you have questions about this study?   YES/NO

- Do you understand that you are free to withdraw from the study without giving a reason?   YES/NO

- Do you understand that once you have been interviewed it may not be technically possible to withdraw your data unless requested within two weeks? YES/NO

- Do you give permission for your data from this study to be shared with other researchers in the future provided that your anonymity is protected?   YES/NO

- Do you understand that non-identifiable data from this study might be used in academic research reports or publications?   YES/NO

Signature of the Participant   ....   Date: ....

Name (in block capitals)   ....

By signing the declaration I indicate that I understand what the study involves and that my answers are anonymous. I agree to take part and I understand that if I do not contact the researcher within 2 weeks of the recorded interview I will be unable to withdraw from the research.

[Version 1]   1

390

Appendix 4. Interview guide (qualitative study).

DRAFT: Interview Guide for Semi-Structured Interviews.

<u>Prior to interview</u>

- Ensure participant has received the participant information sheet.
- Ensure researcher has a copy of participant's signed consent form.
- Test Dictaphone and in-call recording device. Ensure spare batteries available.

<u>Opening the interview</u>

1) Introduction:
   - Researcher introduces herself to the participant
   - Explains the study to the participant
   - Explains what will happen in the interview
2) Confidentiality – the participant's information will be kept secure and they will not be identifiable from any information they provide during the interview. Their information is kept anonymously.
3) The participant is informed that the interview will be recorded and the recording will be kept securely and will only be shared with a transcriber (if used).
4) Withdrawal procedure – the participant is allowed to stop and terminate the interview at any time without any penalty.
5) The participant can withdraw their consent at any time without penalty
6) The participant is informed that they do not have to answer all questions posed to them. They are advised to answer questions that they are comfortable in answering.
7) The participant is asked if they have any questions, and informed that they can ask questions or clarify issues throughout the interview. Questions are answered as necessary.
8) The researcher confirms receipt of the signed consent form.

<u>Interview</u>

Inform participant that the interview will be recorded on a Dictaphone from this point. Switch Dictaphone on, ensure connection to phone and start recording.

1) I'm going to start the interview by asking you some general details about yourself:
   a. Gender (do not ask this – but record gender)
   b. Age (18-24; 25-34; 35-44; 45-54; 54 and over)
   c. When did you leave school/college/university? (Follow up as appropriate – what is the highest qualification you have?)
   d. Do you live with anyone? (To ascertain if the participant has children).
   e. Would you consider yourself to be a healthy weight? Yes/No
   f. What job do you do in the Royal Mail? What does your job entail? PROMPTS – amount of sitting down or activity, location, type of job, shifts etc.
2) Healthy Eating Knowledge:
   a. Have you heard of government recommendations to eat 5 or more portions of FV each day?
   b. Do you find it hard or easy to decide what a portion of FV is according to intake guidelines?
   c. Where have you gained information (if any) on portion sizes?

    d. What would you say a healthy diet looks like? (PROMPT lots of fruit and vegetables, low in saturated fats, high in complex carbohydrates, moderate protein and dairy intake).

    e. Would you say that you eat a healthy, well-balanced diet?

        i. If YES why do you choose to eat healthily (PROMPTS health concerns, fashion, pressure to look a certain way, influence of family/friends, past illness)

    f. Does the cost of food influence the types of food that you buy?

        i. If YES why and what kinds of food do you buy?

    g. Do you often eat past the point of feeling full?

        i. If YES why do you think you do? (PROMPTS taste, not sure when full, politeness, habit to clear the plate etc.).

    h. If you have children who live at home, do they influence what you buy?

        i. If YES – how? Why?

3) Eating and the Workplace:

    a. Do you think that it is easy to eat healthily when you have a full time job?

        i. If YES/NO why?

    b. What could employers do to help their employees eat healthily?

    c. Do you believe that the workplace has a role to play in encouraging people to eat more healthily?

Closing the interview

1) Are there any other things we haven't discussed that you would like to?
    ○ YES: Discuss as necessary, let participant lead.
    ○ NO: Continue to next step.

2) Inform participant that the interview is finished.

3) Ask participant if they have any questions about the interview:
    ○ Answer as necessary

4) Stop recording audio on Dictaphone.

5) Inform participant of what will happen next with their information:
    ○ The interviews will be transcribed and analysed

6) Inform participant that they can contact the researcher at any time with any queries.

7) Inform participant that they can withdraw their consent in the next two weeks through emailing the researcher.

8) Thank participant, ask again if they have any questions
    ○ Answer them as necessary

9) Close the phone call or guide participant in leaving the interview location as applicable.

NB: PROMPTS/PROBES will be used to explore areas that the participant has not mentioned.

Probes to use:

- Could you explain that further?
- I want to make sure I understand what you mean – could you describe that for me again?
- Could you give me an example?
- Why?

- How?
- Could you tell me more about that?
- Could you possibly describe that a little more?
- How did you feel about that?
- What do you mean by ...?
- Could you talk about that a little bit more?

Appendix 5. Organisational consent for study (qualitative study).

From: Shaun Davis
Sent: 14 November 2016 10:23
To: Judith Grant
Cc: Andy Pearson
Subject: RE: Email/Letter Approval from Shaun on PhD Study

Hi,

Happy to approve this.

Good luck.

Regards,
Dr Shaun Davis
MA, MBA, MA, MSc
Chartered FIOSH, FIIRSM, Chartered FCIPD, MIoD
Group Director of Safety, Health, Wellbeing & Sustainability
Royal Mail Group

185 Farringdon Road, LONDON, EC1A 1AA.
Mob: 07436 546 888
Email: shaun.davis@royalmail.com

☀ **Be Positive**   ★ **Be Brilliant**   ◯ **Be Part Of It**

From: Judith Grant
Sent: 14 November 2016 09:06
To: Shaun Davis
Cc: Andy Pearson
Subject: Email/Letter Approval from Shaun on PhD Study

Hi Shaun,

Please find attached my Study Outline for PhD analysis on Royal Mail employees. I would like to interview up to 20 employees, either over the phone or in person, to assess attitudes to and understanding of eating behaviours and healthy eating in an organisational setting. The interviews will take 30 minutes each and I intend to use predominantly front-line or administrative grades – I will ask for support from Dave Joyce/Carl Maden in recruiting participants.

Are you happy to give your consent on behalf of the organisation for me to carry out this study?

Andy cc'd for information.

Kind regards,

Judith

Judith Grant
Group Head of Occupational Health and Wellbeing
Royal Mail Group Safety, Health and Environment, Assurance
Nottingham Mail Centre
Padge Road
Nottingham
NG9 2RR
Mobile: 07776996473
Email: judith.grant@royalmail.com

Appendix 6. Ethical approval for study (qualitative study).

The University of Nottingham

UNITED KINGDOM · CHINA · MALAYSIA

Investigators: Judith Grant and Jonathan Houdmont

Title of study: Cross-sectional and prospective contribution of socioeconomic status, and demographic and personal, to the eating behaviours of employees of the Civil Service.

Duration of study: Until October 2019

Ethics reference number: 208

Faculty of Medicine & Health Sciences
School of Medicine
Division of Psychiatry and Applied Psychology
The University of Nottingham
YANG Fujia Building
Jubilee Campus
Nottingham
NG8 1BB
t: +44 (0)115 82 32214

www.nottingham.ac.uk/medicine

16th January 2017

A favourable opinion is given to the above named study on the understanding that the applicants conduct their research as described in the above numbered application, and adhere to all conditions under which the ethical approval has been granted and use only materials and documentation that have been approved. If any amendments to the study are required, an amendment should be submitted to the committee for approval.

David Daley (Professor)
Co-Chair of DPAP Ethics Subcommittee

Amanda Griffiths (Professor)
Co-Chair of DPAP Ethics Subcommittee

Appendix 7. Example coded transcript from qualitative analysis in NVivo.

The text and coding appear on consecutive pages.

Interview 1

I= Interviewer

R= Respondent

I: First of all, if I could just ask you a few questions about you and the role that you do, that would be really helpful.

R: Yes.

I: Can I ask what age category you fall into? So 18-24, 25-34, 35-44, 45-54, or 54 and over?

R: 35-54.

I: Thank you. And what's the highest qualification you have?

R: I have an HNC, that's probably the highest… yeah.

I: Okay. And do you live with anyone?

R: I'm married.

I: Do you have any…?

R: And I have one daughter who lives with us.

I: Would you consider yourself to be a healthy weight?

R: I'm probably as the scale… as the… as probably… let me think how I would phrase this. If you were looking at a chart, that would probably still say I'm overweight.

I: And what's your role in the Royal Mail? Could tell me a bit about the job that you do and how much sitting down or activity or travelling you do for the role.

R: So I'm the [job title], so it's a national role, so I have the people that work with me who are spread about the country for this, so I do spend quite a bit of time travelling but other than that, I spend probably a significant amount of my time sitting on the computer or on the phone and at a desk and I can tell the difference between days when I'm sedentary and days when I'm more active, like yesterday, when I was travelling and I'm on the move and I'm walking around the airport or whatever. So yeah, it varies and some days, like today, I've spent all day sitting at a desk and other days I could be on the move going between trains and walking around and getting from one place to another, so it does vary significantly.

I: Where is your home office?

R: It's [location] Mail Centre.

I: Okay, so do you get to see it much or are you mostly…?

R: I do, I'd probably say I'm here at least three days of the week and I would say I travel a couple of days of the week.

I: **Okay, so that background's really helpful, thank you. So now I'm going to talk a little bit about healthy eating, so this is quite a pertinent question given the headlines in the news today, but have you heard of the government's recommendations to eat five or more portions of fruit and vegetables each day?**

R: Yes, I have.

I: **And do you think it's easy or hard to actually know what a portion looks like?**

R: I think it can be quite difficult to understand because it's easy I think with fruit and things like that because that's an apple, that's a banana, that's a portion. But I think it's more difficult with vegetables because is it a spoonful of something and how do you work that out? So yeah, I think a portion size, what is the right size of that?

I: **So how have you kind of gained your knowledge on portion sizes?**

R: Well generally I've been following a diet plan for probably about the last year and a half, and plus the fact I'm diabetic, I tend to follow quite a robust plan of your plate should be a third of vegetable or fruit or whatever, so I try to work to that on a daily basis, especially at the main meal, a third of what is on my place is vegetable based and I eat quite a lot of fruit as well, although I try to limit that to mealtimes and maybe the odd snack because again, it's got lots of sugar in it so you have to balance that quite… So in terms of portion size, it's just knowledge and things that I've built up over time I would say rather than anything specific.

I: **How long have you had diabetes?**

R: About probably 20 years now, there or thereabouts, I was in my 20s when I was diagnosed.

I: **And when you were diagnosed, were you given information on what to avoid and things?**

R: Yes, I saw a dietician and they took me through what I should eat and what I shouldn't eat and how to manage and count carbohydrates so that I can manage my insulin levels better.

I: **What would you say then that a healthy diet looks like? ou've said a third of the plate should be fruit and vegetables; what else would you say should be in a healthy diet?**

R: So I think you've got to have a balance of protein, vegetables and some carbohydrates, and limit the amount of fat and sugar that you intake and dairy, although it should be in your diet, it should be restricted a little bit more than the other elements of that. So the diet I tend to work to is a good mix of carbohydrates, protein and fruit and veg and I try and limit my dairy and my sugar intake.

I: **Do you think overall then you actually eat a pretty healthy well balanced diet?**

R: Yeah, I would say I do. I would say now I do, and I find it difficult. I mean I mentioned I travel a lot so I find it difficult when I'm on the move, but when I'm office-based, I can manage it quite well because I limit what I have in the house and what I bring to work, my own lunch and

Taking a break at lunchtime

Leadership behaviours

Job roles requiring long hours and travel

Challenge of workplace temptation

Workplace Culture

Government could do more to promote and encourage healthy eating

Employer has a responsibility to promote good health

Responsibility

Motivation to eat a healthy well-balanced diet

Knowledge

Ease of identifying a portion of Fruit and Vegetables

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Habit of eating past the point of feeling full

Cost of food influencing purchasing behaviours

Cost of food at work (canteen) influencing purchasing behaviour

Children influence purchasing behaviours

Behaviour

Preparing food in advance

Access to healthy foods in the workplace

Access to exercise facilities and opportunities

Access

Coding Density

2A

stuff like that and my own in between snacks or anything, I bring it all with me so I'm not tempted to eat the right things.

I: So do you eat at the canteen much?

R: No.

I: Is there a canteen? I'm sure there is.

R: There is but I don't find that the options that are there are healthy at all. For the last year and a bit, I'm trying to watch what I eat and lose… so I've lost nearly four stone.

I: Oh wow, congratulations!

R: And I've maintained it for nearly a year now which is good for me!

I: That's fantastic!

R: Because I've always been a bit of a yo-yo dieter. When I go and visit different places, generally the only healthy thing I can find is a baked potato and various things to go in a baked potato and sometimes they're not very nice! Even the sandwiches, you've got to be careful with sandwiches because the fillings can be quite unhealthy, and I try to avoid a lot of bread as well. I find bread not very… white bread particularly not healthy, so I have a lot of that, so I cut a lot of bread out my diet and that's I think helpful for my weight loss and my feeling of wellbeing that I don't eat so much white bread. So going around in different canteens, I found it difficult to find options that are healthy but still tasty and nutritious.

I: I don't know about you, but if I have a jacket potato at lunchtime, by about 2pm I'm asleep!

R: Yeah, it's stodgy.

I: So your healthy eating then has been obviously prompted by the diabetes but it's been predominantly around trying to lose weight.

R: Yeah.

I: Have there been any other influences? Do your family encourage you? Are they healthy eaters or…?

R: Well my husband and I both made the decision to get a good… it was one of those moments where we saw a photograph of ourselves and we both thought we need to do something about this because he's like me, he struggles with his weight, although he's not diabetic. But when I've tried to do diets before, I did it myself and maybe going to the class but nobody else in the house was trying to lose weight so quiet difficult, but this time round, my husband and I both did the diet together and we went to Slimming World and Neil, my husband, is a chef to trade, so he did all the cooking and came up with different menus and different dishes that we could eat that were still healthy and fitted within the diet plan. As I said, when I'm here in Glasgow, I bring my own food in with me so I avoid eating the wrong things, so that encouragement at home has really been good and also it's helped… my daughter is not heavy or anything like that but I think it's helped her to see that her mum and dad are now taking care of what and

Taking a break at lunchtime

Leadership behaviours

Job roles requiring long hours and travel

Challenge of workplace temptation

Workplace Culture

Government could do more to promote and encourage healthy eating

Employer has a responsibility to promote good health

Responsibility

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Ease of identifying a portion of Fruit and Vegetables

Knowledge

Cost of food influencing purchasing behaviours

Cost of food at work (canteen) influencing purchasing behaviour

Children influence purchasing behaviours

Preparing food in advance

Access to healthy foods in the workplace

Access

Access to exercise facilities and opportunities

Coding Density

Access

Behaviour

Motivation to eat a healthy well-balanced diet

Habit of eating past the point o

3A

400

conscious of what they eat because they do teach... she comes back from school and they've done healthy eating and that is part of their curriculum, so they've covered healthy eating, so she understands what you should have on your plate. So she makes comment on the fact, "That's really good. You're not having that mummy!" Stuff like that.

I: That's really good!

R: Yeah!

I: **Brilliant! And does the cost of food influence the types of food that you buy?**

R: Not really, no. I would say my husband and I, we always try and buy good quality ingredients; so we would try and buy organic and we would try and buy free range things, so we're not cost driven, and in actual fact what would put me off some of the ready meals is that they are quite pricey, so actually to make something up is actually more cost effective most of the time, even if you buy a better quality ingredient, it's still more cost effective to make it yourself than to buy a ready meal to put in the microwave or the oven.

I: **Absolutely! So you think that actually eating healthily doesn't need to be an expensive option?**

R: No, definitely not.

I: **Do you sometimes feel that you eat past the point of feeling full?**

R: Yes, I do.

I: **And what prompts that? Is that maybe you just like the taste? Is it out of politeness or habit to clear the plate?**

R: I have a theory about plate size. If I go to my mum's house, her dinner plates are probably the same size as my side plates. So if I have dinner on my dinner plates, they're absolutely huge, and it looks pretty heavily laden. You put a couple of potatoes and some chicken and some veg in the middle of it. So people tend to fill those plates and then you're habitually reminded from your childhood that you need to clear your plate and you can't leave stuff. So over time, I've just had to tell myself... I've had to unlearn that and say, "No, I can leave stuff on a plate." So my husband is terrible for putting big portions of pasta and rice and potatoes on my plate and I will leave them now, I won't eat them, because in the past I would have. I would have automatically goes and just finished everything on the plate, even if I was full. Now when I feel full I stop and just say, "No that's it, I've had enough," and he'll say, "Oh," and I'll say, "No, no I've had enough, I don't want to eat any more than I need to eat." But I think I would say the bad side of me is I'm a terrible grazer, so I'm a terrible person if somebody's put out crisps or nibbly things. I will graze and eat those even though I don't necessarily feel hungry but because they're there and they look nice... and I think that's that bit of you that's attracted by the look of something and the fact that that will taste nice. So I've had to try and discipline myself not to do that over the last year, but I think that's always going to be there, that's always going to be in my DNA to want to eat those types of things.

Taking a break at lunchtime
Leadership behaviours
Job roles requiring long hours and travel
Challenge of workplace temptation
Workplace Culture
Government could do more to promote and encourage healthy eating
Employer has a responsibility to promote good health
Responsibility
Source of knowledge on healthy eating
Individual definition of "Healthy Eating"
Ease of identifying a portion of Fruit and Vegetables
Knowledge
Motivation to eat a healthy well balanced diet
Habit of eating past the point of feeling full
Behaviour
Cost of food at work (canteen) influencing purchasing behaviours
Children influencing purchasing behaviours
Preparing food in advance
Access to healthy foods in the workplace
Access to exercise facilities and opportunities
Access
Coding Density

Cost of food influencing purchasing behaviours

4A

I: It's good that obviously you've managed to lose all of that weight and still with that kind of feeling in the back of your mind, so you're obviously changing the psychology a little bit already.

R: Yeah, but I think it is true with portion size because if I think back… as I said, if I go to my mum's and have dinner, her plates are small, but mine's… the plates are huge! And psychologically we think, "Oh I need to have plenty on the plate." So I think everyone's portion size is huge now, much bigger than it would have been before the problem that we've got.

I: Do you find that your daughter influences what you buy to eat?

R: She does for what she eats. She doesn't influence what we eat. So I would say quite often she has a different meal from what we have, and sometimes my husband and I disagree about this, but I'd prefer she eats the same things as us even if… because she'll turn her nose up at something that we've put spinach through, for example, she doesn't like it, but I know from my experience I thought I didn't like things like that until I was older! So you started eating it and thought actually that's not bad! But in your head you think that can't be nice because it's green! So there are some things that she will eat the same as ours but if we're having something that we think she won't like, then we'll give her a pizza or fish fingers or chicken nuggets! But we try and limit it where we can but she doesn't influence what we eat but sometimes what we're eating influences what we give her because we'd say, "She'll not like that," and we'll give her something else, if that makes sense?

I: Yeah, it does. So thinking a little bit about the workplace then, so we've talked a bit about the canteens, but do you think it's easy to eat healthily when you have such a busy fulltime job?

R: No, and I think that I can definitely blame that on how I ended up overweight in the first place because I think when you're busy, you tend to grab and snack on things that are unhealthy rather than take something that's healthy, so I'd have always had a packet of crisps mid-morning or a bar of chocolate or a biscuit, probably a biscuit or two biscuits, and then feel rubbish because it probably pushed my sugars up and down really quickly. Whereas now what I always have is I have an apple, that's what I generally have, and if I don't have access to an apple, I would have a cereal bar or something that's low calorie and relatively low sugar, but I would try and have something that was healthy, and I think you also end up working… I work quite long hours, so I would end up staying here quite late and then you get hungry and you feel you need something sugary, so you would go and have a chocolate bar because you feel you need to have something to treat yourself because you're staying here and psychologically you think I need a treat because I shouldn't here, I should be at home, so you feel I need to spoil myself a bit so I need to have something nice, so you eat something like a chocolate bar, and I used to be really guilty for that when I was travelling to say actually because I'm travelling and I'm going to be late, I'll have a cup of tea but I'll have a kit kat or I'll have a bar of chocolate with that instead of saying actually I don't need that.

So I think there's that element of it then in the workplace, driven by the fact that that psychological thing about I need to treat myself or reward myself, you end up eating things you shouldn't have and boredom – if you're travelling for long periods of time, there's a boredom

Taking a break at lunchtime

Leadership behaviours

Challenge of workplace temptation

Government could do more to promote and encourage healthy eating

Employer has a responsibility to promote good health

Responsibility

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Ease of identifying a portion of Fruit and Vegetables

Knowledge

Motivation to eat a healthy well balanced diet

Habit of eating past the point of feeling full

Cost of food influencing purchasing behaviours

Cost of food at work (canteen) influencing purchasing behaviours

Children influence purchasing behaviours

Behaviour

Preparing food in advance

Access to healthy foods in the workplace

Access to exercise facilities and opportunities

Access

Coding Density

Workplace Culture

Job roles requiring long hours and travel

5A

404

element and I know I'm a terrible one for eating when I'm bored. So not necessarily because I need any kind of nutrition! So yeah, I recognise that in myself and I think I've spoken to a lot of people who say that's true, that when they travel they end up eating loads of rubbish because they think if I'm going on a train, I'll need a packet of crisps and a bar of chocolate and maybe a sandwich to pass the time.

I: **Especially if you're not getting much time for a lunch break, you're having to work and finish, you can end up eating all sorts of calories that you hadn't anticipated.**

R: I know, and that's the thing, or sweets, people put sweets out and you end up eating mints and things like that. For me specifically, I end up – because I'm hungry – end up eating three or four of them and then I feel terrible because my sugar's will have gone up and dropped. So I've really got to watch myself with stuff like that and with this job, I've been in a few supplier meetings now where they bring out biscuits and then they put on a buffet lunch and the one the other day, they had nice sandwiches but then they had pork pies and sausage rolls and I was like oh my goodness, trying to avoid the pastries, and then cakes! And the she's like, "I'll put the cakes on the table." No, don't bother putting them on the table, keep them over there, thanks very much! I'll have some fresh fruit, it's nice! So you're trying all the time not to be dragged into the eating of things that look really nice and I'm sure taste lovely!

I: **Is there anything that workplaces could do to help their employees to eat better?**

R: My thing is that I think when I go to the canteen, what I see is I see lots of sugary snacks, I see lots of unhealthy cooked options and there might be some salad but it's not pleasant looking and it doesn't give me any want to eat it. and the fruit, they've got fruit but the fruit's really expensive what they want to charge! It's like 70p for an apple or a banana! And I think 70p, it's ridiculous! So if they made healthier options more cost effective... I mean I notice lately, I don't know if you've been in Tesco, I've done it two times with my daughter now, we've been going to Tesco, they have a basket of fresh fruit for kids – adults can eat it as well – so that when they're going round shopping, so before my wee girl would be going, 'Can I have this? Can I have that? Can I have these biscuits? Can we have that?" I think because they're eating a banana or having a tangerine or an apple, they're focused on that and they're not thinking about what they could have.

I: **That's brilliant!**

R: It's a really good idea and she always goes straight to the fruit basket and gets herself something when she does into Tesco now, and at school, certainly the schools in [location] where I live, they have healthy snacks, so they always have fruit available and they don't charge for it.

I: **That's really good!**

R: I think they could do more, I'm not saying they have to have free fruit available to people but I think it could be cheaper and more obvious to people than the sugary snacks that are on special at the checkout. So you only go in to buy a cup of tea and before you know it you've got a Kit Kat and an Aero! Because they were on special offer!

I: **Yes! And do you ever use the vending machines at all in the site?**

405

Taking a break at lunchtime

Leadership behaviours

Job roles requiring long hours and travel

Workplace Culture

Government could do more to promote and encourage healthy eating

Employer has a responsibility to promote good health

Responsibility

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Ease of identifying a portion of Fruit and Vegetables

Knowledge

Motivation to eat a healthy well balanced diet

Habit of eating past the point of feeling full

Cost of food influencing purchasing behaviours

Children influence purchasing behaviours

Preparing food in advance

Access to exercise facilities and opportunities

Coding Density

Challenge of workplace temptation

Access

Access to 'healthy foods in the workplace

Behaviour

Cost of food at work (canteen) influencing purchasing behaviour

6A

R:	Yes, and again it's all unhealthy stuff, so there is no healthy options in those. So your best option is usually a packet of crisps. One thing I've been buying a lot of, I've used as a snack is the popcorn, the air dried, because that is really low in calories and fat. Sometimes if you get the… you have to watch the sugar and the salt content but they're generally not too bad, and I use them as a snack, but they don't have them in the vending machines, it's generally crisps and chocolate. But at least one or two healthy options would be good.
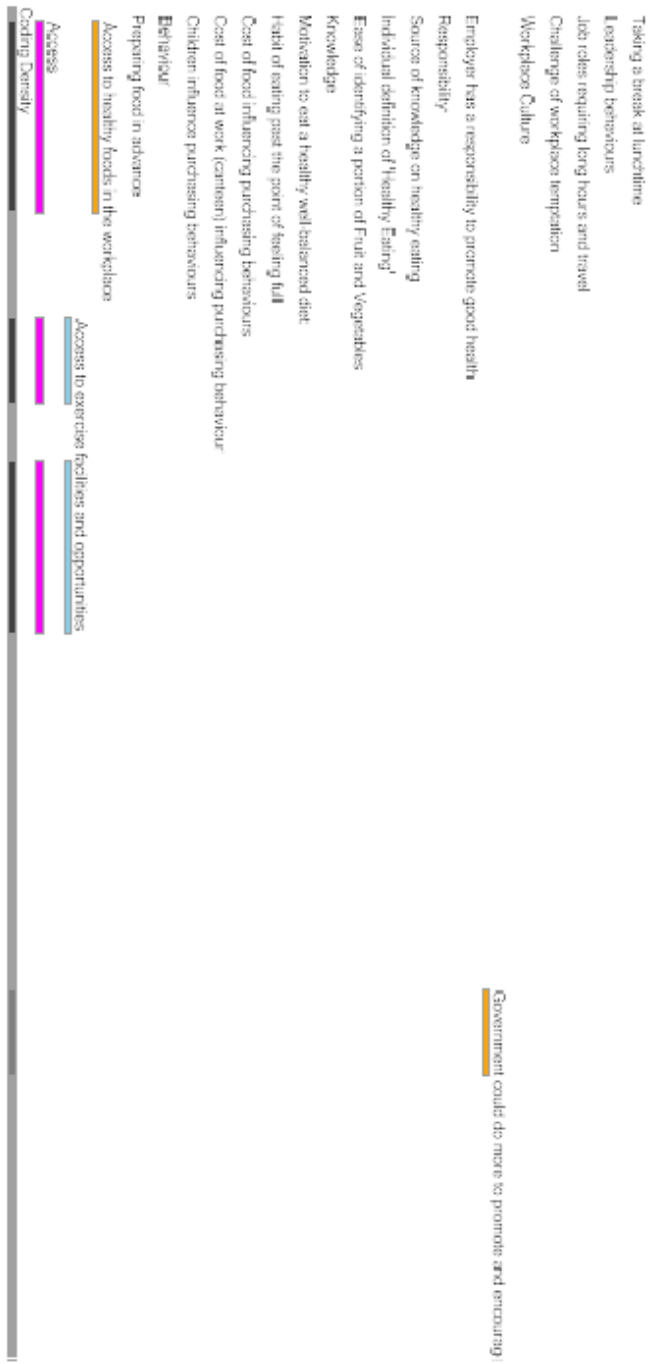
I:	**Is there anything else that a business could do to help people to get healthier? So not just in terms of healthy eating, are there any other suggestions you have? So not just for Royal Mail but for any organisations looking to support their employees?**

R:	I think we're very sedentary now. We all spend a lot of time sitting and a lot of time at computers. So I think if we can encourage people to move about more and be more active. I mean I know some days, the furthest I'll walk is to the toilet and back! And that's not healthy! I mean I know I've got a thing that counts your steps, and some days I've done less than 3,000 steps! But other days where I've been walking about London and getting on and off tubes and in and out of different places, I'll do 9,000 steps. So we should really… I think we could do more to encourage us to be active and be less sedentary at our desks, even if it's take ten minutes in your lunch… take a lunch break because I'm terrible for just sitting at my desk to eat my lunch, so take ten minutes and walk round the building or something, you don't even need to go outside, just do a loop or do a lap of the building or something because I know we're all really guilty for doing that and you do! When I worked in the [location] Distribution Centre years ago, I used to – every day – it was in the middle of an industrial estate and there was nothing there but I used to go out and I used to walk up to the shop and buy a newspaper and walk back and it as like a 20 minute walk but you always felt so much better in the afternoon than when I didn't do the walk. If I didn't go out and get that fresh air and walk, I would have that slump mid-afternoon and I think employers would get a lot more out of people if they were more energised I suppose and by the fact that exercise does energise you as well. So encouraging people to take more exercise during the day while you're at work, I think that would be a good thing and giving people ideas on how they could do it because sometimes we don't think bigger than our square route and that's it.

I:	**And then finally, what do you think perhaps the government could do to support people to get more healthy?**

R:	I think it's quite a difficult one because you can't always legislate for people, can you? I mean I think they give plenty of advice on these things already but I think it's giving people the message on what would happen to them if they don't do it. I think that was the stepping point for me, as I said, we took that photograph, my husband and I – and then you suddenly look at yourself and think I'm in my mid-40s now and I'm diabetic so my risk factor on everything goes up and I'm carrying all this extra weight around, so it's all those risks that we have, and I don't think people necessarily think about that. It's like when people keep smoking even though they know the risks of smoking but they're more encouraged to give it up with the fact that the government have told people, "Listen you could die of lung disease!" Probably the biggest thing that faces our population now is weight problems.

I:	**Yeah, absolutely.**

Taking a break at lunchtime

Leadership behaviours

Job roles requiring long hours and travel

Challenge of workplace temptation

Workplace Culture

Employer has a responsibility to promote good health

Responsibility

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Ease of identifying a portion of Fruit and Vegetables

Knowledge

Motivation to eat a healthy well-balanced diet

Habit of eating past the point of feeling full

Cost of food influencing purchasing behaviours

Cost of food at work (canteen) influencing purchasing behaviour

Children influence purchasing behaviours

Behaviour

Preparing food in advance

Access to healthy foods in the workplace

Access

Coding Density

Access to exercise facilities and opportunities

Government could do more to promote and encourage

R: And the fact that it's a ticking time bomb of people who are now a lot heavier than their parents were at the same age and how do we redress that balance? So I suppose the government needs to do something because otherwise they'll have lots of people who are diabetic, lots of people who will then have strokes and heart attacks and complications of being overweight and all the things that go with that. So I suppose they need to take action now to try and encourage people to eat healthier and exercise more because it's all part and parcel, isn't it, the same thing?

I: **I mean some people may say, "Well it's absolutely none of your business what I do." They may say that to the government and they may say that about their employer as well. So what would you say to them?**

R: I think the government and an employer have a duty of care because as an employer, how many days do we lose by people being unwell because… even the fact, again, since I've lost weight and I've eaten healthier, I've not had as many colds, I've not had as many stomach problems and discomfort. All those things have an effect on my general wellbeing and health is so much better in the last year than it's been I'd say for maybe the past ten years.

I: **Okay, brilliant!**

R: Which was the last time I'd lost quite a bit of weight after I had my wee girl. So I lost a lot of weight after I had her and then I've just yo-yoed up and down in between. So I think that if you can sell to people the benefits of being slimmer, and that's what I mean about slimmer. I've said this time I wasn't going to set myself an unrealistic target and say I'm going to be eleven stone. I said if I could get to be a size fourteen and I get to that weight, and I can maintain myself at that weight, that will be healthier than me trying to achieve something that I can't achieve and then feeling a failure and then being miserable and then doing the yo-yo thing up and down, and that's worked for me. it's worked for me saying if I can get to that weight and then maintain that weight, I think that that's been a lot healthier for me than having this unachievable goal and then finding it difficult to get to and then struggling with it and then just saying I give up, I'll stick with this. So I think I mean I still go to my diet class every week and they're queued out the door because people are determined to lose weight. But I think there is this problem out there and I think that employers and the government have a duty of care to try and encourage people because it's better for the wellbeing of the people and probably society if we all lived a healthier life. We would all feel a lot better. I don't think there would be so much depression. There wouldn't be so much misery if we just all tried to be a bit healthier.

I: **Absolutely.**

R: Sorry, I sounded a bit like a soapbox!

I: **No brilliant, absolutely! Is there anything else that we haven't talked about that you wanted to add or any healthy behaviours?**

R: No. I mean I think for me, what I found, is that being diabetic and dependent on insulin, I think sometimes in the workplace that can be quite difficult because people don't understand. They let meetings overrun, they don't think about lunch breaks for people, and I find that can be quite difficult as somebody who needs to eat at a regular interval. I've been in meetings where they just keep running on and then by the time they're finished the canteen is closed and you

Leadership behaviours

Job roles requiring long hours and travel

Challenge of workplace temptation

Government could do more to promote and encourage healthy eating

Employer has a responsibility to promote good health

Responsibility

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Ease of identifying a portion of Fruit and Vegetables

Knowledge

Motivation to eat a healthy well balanced diet

Habit of eating past the point of feeling full

Cost of food influencing purchasing behaviours

Cost of food at work (canteen) influencing purchasing behaviour

Children influence purchasing behaviours

Behaviour

Preparing food in advance

Access to healthy foods in the workplace

Access to exercise facilities and opportunities

Access

Coding Density

Workplace Culture

Taking a break at lur...

8A

410

think how am I going to get something to eat? And before you know it, you're at a vending machine looking at a packet of crisps and a chocolate bar. So I think the responsibility sits with all of us to think a little bit more about other people and how… not just saying because I'm diabetic, but if we're having meetings, you need to plan in breaks in the meetings and plan in a proper lunch break and stick to those times and make sure when you plan it, the canteen's open or there's the ability to access decent reasonable food at a time when you're taking a break because that's a constant frustration to me and I mean I've been there and then you're running about and then as I said, your only option is something out the vending machine where it's crisps and chocolate and that's not good at all.

So I think that's one of the things for me as an employer, any business should be looking to make sure that they… because that's got to be part of the welfare of people and looking after them and of planning that in. But I think I covered everything that I was thinking about with it but it's interesting that you're doing something like that because I think we must have… because we've got a workforce that ranges a significant age range, but the majority being in the older age bracket, the 45 plus, I shouldn't say older – middle aged bracket! It will be interesting to see what kind of results, what the eating habits of people are in our business, and it will differ I suppose when you go to operational people as opposed to non-operational people. People who work on the frontline and therefore are more… burn more energy because their walking distance or they're working in the mail centre and they're sorting a lot of stuff so they need to eat more to give them energy to keep going through the day. Where somebody like me who's quite sedentary and doesn't move a lot, how you balance that as a company and how you advise people I suppose. It's interesting.

I: **I will be sharing, as I say, the outputs with the business on the completion of the interviews, so thank you for taking part and giving your feedback to the business.**

R: It's really difficult but if there was an option there, people would take it. But the fact that there's not an option there… quite interesting, my husband, I've mentioned he was a chef, he's head of catering in the prison service, a prison in Kilmarnock, and he has to – with government guidelines – he has to stick to giving healthy options and so much fruit and veg and portion sizes and all sorts of things and quite constricted by budgets. So he's got to feed three meals a day on something like £2.50 a head. He said it is absolutely possible to do healthy on a budget because as he says, you bulk out… you might not be able to afford to put a lot of chicken in a curry but you can put lots of veg in a curry and that will reduce the cost of the curry. So it was quite interesting you were saying about just healthy eating doesn't necessarily have to cost and I don't think it does. I think you can do it. You just need to think and plan ahead and understand what you're putting into your recipes to make them healthier and I think that's been the eye opener. When you start looking at what you're eating and you start picking up packets and you look on the back and you go really?! there's that much sugar in that?! Because that's the thing with a lot of things that are supposed to be low fat, you look at the low fat and you think oh that's really great, there's no fat in that! and then you look at the sugar content and you think well that's a waste of time me having that and you put it back down again because it's full of sugar to make it taste better because there's no fat in it!

I: **Thank you, and have a good day.**

Taking a break at lunchtime

Leadership behaviours

Job roles requiring long hours and travel

Challenge of workplace temptation

Workplace Culture

Government could do more to promote and encourage healthy eating

Employer has a responsibility to promote good health

Responsibility

Source of knowledge on healthy eating

Individual definition of 'Healthy Eating'

Ease of identifying a portion of Fruit and Vegetables

Knowledge

Motivation to eat a healthy well-balanced diet

Habit of eating past the point of feeling full

Cost of food at work (canteen) influencing purchasing behaviour

Children influence purchasing behaviours

Preparing food in advance

Access to healthy foods in the workplace

Access to exercise facilities and opportunities

Access

Coding Density

Cost of food influencing purchasing behaviours

Behaviour

9A