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UNIVERSITY OF SOUTHAMPTON

FACULTY OF MEDICINE

Human Development and Health

Improving the diets of preschool children

by

Megan Rosie Jarman

Thesis for the degree of Doctor of Philosophy

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UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF MEDICINE

Public Health Nutrition

Thesis for the degree of Doctor of Philosophy

IMPROVING THE DIETS OF PRESCHOOL CHILDREN

By Megan Rosie Jarman

The quality of young children's diets in the UK is a cause for concern. Research to identify influences on children's diets has largely focused on those within the child's immediate environment, identifying a number of maternal, child and home environment characteristics which appear to be important. However, these are commonly studied either in isolation or in conjunction with only a few others, which limits understanding of their relative importance and whether they interact to determine child's quality of diet. Therefore this thesis set out to address two research questions: 1) How do maternal, child, and mealtime environmental, characteristics interrelate to influence preschool children's quality of diet? 2) Does an intervention aimed at improving the diets and lifestyles of women impact on their preschool children's quality of diet?

A subset of mothers enrolled in the Southampton Initiative for Health (SIH) intervention, and who had young children, were interviewed at baseline (n348) and again two years later (n228). Questionnaires were completed by mothers, on behalf of their children. Children's quality of diet was assessed using a short FFQ, developed and validated as part of this project. Maternal feeding practices and children's mealtime environments were also assessed. Data on mothers' psychological characteristics including self-efficacy, sense of control over life, food involvement, and well-being, and household food security were examined. Four focus group discussions were held with mothers of young children to explore further the associations observed in the baseline data.

At baseline, cluster analysis was performed on the maternal psychological data. Mothers fell into one of two clusters which were termed 'more resilient' and 'less resilient'. Compared to those in the more resilient cluster, mothers in the less resilient cluster felt less in control of their life, less able to overcome challenges both in general and those specific to eating healthily, had lower levels of well-being and gave food low priority in their lives. Mothers in the less resilient group had children with poorer quality diets, and they managed their child's mealtime environment differently, using fewer covert feeding strategies to limit their child's exposure to undesirable foods, and encouraging their child to eat meals while sitting at a table less often than those who were more resilient. Their children were also more likely to consume take-away foods and spend more time sitting in front of a screen. Further analyses also showed these baseline factors remained important predictors of children's quality of diet two years later. The focus group discussions indicated that mothers felt mealtimes were particularly stressful, and as a result, feeding their children healthily was sometimes a lower priority than reducing conflict. Children's temperament and fussy eating added to the stress of mealtimes and some mothers felt unable to control these situations.

Analyses showed that the SIH intervention had not improved the quality of diet of mothers or children. The intervention may have been more effective if it had been better targeted and evaluation in a larger sample would have been advantageous.

This is the first study to consider the combined influences of maternal psychological characteristics and child and mealtime characteristics in determining young children's quality of diet. The findings suggest that supporting mothers to feel more able to manage stressful mealtime situations, as well as encouraging use of covert feeding strategies and eating meals at a table, would be important elements in future interventions. Recognising that mothers may feel unable to implement recommended healthy behaviours due to family functioning at mealtimes is key if we are to improve the diets of preschool children in the future.

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DECLARATION OF AUTHORSHIP

I, Megan Rosie Jarman

declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

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I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given.
With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. Parts of this work have been published: Please see Outputs from this project (page xix)

Signed:

Date:

Declaration – detailed

I have undertaken the following tasks for this research project:

- I performed the search and review of the literature on the influences on children's diets.
- I developed the survey methods and questionnaires which were used in this project, as well as the accompanying materials such as survey protocol, prompt card and participant information sheets.
- I wrote the ethics applications for this the surveys and focus groups under the supervision of Professor Hazel Inskip.
- I developed and conducted the evaluation study for the short FFQ; including writing the protocol, the ethics amendment application and carrying out all of the surveys. The development of the short FFQ was carried out with assistance from Dr Sarah Crozier, and based on the methods that she developed.
- I cleaned and analysed the survey data with assistance from MRC statisticians Georgia Ntani and Professor Hazel Inskip.
- I developed the protocol and accompanying materials for the focus groups with guidance from Dr Wendy Lawrence.
- One of the focus group discussions was moderated by Dr Wendy Lawrence, which I observed as part of my training. I moderated the other focus groups.
- I analysed the focus group data with the assistance of Ileana Cahill, an MSc student, and under the supervision of Dr Mary Barker and Dr Wendy Lawrence.
- I wrote this thesis

The children's baseline and follow-up questionnaires were mainly administered by two fieldworkers; Lorraine Conroy and Elaine Douglas.

The Southampton Initiative for Health intervention was a piece of work carried out jointly by the Medical Research Council (MRC) Lifecourse Epidemiology Unit (LEU), University of Southampton and the National Institute of Health Research (NIHR) funded Southampton Nutrition Biomedical Research Unit. The development and delivery of the intervention was not carried out for the purpose of this PhD. In addition the outcome evaluation of the SIH on the diets and lifestyles of women was not carried out for this PhD project although I use some of the data from these surveys

Outputs from this PhD project

Awards:

I was awarded the 2010 Louis Bonduelle foundation research award of €10,000 for this project.

I was awarded the Highly Commended Poster Prize by Professor Dame Sally Davies at an NIHR Experimental Training Camp 2011.

Collaborations:

A formal collaboration has been established with Professor Jane Ogden, University of Surrey, who developed the maternal feeding practices scale which is used in the surveys. She has provided useful input into part of the analysis plan for the PhD project.

Publications:

Barker M, Baird J, Lawrence W, **Jarman M**, Black C, Barnard K, Cradock S, Davies J, Margetts B, Inskip H, Cooper C. The Southampton Initiative for Health: a complex intervention to improve the diets and increase the physical activity levels of women from disadvantaged communities *Journal of Health Psychology* 2011 16(1):178–91

Jarman M, Lawrence W, Ntani G, Tinati T, Pease A, Black C, Baird J, Barker M, and the Southampton Initiative for Health Study Group. Low levels of food involvement and negative affect reduce quality of diet in women of lower educational attainment *Journal of Human Nutrition and Dietetics* 2012 25(2): 444–452

Black C, Lawrence W, Cradock S, Ntani G, Tinati T, **Jarman M**, Begum R, Inskip H, Cooper C, Barker M, Baird J. Healthy conversation skills: increasing competence and confidence in front-line staff *Public Health Nutrition* 2012

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Jarman M, Inskip H, Ntani G, Cooper, Robinson S, Barker M. What influences the diet of preschool children? A principal component analysis of maternal, child and mealtime environment characteristics (Conference Abstract) *The Lancet Online* 2013 (In press)

Baird J, **Jarman M**, Lawrence W, Black C, Davies J, Tinati T, Begum R, Mortimore A, Robinson S, Margetts B, Cooper C, Barker M, Inskip H. What is the effect of a behaviour change intervention on the diets and physical activity levels of women attending Sure Start Children's Centres in Southampton? Findings from a non-randomised controlled trial. *Journal of Epidemiology and Community Health* 2013 (submitted)

Lawrence W, Black C, Tinati T, Cradock S, Begum R, **Jarman M**, Pease A, Margetts B, Davies J, Inskip H, Cooper C, Baird J, Barker M. 'Making every contact count': evaluation of the impact of an intervention to train health and social care practitioners in skills to support health behaviour change *Journal of Health Psychology* 2014 (In press)

Jarman M, Inskip H, Ntani G, Cooper, Baird J, Robinson S, Barker M. Influences on the diet quality of preschool children: importance of maternal psychological characteristics *Public Health Nutrition* 2014 (Submitted)

Presentations:

ISBNPA 2011 Melbourne Better maternal diet and a covert style of control over children's eating habits improve the quality of children's diets – Oral presentation

DOHaD 2011 Portland Parenting control practices over children's eating habits may be a focus for public health interventions – Poster presentation

UKSBM 2011 Stirling Who uses covert control over children's eating habits? – Poster presentation

ISBNPA 2012 Austin Development of a short food frequency questionnaire to assess the dietary pattern of pre-school children – Poster presentation

ISBNPA 2013 Ghent Does maternal use of overt and covert control practices on pre-school children's quality of diet change as children age? A longitudinal analysis – Oral presentation

Megan Jarman

Population Science conference 2013 Southampton What influences the quality of diet of preschool children? A principal component analysis of maternal, child and mealtime environment characteristics – Oral presentation

UK Public Health Science conference 2013 UCL Child Health Institute What influences the quality of diet of preschool children? A principal component analysis of maternal, child and mealtime environment characteristics – Poster presentation

Megan Jarman

**I dedicate this work to my wonderful parents Lorraine and John.
For always encouraging me to believe ‘I can do it’.
I am eternally grateful.**

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List of abbreviations

ALSPAC – Avon Longitudinal Study of Parents and Children

BMI – Body Mass Index

DEFRA – Department for Environment, Food and Rural Affairs

FFQ – Food Frequency Questionnaire

GCSE – General Certificate of Secondary Education

GIS – Geographical Information System

GPPAQ – General Practice Physical Activity Questionnaire

HFSS – High Fat, Salt, or Sugar

HOME – Healthy Offerings via the Mealtime Environment

IMD – Index of Multiple Deprivation

INFANT – Infant feeding, Nutrition and Activity Trial

LACORS – Local Authorities Coordinators of Regulatory Services

LINDNS – Low Income National Diet and Nutrition Survey

MAR – Mean adequacy ratio

MJ – Mega Joule

NDNS – National Diet and Nutrition Survey

NEAT – Nutrition Education Aimed at Toddlers

PCA – Principal Components Analysis

SACN – Scientific Advisory Committee on Nutrition

SD – Standard Deviation

SFVS – School Fruit and Vegetable Scheme

SIH – Southampton Initiative for Health

SWS – Southampton Women’s Survey

UK – United Kingdom

USA – United States of America

WHO – World health Organisation

1 Background to children's diets

1.1 Children's diets in the UK

In 2008 the Scientific Advisory Committee on Nutrition (SACN) released a report on the Nutritional Wellbeing of the British Population⁽¹⁾ which reviewed the results of the National Diet and Nutrition Survey (NDNS)⁽²⁾. The NDNS aimed to provide a comprehensive cross-sectional picture of the dietary habits and nutritional status of the UK population. The SACN report of the NDNS findings highlighted the poor diets of young children, and that improving the quality of the diets of children was an important area for investment. While 'quality of diet' is a broad description, it is generally defined as "adherence to dietary recommendations" and describes the foods, rather than the nutrients, that an individual consumes⁽³⁾. A good quality diet is characterised by high intakes of unprocessed, nutrient dense foods e.g. fruits, vegetables, whole-grains etc and conversely a poor quality diet is characterised by frequent intakes of foods high in fat, salt or sugar e.g. chips, white-bread and soft drinks⁽⁴⁾. The SACN report indicated that poor quality diets were common among children aged 1.5–4.5 years, especially those from low socio-economic groups. The quality of diets of young children in the UK is therefore a current concern.

The data for children aged 1.5–4.5 years, reviewed by SACN, were collected between July 1992 and June 1993. More recent information on the quality of children's diets in the UK that has been provided by two large cohort studies, suggest that little has changed in the intervening decades. In the Avon Longitudinal Study of Pregnancy and Childhood (ALSPAC) a total of 10,193 three year old children had their diets assessed using a postal food frequency questionnaire (FFQ) which was completed by the child's main caregiver, between 1994 and 1996. These children were found to consume diets which ranged in quality, with the poorest having high intakes of fatty and sugary convenience foods such as crisps, biscuits and chips, and those with the best diets having high intakes of foods generally regarded as healthy, such as vegetables, fruit and fish. ALSPAC also confirmed that children consuming the poorer quality diets were more often those who came from more disadvantaged families^(5;6).

The Southampton Women's Survey (SWS), a large prospective cohort study, offers a more recent picture of children's diets. Southampton is a relatively deprived city in the affluent south of England. Southampton is ranked eightieth among the most deprived local authorities in England out of 326 such areas⁽⁷⁾. Analysis of data for 1645 children, whose diet was assessed at the age of three years, was carried out from 2001–2003. As in ALSPAC the SWS showed great variation in the quality of children's diets and that there was great disparity between children eating the best and poorest quality of

diets⁽⁴⁾. Those with the best quality diets consumed higher quantities of vegetables, fruit, water, whole-grains, fish and yogurt. Conversely, those with the poorest quality diets were consuming higher quantities of white bread, chips, crisps, low calorie soft drinks and confectionery. The SWS described very similar diets in mothers and their children such that the children who had the worst quality diets tended to have mothers who had poorer quality diets themselves. Independent of maternal diet quality, mothers who had fewer formal qualifications had children with poorer quality diets⁽⁴⁾.

These studies suggest that there has been little improvement in the quality of young children's diets since the SACN review and, worryingly, that there is still a substantial proportion of children in the UK with suboptimal diets.

1.2 Importance of diet in early childhood

The Marmot review of health inequalities (2011) describes the importance of, and proposes strategies for, reducing health inequalities in the UK⁽⁸⁾. The first objective laid out in the report is "to give every child the best start in life" which states that improving health behaviours such as healthy eating during the first five years of life will have a positive influence on children's development, educational attainment, and risk of later disease.

1.2.1 Development – body composition and obesity

Levels of childhood overweight and obesity have increased dramatically over the last few decades. In the UK, currently one in five children begins primary school overweight or obese⁽⁹⁾ and the rates are even higher among children from lower socio-economic groups⁽¹⁰⁾. It has been suggested that young children whose diets consist of high intakes of energy-dense, high fat and high sugar food and drinks and who have high levels of sedentary behaviour are at greater risk of developing overweight and obesity in childhood and later life⁽¹¹⁾. The early effect of variation in infant diet on children's body composition has been demonstrated in the SWS⁽¹²⁾. In 536 children, quality of diet was assessed at 12 months; fat mass, lean mass and body mass index (BMI) were measured at four years. A poorer quality of diet at 12 months old was associated with lower lean mass in the children when they were four years old; short duration of breast-feeding was associated with greater adiposity at four years. These findings were independent of confounding factors such as infant birth weight, and child height at age four. Overweight and obesity have been shown to track from early to mid-childhood and to adulthood^(13;14). This is concerning as obese children who go on to become obese adults have been found to have increased cardiovascular disease risk factors such as hypertension, insulin resistance and increased triglyceride and low-density lipoprotein cholesterol levels^(14;15). However there is promising evidence that the

greater health risks of overweight children can be changed. A recent study analysed data from four prospective cohort studies in Europe and showed that people who were overweight or obese as children but were normal weight by adulthood had a similar risk of developing type two diabetes and cardiovascular disease as those who were never obese. Whereas those who were overweight or obese as children and who still had a high BMI as adults were at greater risk of developing these diseases⁽¹⁵⁾. Thus, if children who are overweight are able to develop healthy dietary behaviours to prevent them becoming overweight adults then they may reduce their vulnerability to chronic disease.

1.2.2 Tracking of dietary behaviours

Dietary patterns and eating behaviour traits have also been found to track from childhood to adolescence and into adulthood⁽¹⁶⁻¹⁸⁾. Dietary patterns identified in cohorts of children, measured at multiple time points, have shown moderate to strong stability from three to 21 years of age. In addition, eating behaviour traits such as satiety responses, eating slowly, enjoyment of food, emotional over-eating and food fussiness have also been shown to be stable from age four to ten years old⁽¹⁷⁾. This evidence suggests that food choices and eating behaviours developed in early childhood remain across the life course. Evidence of the tracking of eating behaviours and overweight and obesity highlights the importance of developing healthful behaviours from an early age.

1.2.3 Educational attainment

The quality of a child's diet appears to affect more than their weight and physical health, it may also have an important influence on their educational attainment. In one study, quality of diet at 12 months and IQ (a complex measure of intelligence) at age four was assessed in 241 children. Results showed that children who were fed a better quality diet (high in vegetables, fruit and home prepared meals) at 12 months of age had a higher IQ score at four years and although the increase was modest, it remained statistically significant after adjusting for confounders such as mother's education, intelligence and socioeconomic position⁽¹⁹⁾. This difference may persist as Feinstein *et al* found that children who consumed a diet high in junk food at age three, four and seven years performed more poorly in their national school tests at age ten and eleven years⁽²⁰⁾. This finding was also independent of family characteristics such as maternal educational attainment and parenting style. Furthermore, a large study of 4429 children showed that healthier dietary patterns at six months old were associated with higher IQ test scores at age seven years⁽²¹⁾. Analyses were independent of confounders including maternal, child and birth characteristics. Other aspects of dietary behaviour may also be important for academic achievement, such as children's breakfast habits⁽²²⁾. For example children who were breakfast eaters tended to have a better

quality of diet and nutritional status than breakfast skippers. In terms of the effect on their general academic performance, children who consumed breakfast also tended to have enhanced attention, concentration, memory, school attendance and higher academic test scores⁽²²⁾.

1.2.4 Disease risk

The children of today will be the parents of tomorrow. Because eating behaviours track, the quality of young children's diets has the potential to not only affect their own risk of disease in later life but also to impact on the health of their children and therefore future generations. Emerging evidence continues to highlight the importance of a woman's quality of diet before and during pregnancy for her offspring⁽²³⁾.

Adequate nutrition in the womb is essential to support the development and growth of a fetus, although the complex interaction between maternal nutrition and fetal outcomes remains poorly understood. There is, however, a substantial body of research that suggests poor fetal growth and slower child growth are associated with increased mortality and morbidity later in life. Evidence from studies across the world consistently indicates that men and women who were of low birth weight have a raised risk of developing diseases such as cardiovascular disease, type-two diabetes and hypertension in adulthood⁽²⁴⁻²⁸⁾. This highlights the importance of diets of sufficient quality to enable young women to meet the nutritional demands of pregnancy. Establishing a good quality diet early in life, that tracks into adulthood will support childhood growth and development but also future pregnancies. This suggests that improving nutrition behaviours and the quality of diet of young children today could not only improve their own health through the life course but is also of importance for the health of future generations.

Although the quality of diets of young children is important, poor quality diets are common in the UK. However, before interventions can be developed to improve the diets of young children it is first necessary to explore the factors which may impact on the quality of children's diets in order to identify possible levers for change. Therefore the next chapter in this thesis will describe a review of the literature on the determinants of preschool children's quality of diet.

2 What influences children's diets?

The following chapter is a review of the literature on the determinants of preschool children's quality of diet. The aim of this chapter was to identify gaps in the evidence and develop research questions to address these inconsistencies.

Ecological systems theory suggests that development of behaviours, such as eating behaviour, can only be explained by consideration of both the immediate context, or ecological niche, within which an individual is embedded, and the wider contexts which influence the individual's immediate context⁽²⁹⁾. For instance, for a preschool child, the immediate context is the family, which is in turn embedded in the wider social context of the community. As well as these wider contexts there are also child characteristics which are likely to interact with family and community characteristics to affect development of certain behaviours. Ecological systems theory represents a useful way of considering the development of and influences on eating behaviours and diet quality. Pictorial models can visually represent the complexity of the factors which influence quality of diet. However, no such ecological model has yet been published to demonstrate the influences on the quality of preschool children's diets. Given the suggested relationship between diet and weight status⁽¹¹⁾ it is likely that some of these will also influence diet. Figure 2.1 shows an ecological model of influences on children's weight status which sets out potential key determinants in each context⁽³⁰⁾. This review of the literature uses the ecological model as a structure and considers factors operating at each of the levels in the model, but as determinants of variation in quality of young children's diets.

The review of the literature was systematic in its approach. A protocol explaining the search strategy is given in Appendix A. The databases EMBASE, MEDLINE, PsycInfo and ISI Web of Knowledge were searched for articles using the search terms described in Appendix A, which reflected an aspect of diet quality, in addition to the term 'child'. The majority of articles retrieved were excluded due to the age of the study population, being older or younger than preschool age. In addition to the articles retrieved using the search strategy, additional articles, such as government policy documents and reports were retrieved from governmental websites. Searches were performed using different terms for the outcome variable (e.g. diet, junk food, high fat etc) and the term child. It was expected that searching on the outcome variables would identify the influencing factors which have been explored in the literature; however, additional searches were performed on the determinants included in the ecological model (Figure 2.1) and bibliographies of retrieved articles were scanned, to increase the likelihood of identifying all eligible articles.

The review shows that there has been relatively limited research that addresses influences on the quality of young children's diets. Much of the literature to date has focused on influences on weight status or obesity as an outcome, rather than factors influencing quality of diet. The evidence which does exist on factors influencing young children's diets has largely considered maternal influences, as mothers are often the food 'gatekeepers' for their children. The following review considers what is known about influences on the quality of young children's diets at each level of an ecological model, with the intention of creating a new model which will indicate both the gaps in what is known and where there are potential levers for change.

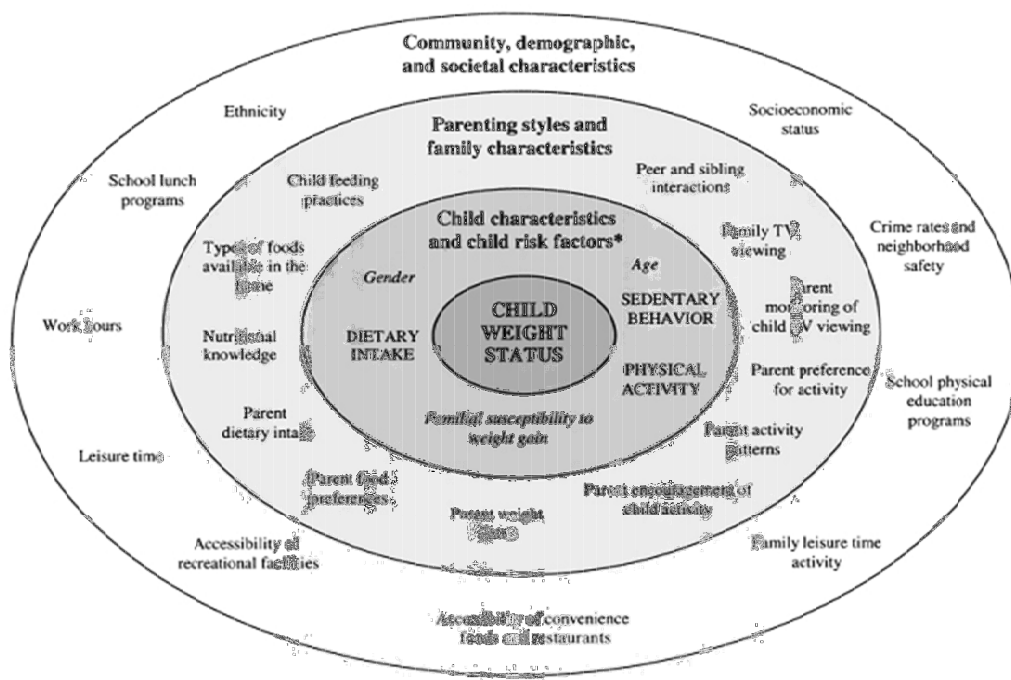


Figure 2.1 Ecological model displaying layers of influences on children's weight status

2.1 Community, demographic and societal characteristics

Children are exposed to food in many scenarios. In the wider community children are readily exposed to foods in childcare settings and food retail outlets where policies, legislation and guidelines are in place to inform and influence food provision to young children. The actual effect of these wider influences on children's quality of diet is sometimes challenging to quantify, however, as evaluation of factors at the wider level is limited.

2.1.1 UK Policy and legislation

Between 1999 and 2009 the government published over 25 policies relating to the health of under-fives⁽³¹⁾. These largely aimed to reduce health inequalities in children through targeted service provision.

In 1997 an independent inquiry into inequalities in health, led by Sir Donald Acheson, was commissioned to review the latest information on inequalities in health and to identify priority areas for policy development in order to combat growing health inequalities⁽³²⁾. In response to this report, the government established Sure Start in 1999. Sure Start local programs (now Sure Start Children's Centres) were a key early development for children under five years old and their families. They were set up with the intention of working with parents and families to reduce health inequalities by promoting social, intellectual and physical development of infants and young children, particularly in deprived areas of the UK. Sure Start Children's Centres offer services including healthcare, parenting skills, quality play and learning experiences and family support. Whilst they were originally set up in the 20% most deprived wards in the UK, they have now expanded to serve the whole community. The government originally aimed to have 250 Centres in operation. There are now more than 3600⁽³³⁾. There is an on-going national evaluation of Sure Start. In 2008 Melhuish and colleagues reported that children and their families benefited from living in Sure Start local programme areas⁽³⁴⁾. Families with three year old children in areas with the Sure Start local programme showed less negative parenting, provided a better home-learning environment and had children with more positive social behaviour and greater independence, when compared to families living in similarly deprived areas without the programme. Despite providing an opportunity to influence the diets of families through cooking programmes and snack provision in the centres, no nutrition related policies existed, until recently, to specify food to be provided by or consumed within the Centres. To date, dietary outcomes have not been part of the evaluation of Sure Start Children's Centres. However, the anticipated impact of manipulating the food provision in children's centres on children's food intake can be compared to the experiences of the school fruit and vegetable scheme (SFVS) which the Government implemented in 2004. The SFVS provided children between 4–6 years old with one piece of fruit or vegetable on every school day, with the intention to increase children's overall consumption. At three months following the implementation of the scheme, children in school year reception and one (aged 4 and 5 years) were consuming, on average, 0.5 and 0.7 more portions of fruit and vegetables compared to baseline intakes, which fell to 0.2 portions in both age groups after seven months. In school year 2, intakes were increased at three months but these effects had disappeared at seven months when the children were no longer eligible to receive the free fruit and vegetables⁽³⁵⁾. This suggests that changing the food provision in Children's Centres, by

serving fruit and vegetables, is likely to impact on children's fruit and vegetable intake but that it may not result in a sustained change after ceasing to attend the Children's Centre.

In 2004 the government further addressed the need to make a societal change in order to reduce inequalities in children's services. They released a green paper entitled '*Every Child Matters*'. The paper described the aims against which all services for children and families would be assessed. These were: 1) be healthy, 2) stay safe, 3) enjoy and achieve, 4) make a positive contribution and 5) achieve economic well-being. Central to this policy was to 'give every child the best start in life'. Following this in 2006, the national welfare food scheme was replaced with the *Healthy Start* programme which aimed to influence the diet and nutrition of vulnerable pregnant women and their children. The welfare food scheme provided low-income pregnant women and families with children under five years old with vouchers for milk, infant formula and vitamins, the new *Healthy Start* scheme provided additional vouchers to purchase fresh fruit and vegetables. Mothers under the age of 18 or who were in receipt of benefits or tax credits could apply for the vouchers. In order to encourage low-income women and families to also engage with antenatal, postnatal and child services, the programme stipulates that applications must be approved by a health professional. As part of engaging with health professionals women are offered counselling and support for breastfeeding to try and encourage uptake in this population. An evaluation of the improvement in dietary behaviours of a sample of women registered to the Healthy Start scheme in Sheffield indicated improvements in certain nutrient intakes⁽³⁶⁾. This evaluation set out to assess the impact of the fruit and vegetable vouchers and increased support on food and nutrient intakes, none of the women in the Healthy Start scheme in this study had been provided with the vitamin supplements. This evaluation reported that women in the Healthy Start scheme consumed more fruit and vegetables (3.3 portions per day) compared to women who had taken part in the welfare food scheme (2.4 portions per day). In addition, women in the Healthy Start scheme had higher intakes of energy, iron, calcium, folate and vitamin C. These differences were independent of confounders (age, education level, number of children, etc). This study suggests that the Healthy Start scheme has beneficial effects on the dietary intakes of women registered to the scheme. However, a qualitative evaluation of the Healthy Start program with parents and health professionals has suggested that uptake of the program is poorer than desired⁽³⁷⁾. The most common barrier to receiving the Healthy Start vitamins was access and awareness. Mothers suggested that they were unsure about the need to take vitamins and that they received little advice from their health visitor about it. In addition, health visitors stated that their workload pressures and infrequent contact with mothers inhibited them from promoting or advising on the Healthy Start vitamins. This

suggests that for mothers who do receive the scheme, there are dietary benefits but many mothers are being missed due to poor awareness and limited capacity of health visitors.

More recently the Government have established the Early Years Foundation Stage, which sets the statutory standards which all early years providers must meet. It is a statutory framework that sets the standards for the learning, development and care of children from birth to five years old⁽³⁸⁾. All registered early years settings are inspected against the framework. Within this framework, specific guidance on food and drink provision states that all meals, snacks and drinks served in these settings must be healthy, balanced and nutritious and that water must be provided at all time. There must also be an area which is adequately equipped to provide healthy meals, snacks and drinks for children. The framework does not, however, define what it considers to be healthy, balanced or nutritious food. The food and drink guidance to accompany the Early Years Foundation Stage framework is discussed in more detail in section 2.1.2.

As recognition of the need to develop more targeted policies to combat diet-related ill health grew, the Department of Health released a public health white paper entitled *"Choosing Health"* which emphasised the need to develop strategies to combat increasing levels of childhood obesity. At the same time a review of the evidence on the effects of food advertising to children was commissioned by the Food Standards Agency. The Hastings review of research on the effects of food promotion to children was published in 2003⁽³⁹⁾. The authors found that many of the foods advertised to children were not consistent with healthy eating patterns. The majority of foods promoted to children were pre-sugared breakfast cereals, soft drinks, confectionary, savoury snacks and fast food. In addition the advertisements used fun and fantasy rather than health and nutrition to promote consumption. A number of studies reviewed demonstrated that food advertising elicited an effect on children's food behaviour. Children of primary school age were found to be influenced by advertising when it came to choosing playtime snacks in that children more often chose the advertised snack than non-advertised snacks⁽⁴⁰⁾. There was also evidence to suggest that preschool children 'liked' foods they had observed in an advertisement more than non-advertised foods⁽⁴¹⁾. In addition, low-income children between the ages of 2-6 years who were exposed to adverts of different foods and then asked to choose between the advertised and non-advertised food, results were compared to a control group who were not exposed to the advertisements⁽⁴²⁾. Children in the experimental group were more likely to choose the advertised food on seven out of nine times. In addition two adverts were shown to the experimental group twice which resulted in the experimental group being three times more likely than the control group to choose

that food, which was the largest differences between the groups. This suggested that there was an additional effect of exposure intensity. Establishing the link between exposure to advertisements and actual food intake is challenging. Although a number of studies had attempted to assess the effects of food promotion on diet and obesity in children with conflicting results. The review suggested that there was modest evidence for the effect of food promotion on food consumption. The review concluded that there was substantial advertising to children and the advertised diet was at odds with one recommended by health experts, and, that food promotion may influence children's food preferences. In response to this review and to the growing body of research describing the influence of food promotion on children's food preferences, purchasing requests and consumption⁽⁴³⁾, Ofcom pledged to regulate the advertising of food to children. Ofcom is the independent regulator of television, radio, telecommunications and wireless communications in the UK. Part of their role is to set standards and regulations for television advertising. The new regulations, which came into force in 2009, stated that advertisements for food products high in fat, salt or sugar (HFSS) must not be shown during programmes specifically made for children (including pre-school children). This measure removed all HFSS advertising from dedicated children's channels and from being shown in or around programs of particular appeal to children under 16. These restrictions also applied to program sponsorship by HFSS food and drink products. Alongside these scheduling restrictions, Ofcom also revised rules about the content of all food and drink advertising to children. Key elements of the content rules included a prohibition on the use of licensed characters, celebrities, promotional offers and health claims in advertisements for HFSS products targeted at pre-school or primary school children. Independent evaluation of these regulations is scarce. Evaluation of the impact of these regulations on the food consumption patterns of children is difficult since most of the exposure and impact takes place in uncontrolled settings, like in the home, it is challenging to be able to attribute changes in behaviour to a single exposure. However, Adams *et al* conducted repeat cross-sectional studies to assess the exposure of children to HFSS advertising before and after the regulations came into force. They gathered detailed information on all advertisements broadcast and viewing data for children aged 4–15 years from a UK audience research bureau six months before and six months after the regulations came into force, for a period of a week at each time point. They then assessed changes in HFSS advertising to children before and after the regulations. They found that despite appropriate adherence to the regulations, following the regulations 14.5% of advertising person-minute-views (calculated by multiplying the number of children watching an advert by the length of the advert in minutes) were for food, and of these, 60.4% were for HFSS food, compared with 14.8% and 38.6% respectively before the regulations came into force. Therefore relative exposure of children to food advertising did not change and, perhaps worryingly, as a proportion of

all food advertised children were exposed to more adverts for HFSS foods⁽⁴⁴⁾ compared with before the regulations came into force.

In 2011 the government released a new public health white paper entitled '*Healthy Lives Healthy People*'. This paper provided a broad overview of how the new government planned to change the public health strategy for England. The headline message from this paper was that responsibility for improving and maintaining health would move away from central government and focus more on local government and individuals, the rationale for this 'bottom-up' approach being that it would give local government more freedom to develop their own ways of improving public health in their own area. The paper highlights the need to establish healthy behaviours from infancy and specifies that there should be "stronger support for the early years". In order to do this it states that every child will be given the best start in life by increasing health visitor numbers and refocusing services provided by Sure Start Children's Centres towards 'those who need them most'. It also places more responsibility on Sure Start Children's Centres to support improvement in children's quality of diet.

The policy context that governs provision of health services for children is complex. Clearly the government recognises the importance of developing healthful behaviours in the early years of life, and especially in those who are materially disadvantaged. However, reducing inequalities in child health has been a high priority area for many years which would suggest that to date the policies have not had the intended effect. Limited evaluation makes it unclear what impact these policies and the subsequent strategies developed are really having on the diets and diet related health of young children.

2.1.2 Childcare settings

A preschool child's food provision does not solely come from their family. Many spend time in childcare settings where food and drink is usually supplied. In 2010 the UK government carried out a childcare and early years survey of parents. In total 6700, parents with at least one child under the age of 15 were interviewed regarding their child care arrangements. Respondents to the survey came from varied backgrounds with 51% having left education with a General Certificate of Secondary Education (GCSE) qualification or less, and 2890 families having at least one preschool child. The survey found that 84% of three to four year olds in the study had been in formal childcare and the average time spend in care was 6 hours per day⁽⁴⁵⁾. Thus the childcare setting represents an opportunity to influence children's food exposure and quality of diet.

In 1998, the Caroline Walker Trust, a charity which produces expert reports and nutrition guidance for vulnerable people, produced guidelines for childcare settings on food provision for under five year olds in the UK⁽⁴⁶⁾. There have since been a number of studies which have assessed food provision in these settings in the UK. In 2006 a survey of 110 early learning and childcare settings assessing healthy eating was carried out by Ofsted⁽⁴⁷⁾. They judged 64% of day care centres as 'good' or 'outstanding' for provision of healthy food, however, they did not define what they considered as healthy. They stated that the remaining 36% providers that were judged as not meeting standards tended to provide snacks which were 'unhealthy' and that the staff lacked knowledge of individual dietary needs. In 2009 a national survey of food in nurseries was conducted by the Local Authorities Coordinators of Regulatory Services (LACORS)⁽⁴⁸⁾. In total 118 nurseries from 29 local authorities were included in the survey. The main findings were that whilst most were keen to provide healthy food and drinks, none of the meals served met the nutrient guidelines set out by the Caroline Walker Trust and most of the staff interviewed were not aware that there was nutrition guidance available. The nutrition guidelines stipulate the amount of energy, fat, carbohydrate, protein, iron, zinc, calcium, vitamins A and C, and salt, as a percentage of children's reference nutrient intake, that each food provision occasion should provide the child,. The guidelines also state that children should be offered 4–5 different fruits and vegetables at meal and snack times. Many of the nurseries provided meals and snacks which were lacking in energy and some micronutrients and were high in salt, as they often used pre-packaged foods. There were similar findings from a survey in Liverpool of 49 childcare centres⁽⁴⁹⁾. Although here they found that fruit was often provided as a snack, once again meals were not meeting the nutrition guidelines and there was little awareness of any food and nutrition guidance available for early years childcare settings.

More recently, the School Food Trust, now the Children's Food Trust, published new guidance for food and drink provision in early years settings⁽⁵⁰⁾. The guidance is to accompany the Early Years Foundation Stage statutory framework, which all childcare settings will be evaluated against, as discussed in section 2.1. In 2012 the Children's Food Trust carried out a preschool food survey to examine the extent to which current food provision meets the new guidance⁽⁵¹⁾. In total 57 preschool settings from three local authority areas participated. Field-workers visited the settings three times in a week and recorded all food and drink provided for the children, in addition they chose one or two children to record their food consumption in detail. Using a version of the Food Standards Agencies food databank, the nutrient content of foods provided and consumed were calculated. Interestingly of the 348 children who ate lunch at the childcare settings 118 had brought lunch from home. When comparing lunches provided by childcare settings to home brought, those provided by the setting

contained less energy but more protein, fibre, vitamin A and folate, the same amount of zinc and nearly as much iron as the home bought lunches. In addition, children were more likely to eat more of the setting provided lunch. The differences in the nutrient content of the lunches reflected to wider variety offered from the setting provided lunch compared to the home brought lunch. In terms of meeting the guidelines, the report found that most early years settings were providing foods which met the guidelines, however areas for improvement included providing more wholegrain versus white starchy foods, providing more fruit and vegetable options at breakfast, using low salt and sugar versions of pre-packaged foods such as baked beans, and providing a greater variety of protein sources. With regards to nutrient content of meals and snacks, energy intakes were lower than recommended at mealtimes but not at snack-times. Meal and snack content of vitamins A and C, protein and calcium was generally sufficient to meet the guidelines, however, iron and zinc contents were too low and salt content too high. The report concluded that childcare settings were meeting many of the food and drink guidelines but that there were still improvements to be made. Specifically, they encouraged childcare providers to sign up to the Early Years Code of Practice for Food and Drink, a food policy developed by the Children's Food Trust which offers practical support to creating healthier food environments. As well as suggesting that caterers review their menus for iron, zinc and salt content. Whilst this report painted an encouraging view of food provided in childcare settings, it is worth noting, that the sample was not nationally representative and as inclusion in the survey was voluntary the childcare providers that agreed to take part may be those who were already aware of and following the nutrition guidelines.

Clearly food provision at childcare settings has the potential to influence diet quality and eating behaviours of young children. There are a number of guidelines and frameworks to try and regulate the food provided to young children in these settings but the awareness or ability to use these guidelines by the providers may be limited.

2.1.3 Socioeconomic position

Research shows that diet quality often follows a social gradient. The poorest quality diets tend to be consumed by those who are economically and educationally disadvantaged. It has been suggested that there are two main factors which exacerbate dietary inequalities these are that: 1) healthy diets are more expensive, and 2) communities which are more deprived have poorer physical access to healthy food. The second of these, the environmental factors, are discussed in section 2.1.4. This section of the review focuses on the cost of consuming a healthy diet.

In response to reports of dietary inequalities in the UK, the Food Standards agency commissioned the Low Income Diet and Nutrition Survey (LIDNS) which was run as part

of the National Diet and Nutrition Survey programme (discussed in section 1.1). The aim of the LIDNS was to provide nationally robust and representative data on the dietary habits and nutritional status of low income families in the UK. The survey was carried out between 2003 and 2005 and reached a sample of 3728 which represented a mixture of adults up to 65 years and children as young as 2 years old. The results showed that, compared to the results from the national survey, those children who were from a low income family were more likely to consume more of the foods that are indicative of a poor quality diet such as processed meat, added sugar and sugar sweetened soft drinks, as well as consuming fewer foods such as wholemeal bread and vegetables. However, the differences were relatively small which was surprising. In children aged 2–10 years boys and girls were only consuming 1.6 and 2.0 servings of fruit (including juice) and vegetables per day, respectively, compared to 2.0 servings per day in boys and girls combined, in the previous NDNS⁽¹⁾. In addition to information on food consumption the survey aimed to assess some of the factors which may influence food choices of disadvantaged families. Sixty percent of parents in the study reported that they would like to change their child's diet by increasing the amount of fruit and vegetables they consume. The most commonly reported influences on food choices were the price of healthy foods, the quality of fresh produce available and how much money the family had available to spend on food. The survey also included a measure of food security. Food security is defined as having access to enough food to maintain health at all times. In the LIDNS 29% of respondents reported themselves as food 'insecure' meaning they admitted to having to skip meals or not being able to consume a balanced diet because they ran out of money for food. The measure of food security was associated with lower consumption of fruit, vegetables, wholemeal bread, meat and fish, although these associations were confined to women. Men and children seemed less likely to be affected by food insecurity. This was not the case in the SWS which assessed the prudent diet score of three year old children living in food insecure compared to food secure households. They found that children living in food insecure households were more likely to consume a poor quality diet high in energy dense, nutrient poor foods. When this analysis was adjusted for maternal characteristics which predicted food security status e.g. smoking status, social class group, age etc., the association between food security and child's absolute energy intake lost significance, but energy intake per kg of body weight remained significantly higher for those who were food insecure⁽⁵²⁾. In summary, those who are materially deprived tend to have a poorer quality diet and money is clearly an important factor when choosing food. However the question remains; does it actually cost more to eat healthily?

The costs of healthful diets have been studied in many developed countries. Research in the USA assessed the cost per mega joule (MJ) of energy for a range of foods and drinks and found that the nutrient poor, energy dense foods indicative of a poor

quality diet were substantially cheaper than the foods recommended for a healthy diet⁽⁵³⁾. For instance, the energy cost of soft drinks was, on average, \$0.30 per MJ compared to orange juice which was \$1.43 per MJ. In the past, public health promotion messages have aimed to persuade the public to replace energy dense foods such as fats and sweets with energy scarce, nutrient rich foods like fruits and vegetables. However, a modelling study in France has shown that this behaviour would incur greater diet costs. The study estimated the costs of a freely chosen diet in 837 French men and women and examined the relationship between diet quality and diet cost⁽⁵⁴⁾. They showed a diet high in grains, fats and sweets was associated with lower diet costs, when adjusted for age, gender and energy intake. In addition a diet high in fruits and vegetables and/or meat was associated with higher diet costs. When participants were split into quintiles according to their energy intake, they showed that across quintiles an increase of 100g in fat and sweet consumption would reduce overall diet costs from between €0.05 in the highest quintile of energy intake and €0.40 in the lowest. Conversely, an increase of 100g in fruit and vegetable consumption equated to an increased diet cost of between €0.18 and €0.29 in the lowest to highest quintiles respectively, thus suggesting that removing fats and sweets and adding fruits and vegetables into a diet does cost more money. Similarly in the UK a study found that consuming a healthy diet cost more money than consuming a diet that did not conform to healthy eating guidelines⁽⁵⁵⁾. Over 15,000 women in the UK took part in the study in which they had their diet assessed in terms of quality and price. Women were split into eight groups according to their compliance with World Health Organisation (WHO) dietary guidelines. Women in group 0 did not meet any of the guidelines whereas women in group 8 were meeting all of them. Absolute diet costs were calculated for each woman using the foods they reported consuming and price information from the 1995 National Food Survey and the 1997 Tesco shopping catalogue. Women in group 8 were spending, on average, £1.48 per day more than those in group 0, which equated to an extra £540 per year. These studies show that it appears more costly to eat more healthily. In addition in the SWS, the cost of consuming a 'prudent diet' was calculated⁽⁵⁶⁾. It was reported that the estimated average weekly cost of the median diet of women with scores in the lowest quarter of diet scores was £9.28, compared to £11.22 in women in the highest quarter. This also suggests that healthier diets come with an increased cost. More recent statistics from the Department of Environment, Food and Rural Affairs (DEFRA) showed that in the UK between 1998 and 2009 the overall price of food rose by 33%, with a particularly sharp rise in 2007 (due to increased fuel prices), whereas in the same time period average incomes of low income households only rose by 22%⁽⁵⁷⁾. Worryingly this rise in food price coincided with a decline in fruit and vegetable purchases, especially in low income households. In 2009, families in the most deprived quintile purchased more than 50% fewer fruits and vegetables than those in the most affluent quintile, thus

widening the dietary inequalities gap. However, DEFRA also reported that the rise in food prices made little change to the price of fruits and vegetables relative to all food prices suggesting that the relative affordability of fruits and vegetables did not change. Therefore some families with low incomes redirected their spending away from fruits and vegetables even though their relative cost remained the same. A recent study aimed to attribute the cost of diets currently consumed by the British adult population and assessed socio-demographic differences in diet costs at an individual level⁽⁵⁸⁾. The study used data from the NDNS rolling surveys. The sample included data on 1016 adults. The study found that the average energy-adjusted daily diet cost was £4.09 per 10 MJ. A multivariate model showed that consuming 5 portions of fruit and vegetables per day was associated with an increased, energy-adjusted, daily diet cost of 49 pence per 10 MJ compared to those who consumed fewer portions. In addition, each increase of household income category was associated with an increase of daily diet cost of 14 pence per 10 MJ. This study showed that people consuming more fruits and vegetables had higher value diets, as did those with higher incomes; interestingly these findings were independent of one another, suggesting that diets of better quality, indicated by higher fruit and vegetable consumption, are associated with higher diet costs.

Perhaps unsurprisingly, research has found that these dietary inequalities also impact on the diets of young children, with children who live in low income households more likely to have a poorer quality diet than children who live in more affluent households⁽⁵⁹⁾. In a study in Germany which assessed the effect of income inequality on two year old children's diets, they found that children in households with the lowest income consumed fewer fruits and vegetables and more processed foods than those in household with higher income⁽⁶⁰⁾. Similarly in SWS, three year old children were more likely to consume a diet higher in crisps, white bread and soft drinks, as well as lower in fruits and vegetables, wholemeal bread and water if their families were more deprived⁽⁴⁾. This association was independent of their mother's quality of diet and educational level. Likewise in a study which comprised of a targeted sample of low income mothers and their two year old children, 85% (n=255) of the children had a diet of poor quality when assessed against adherence to dietary guidelines⁽⁶¹⁾.

Clearly the available money that a family has to spend on food is associated with quality of diet of young children. Research consistently finds that children in more deprived families tend to consume poorer quality diets. It is important to point out, however socioeconomic position does not account for all the variation in children's diets, and there are some children in low income families who have healthy diets. As previously discussed, it is thought that it is not only the cost of healthy foods which impacts on the diets of deprived families but other factors are also important including that their physical access to healthy choices may also be limited.

2.1.4 Community food environment

Family food choices are influenced by a number of external factors and it has been hypothesised that the food environment surrounding families promotes inequalities in diet. More specifically it has been suggested that families who live in areas of deprivation have poorer access to and availability of healthy foods as well as greater exposure to outlets selling fast or take-away foods⁽⁶²⁾. A plethora of studies has aimed to determine the effect of types of grocery stores and density of fast and take-away food outlets in the local environment on purchasing and consumption of foods, but have returned differing results⁽⁶³⁾. An overwhelming amount of research from the USA has shown that there are disparities in access to healthy foods with low-income, rural and minority neighbourhoods having more small convenience type stores and being further away from large supermarkets, which offer more choice at lower prices⁽⁶⁴⁾. To date there is little evidence from the UK. However, the research that there is has not supported these findings with studies finding no difference in the accessibility of supermarkets according to neighbourhood characteristics⁽⁶²⁾. A study conducted in Scotland assessed the price and availability of 57 foods in different food outlets in areas of differing deprivation⁽⁶⁵⁾. The authors reported that food price and availability were not associated with area deprivation. In addition, a study which assessed where mothers living in deprived areas shopped showed that 100% (n=300) reported using a supermarket. The authors concluded that, for mothers who were living in deprived neighbourhood, access to supermarkets was not an issue⁽⁶¹⁾. One explanation for the difference in findings from the UK and the USA is that neighbourhoods in the USA are more segregated than in the UK, where communities with differing characteristics tend to reside closer to each other and thus, the supermarkets used by the less deprived communities are also more accessible to the more deprived⁽⁶²⁾.

Research findings on the relationship between the location of fast-food outlets, and level of deprivation in the UK, are also conflicting. A UK study by Cummins *et al* focused specifically on the McDonalds chain of restaurants⁽⁶⁶⁾. They pinpointed the location of every McDonalds restaurant in England and Scotland in 2005 (n=942) and linked these data to the Index of Multiple Deprivation (IMD) scores for each locality. They found that the number of restaurants per 1000 residents was higher in more deprived areas. A study by Molaodi *et al* reported similar findings in that fast-food outlets in England were more likely to be located in more deprived areas compared to more affluent areas⁽⁶⁷⁾. However, a study by Macintyre *et al* which assessed all 'out-of-home' food outlets by area deprivation in one city in Scotland saw no such association⁽⁶⁸⁾.

The impact of these differences in the community food environment on the quality of preschool children's diets remains largely unexplored. One study which explored the neighbourhood food and physical activity environment of preschool children focused on body mass index, rather than diet, as the outcome. This study assessed the food and physical activity environment as well as crime rates in the neighbourhoods of over 7000 preschool children and looked for associations between these and their body mass index⁽⁶⁹⁾. The other studies, which have involved assessments of quality of diet in older children, have reported conflicting results, studies from Australia, Canada and the UK suggested that there was an association between locality of food outlets and children's diet. However, studies from the USA reported no such associations. Average distance to nearest playground and fast food outlet was calculated using geographical information system (GIS) and crime rates were recorded as incident per 1000 residents in each of the neighbourhoods. They reported that there was no association observed between the food or physical activity environment, or local crime rate and children's body composition. However, this study included no assessment of whether the children actually used the fast food outlets or playgrounds. Whilst this was the only study assessing preschool children, there have been a few published which have explored the food environment and quality of diet in older children. In Australia GIS was used to identify density and proximity of food retail outlets (fast-food, convenience store, restaurants, take-away, supermarket and greengrocers) from children's homes and relationships were explored with fruit and vegetable consumption in 801 5–12 year olds⁽⁷⁰⁾. Interestingly over 70% of children did not have any of the types of the outlets within 800m of their home. This distance was used as a reference point as it was considered an acceptable distance for a child to walk. Children that did have a convenience store within 800m of home were 25% less likely to consume ≥ 3 vegetables per day. In addition those who lived within 800m of a fast-food outlet were 38% less likely to consume ≥ 2 fruit per day and for each additional fast-food outlet within that radius the odds of consuming less fruit increased by 18%. Whilst this suggests a negative influence of the food environment on children's fruit and vegetable intake, this research group published a second paper from the same study but this time focused on children's fast-food and take-away food intake⁽⁷¹⁾. In this instance they reported that for each increase in the number of fast-food and take-away outlets within 800m of home there were 3% lower odds of consuming fast- or take-away foods. In addition there was no association between the numbers of these outlets on the route to their school and consumption of these foods. However, the authors acknowledge that their classification of fast-food and take-away outlets was subjective as they did not collect information on the menu items in the establishments. A similar study in the UK identified relationships between proximity to and density of supermarkets, convenience stores and take-away outlets and quality of diet in 1721 children aged 9–10 years⁽⁷²⁾. Again GIS was used to determine proximity to and density

of the food outlets in each neighbourhood. They reported that an increase in distance from a supermarket was associated with increases in mean fruit and vegetable intake (0.11 portions per week for both) and decreases in white bread consumption (−0.11 portions per week). In addition higher density of supermarkets within a 1km radius was associated with increases in vegetable consumption (0.31 portions per week). Living further away from a convenience store was related to a decrease in child's crisp, chips, sweets, chocolate and white bread consumption, which is similar to the finding in Australia where proximity to convenience stores was negatively associated with fruit and vegetable consumption. However, unlike in Australia, the study in the UK also reported a negative association between proximity to take-away outlets and crisp, chocolate, soft-drink and white bread consumption. This is conflicting with evidence from Canada however, where they reported that there was no association between proximity to supermarkets from 8–10 year old children's homes or schools and their intakes of fruit, vegetables or sugar sweetened soft drinks or number of snacks eaten out of the home⁽⁷³⁾. However, there was consistency in the association between proximity to convenience stores and children's diets with those who lived further away from a convenience store consuming fewer snacks away from home. Finally in the USA, no association was reported between community food environments and fruit and vegetable consumption in children and adolescents⁽⁷⁴⁾. The community food environment was assessed by asking parents of the children to report their proximity to food outlets and then the food outlets were categorised as either 'more-healthy' (supermarkets, fruit and vegetable markets and non-fast-food restaurants) or 'less-healthy' (convenience stores and fast food restaurants). Proximity to neither more- or less-healthy outlets was associated with children's fruit and vegetable intakes. Although the methods in this study had been validated they were subjective and the use of technology such as GIS may be beneficial in such studies. The evidence of the influence of the food environment at the community level and children's quality of diet is limited and somewhat conflicting, although there appears to be some agreement regarding a negative influence of residing near convenience stores. The lack of consistent assessments of both the environment and dietary outcomes could be contributing to the lack of consistency in the results. Two reviews of the literature on the food environment and diet conclude that equivocal findings may indeed be due to the lack of a standard tool or method with which to measure the food environment⁽⁶³⁾.

It is likely that aspects of the community environment within which food is purchased and consumed will have an impact on the quality of young children's diets but further research is required, firstly to develop a standard measure of the food environment and secondly to assess its influence on young children's diets.

2.1.5 Employment

Employment patterns among mothers with young children have changed substantially in recent decades with more mothers entering employment⁽⁷⁵⁾. To date much of the research has focused on the effect of maternal employment on child weight status⁽⁷⁶⁾ or the dietary habits of older children⁽⁷⁷⁾ with few studies focused on preschool children. It is unclear as to whether maternal employment has a beneficial or detrimental effect on children's diets. Researchers argue that on the one hand mothers who work more are likely to have a higher income and therefore have more money for purchasing healthier foods, but on the other hand, mothers who work long hours have less time to prepare and cook meals from scratch and therefore rely on more convenience foods, which are often poorer in nutritional quality⁽⁷⁸⁾. In addition, whilst at work, mothers are unable to supervise their child's food consumption as the child is looked after by a third party. Johnson *et al* assessed the relationship between maternal employment and young children's diet quality using data from a nationwide food consumption survey carried out in the USA. Diet was assessed using multiple 24 hour recalls and a two day food record to assess the nutrient adequacy of the child's diet. They found that maternal employment (full-time, part-time or unemployed) showed no significant relationship with diet quality (nutrient adequacy or energy intake from fat) in the children⁽⁷⁹⁾. However, a more recent study in Australia showed that maternal employment did have an indirect effect on the snacking behaviour of their 4–5 year old child. Mothers who worked part-time (<35 hours per week) had children who tended to watch less television than those whose mothers either worked full-time or who were unemployed. In turn these children consumed fewer unhealthy snacks (crisps, cakes, sugary drinks etc). The authors suggest that the beneficial effect of working part-time may be because these families benefit from increased income compared to those with non-working mothers and in addition, these mothers have more spare time than those working full-time (≥ 35 hours per week). Finally, results from the Millennium Cohort Study which assessed the relationship between maternal employment and health behaviours of 5-year old children in the UK found that having a mother in employment appeared to have a detrimental effect on their children's diets. In a sample of 12,576 mother-child pairs, children whose mothers worked part- or full-time were more likely to consumed sugar-sweetened soft drinks between meals compared to other beverages. In addition, these children were more likely to watch >2 hours television per day and be driven to school, compared to children whose mothers had not been employed⁽⁷⁵⁾. Consequently, the message about the effects of maternal employment on the quality of preschool children's diets remains unclear. Further research is needed to explore this association, and to identify the mediating factors.

2.1.6 Conclusion

The wider environment may operate in a number of ways to influence the quality of young children's diets. However the picture is complex and research on the mechanisms and evidence for any impact it has had to date is lacking, a conclusion which was shared in a review of policies affecting pre-schoolers risk of obesity in 2006⁽⁸⁰⁾. Until the evidence base increases it is difficult to identify the most effective levers for intervention in these contexts.

2.2 Parenting styles and family characteristics

While their food behaviours and taste preferences are still developing, preschool children have a limited capability to make food choices for themselves as they rely on others to provide their food and drinks, and who in turn provide their eating environment. The existing evidence about the role played by parents in shaping pre-schoolers eating environments largely focuses on mothers. Although it is widely expected that fathers also influence their child's eating experiences, to date research on the specific influence of fathers on the quality of preschool children's diets is limited and most studies have focused on maternal influences on young children's diets. It is highly likely that maternal and familial factors play a pivotal role in shaping the quality of young children's diets. The following section reviews evidence which links maternal and familial factors to feeding practice and patterns of diet in young children.

2.2.1 Maternal food preferences and diet

Maternal food preferences, intake patterns and eating behaviours all influence the foods which are made available and offered to young children and it is well documented that the diets of preschool children are often very similar to those of their mothers^(4;81-84). In a study by Cooke *et al*, parents of 564 two to six year old children reported frequency of fruit and vegetable consumption for themselves and their children⁽⁸¹⁾. They found that parental fruit and vegetable intake was the strongest predictor of the child's fruit and vegetable intake. A similar finding was also reported in a study by Fisher *et al*, who found that five year old girls who had the highest servings of fruits and vegetables had parents who also had the highest servings of fruits and vegetables⁽⁸²⁾. An association with maternal diet is also apparent when assessing whole diet quality, not just fruit and vegetable consumption. In a study conducted in Finland dietary patterns of one-year, three-year and six-year old children were compared to those of their mothers. The main dietary patterns were identified as 'healthy' (those with high intakes of vegetables, skimmed milk and whole grain bread), 'traditional' (high intakes of dairy spread and full-fat milk) and 'fast-food sweet' (high intakes of sugar-sweetened beverages, fried potatoes, chips, nuts and dried fruit).

This study reported similarities between the dietary clusters of mothers and their three and six year old children⁽⁸³⁾. Using principal components analysis, in SWS Fisk *et al*, found that the strongest influence on a three year olds dietary pattern was the pattern of their mother's diet, such that if a mother had a more 'prudent' diet pattern, a pattern which mirrored guidelines for healthy eating, her three year old child was also likely to have a more prudent diet⁽⁴⁾. Likewise, mothers with poor quality diets were more likely to have children with poorer diets characterised by high intakes of white bread, chips, processed meat and soft drinks, as well as low intakes of vegetables, fruit, wholegrains and water. Consistent with this finding, Hoerr and colleagues assessed quality of diet in 100 mother-toddler pairs from disadvantaged families. Quality of diet was determined by calculating the mean adequacy ratio (MAR) score for eight micro-nutrients for mothers and their children. The MAR score is an index of the average percent of recommended intakes of selected nutrients. A higher score represents adherence to the recommended daily allowances for those nutrients and scores have been shown to correlate with intakes of fruits, vegetables and dairy foods. Mothers who had a higher diet score tended to have children who also had a higher diet score and conversely, the study reported that mothers who had poorer quality of diet scores had children with poorer quality diets⁽⁸⁵⁾.

One explanation for the association between parent's and children's diets is modelling effects. Children, especially young children, have an innate desire to mimic their parent's behaviours, including eating the foods they see their parents eat. Children's observation of others' eating behaviour has been shown to influence the development of their own food preferences. One study observed that children aged 14–48 months put foods in their mouths more readily when they were following the example of their mother, relative to the effect of a stranger behaving in this way⁽⁸⁶⁾. In addition, research by Birch and colleagues has focused on assessing factors determining children's food preferences, and has shown that maternal modelling can even influence children's preferences for foods which, at first, the child rejected. The study found that if a child witnessed their mother consuming foods that the child initially disliked, their preferences for that food increased⁽⁸⁷⁾.

In a study by Kral *et al*, assessing child eating behaviours in the context of their family environment, the authors suggest that the association between mothers and child's diet may be bidirectional. That parents influencing their child's diets through modelling their own food preferences is expected, but it is also possible that parents provide, and consume, foods that are determined by their child's innate preferences⁽⁸⁸⁾.

The availability of foods in the home is also an important issue in determining the nature of children's diets and may also influence the link between mother's and child's diets. This is discussed in detail in section 2.2.8.

Research has demonstrated a clear relationship between the quality of mother's and children's diets but the factors which underlie this association require further exploration. An analysis of mediators of the relationship between mother's and children's quality of diet would provide greater insight into this relationship. In addition qualitative research focused on the influences on mother's food choices for their preschool children could explore of why mother's and children's diets tend to be of a similar quality.

2.2.2 Maternal body mass index

There have been only a few studies which have assessed the relationship between maternal weight status, defined by their body mass index (BMI) and child's diet. One such study assessed fruit and vegetable intake and snacking behaviours in 1976 young children and their mother's BMI. They found that mothers with a higher BMI tended to have children who consumed fewer fruits and vegetables; for every unit increase in maternal BMI score children tended to consume 0.12 fewer portions of fruits and vegetables a day. They also reported that children whose mothers had a higher BMI tended to consume fewer 'healthy' snacks and more 'unhealthy' snacks, although these associations did not reach statistical significance. In line with these findings, in the SWS, Fisk *et al*, which assessed dietary patterns in 1640 three year old children, mothers with a higher BMI tended to have children who consumed a more 'imprudent' diet characterised by high intakes of energy dense, nutrient poor foods such as white bread, chips, crisps and soft drinks as well as low intakes of nutrient dense foods such as vegetables, wholegrain, fish and water, independent of maternal educational attainment, index of multiple deprivation score, age, and number of children.

Although data are limited, the nature of the relationship between maternal BMI and child's quality of diet is as might be predicted. A high BMI in the mother may be indicative of adverse health behaviours such as poor quality of diet, which in turn negatively influences the child's quality of diet. However, more research is required to be certain of this relationship.

2.2.3 Maternal Education

A number of studies have shown that the level to which a mother is educated is associated with the quality of her child's diet. Mothers who are more poorly educated have been found to have children who tend to display dietary behaviours indicative of a poorer quality of diet – these include consuming more added sugar⁽⁸⁹⁾ and snacks⁽⁹⁰⁾

and fewer portions of fruits and vegetables^(81;91). A study by Kranz *et al*, which assessed added sugar intake (teaspoons per 100kcal energy intake) in 5652 two to five year old children in the USA, found that mothers who spent less than 12 years in education had children who tended to consume more teaspoons of added sugar, as a proportion of their energy intake, compared to children of mothers who had spent longer in education. Additionally in a study of children's snacking behaviour, parental feeding practice and socio-demographic background, children whose mothers were less educated tended to consume more snacks including sugary soft drinks, crisps, ice-cream and confectionery. Furthermore, two studies of fruit and vegetable intakes of preschool children, one in the UK and one in Australia, intakes tended to be lower in children whose mothers were more poorly educated^(81;91). This association has also been shown in two large cohort studies in the UK^(4;92). In the Avon Longitudinal Study of Parents and Children (ALSPAC), Northstone and colleagues found that preschool children who had a diet high in junk and convenience foods were more likely to have mothers who had lower levels of educational attainment⁽⁹²⁾. A finding which was mirrored in SWS, where three year old children were more likely to have an imprudent diet if their mothers were educated to a lower level.

The reason for these inequalities however, is not obvious as women who continue in education beyond secondary school are not necessarily taught how to feed their child a good quality diet. Research into the food choices women make for their families suggests that educational attainment influences diet by shaping women's responses to the challenges of feeding themselves and their children. Being of lower educational attainment is associated with feeling less in control of life in general and their food choices in particular^(93;94).

The educational level of a child's mother clearly influences the quality of a child's diet, however, the mechanism for this association appears to be complex, and further research is needed to assess factors that may account for it.

2.2.4 Maternal nutrition knowledge

The relationship between maternal nutrition knowledge and child's quality of diet is not necessarily a straight forward. The assumption is that if a mother knows what constitutes a healthy diet then she will provide this for her child. The evidence, however, suggests a gap between knowledge and behaviour. In a study by Crombie *et al*, quality of diet in two year old children and mother's nutrition-related health beliefs were assessed in 300 mother-child pairs living in deprived areas of Scotland⁽⁶¹⁾. The results showed that knowledge of nutrition health messages was high, with 100% of mothers agreeing with the statements 'children should eat more fruit, vegetables and starchy foods (bread, potatoes, rice etc)' and 'children should eat less fried food, crisps

and confectionery'. Most mothers also recognised a diet–health relationship, with the majority of mothers agreeing to statements such as 'more fruit and vegetables could help prevent cancer' and 'less sugar will help maintain a healthy weight'. However, only 35% of mothers reported that they were confident in their knowledge of healthy eating. Interestingly, mother's nutrition knowledge was not associated with child's diet quality but their confidence in their nutrition knowledge was. However, this association was no longer evident after taking account of other maternal factors, such as perception of control over her child's diet. This highlights the complexity of the relationship between nutrition knowledge and child's diet, as well as the interrelationships that exist between maternal characteristics that can affect food choice. In a study in the USA, mother's food choice criteria (e.g. health, ease of preparation or child's food preferences) and child's quality of diet were assessed in 218 mother–child pairs⁽⁹⁵⁾. Mothers were presented with a list of 17 foods and for each one was asked to indicate their beliefs about the food item; for example; 'how good is this food for the health of your child?', 'this food is convenient to prepare' or 'how good does this food taste to your child?'. A food frequency questionnaire including these 17 foods was then completed to assess how often the child consumed these foods. Mothers were clustered according to their beliefs about the foods. In total 42% of mothers were in a cluster defined by their belief that health was an important factor when choosing food for their child. In these mothers, nutrition related health knowledge scores were higher and their children had better quality diets. Over 50% of mothers, however, indicated that other criteria such as taste and convenience, were more important when choosing food for their child, and these mothers had poorer nutrition–related health knowledge and their children had poorer quality diets. This study suggested that future interventions to improve children's diets should aim to address mothers nutrition–related health beliefs.

2.2.5 Maternal feeding style

A feeding style refers to the emotional climate parents create around the mealtime setting, whereas a feeding practice refers to the strategies which parents adopt in order to control their child's eating habits, the latter will be discussed in section 2.2.6. Eating experiences of preschool children usually take place in the presence of a parent, often their mother so whilst most studies report 'parental' feeding styles, they are actually describing maternal feeding studies. A mother's feeding style represents her approach to maintaining or modifying her child's eating behaviour. Research suggests that mothers can be characterised into one of three categories of feeding style.

1. Authoritarian: where they have expectations about what they want their child to eat and not to eat but lack warmth and responsiveness. These mothers often enforce strict rules during eating occasions and having little regard for children's own choice or preferences.

2. Authoritative: where they also have expectations about their child's diet but are less direct and often encourage the child to eat certain foods but also provide the child with a choice about healthy eating options.
3. Permissive: where they have no expectations about the quality of their child's diet, they allow their child to consume any foods in any quantity with the only limiting factor being the availability of the food⁽⁹⁶⁾.

Studies which have explored associations between maternal feeding style and child's quality of diet are few in number and return differing results. In a study in the USA, 231 low income parents of preschool children were interviewed to assess their feeding styles, and kept diaries of their child's fruit and vegetable consumption. They found that parents who reported using a more authoritarian style of parenting during feeding situations (any time a mother is providing her child with food) tended to have children who consumed fewer vegetables compared with those who used a more authoritative style. Conversely parents who used more of an authoritative style had children who consumed more dairy foods and vegetables⁽⁹⁷⁾. This study did not assess permissive feeding styles. However, in a study by Hoerr *et al*, which was also conducted with low income parents of preschool children (n=715) in the USA, use of permissive feeding styles was associated with lower consumption of fruits and vegetables and dairy foods in the children, and, unlike the previous study, there were no significant differences in fruit and vegetable consumption of children whose parents used authoritative or authoritarian feeding styles⁽⁸⁴⁾. In contrast, a study of 755 Belgian parents of pre-schoolers that also assessed parental feeding styles and child's fruit and vegetable intake, found that none of the feeding styles was associated with differences in children's fruit and vegetable intake⁽⁹⁸⁾.

In summary, evidence of the effect of maternal feeding style on the quality of diets of preschool children remains equivocal. To date, studies have been cross-sectional and therefore causality cannot be determined. In a review of the literature on feeding styles and children's fruit and vegetable consumption, Blissett suggests that the association could act in either direction. On one hand a parent's feeding style could shape children's dietary outcomes, on the other, a parent could adapt their feeding style in response to their child's food behaviour, e.g. picky eating⁽⁹⁶⁾. Vereecken *et al*, suggest that the lack of a consistent association between parental feeding style and child's diet could be because the influence is indirect and acts through parental feeding practices. In their study, parental feeding styles were significantly associated with child's diet in a univariate model, however, when parental feeding practices were included in the model, the effects of feeding styles lost significance⁽⁹⁸⁾.

2.2.6 Maternal feeding practices

Maternal feeding practices refer to strategies a mother uses to control her child's diet and have been the focus for number studies exploring influences on children's quality of diet⁽⁹⁶⁾. Many mothers have expectations about the types of food that they want, or don't want, their child to consume. Often this can result in mothers adopting certain control strategies such as restriction of, or pressure to, consume certain foods⁽⁹⁹⁾. Research on the influence of maternal feeding practices has returned conflicting results. In a study by Vereecken *et al*, of 316 mothers of children age 2.5–7 years, maternal feeding practices, specifically pressure to eat healthy foods, and child's fruit and vegetable intake were assessed. They found that maternal use of pressure to eat was positively associated with fruit, but not vegetable, consumption in the children⁽¹⁰⁰⁾. However, in a study by Wardle and colleagues, maternal use of both pressure to eat, and restriction strategies were negatively associated with fruit and vegetable consumption in 2–5 year old children⁽¹⁰¹⁾. Maternal restriction of foods was also associated with lower fruit and vegetable consumption in a study of 73 preschool children, but this study reported that maternal use of pressure to eat was not significantly associated with children's fruit or vegetable intake⁽¹⁰²⁾. In both of these studies, however, they assessed use of restriction to limit consumption of 'unhealthy' foods but the only dietary outcome measured was fruit and vegetable intake, thus they were not able to ascertain whether or not restriction was negatively associated with consumption of 'unhealthy' foods. Further inconsistent findings in the research are represented in a study in which 2578 parents with two year old children were asked about their use of restriction feeding practices and completed a more comprehensive assessment of their child's diet. Parents who used restriction were more likely to have children who consumed fewer of the restricted foods (cookies, cakes, soft drinks, crisps and sugar) and, unlike the previous studies, higher intakes of fruits and vegetables⁽¹⁰³⁾. Finally one study assessed parental use of pressure to eat and restriction and child diet, at two time points, in a longitudinal study over 12 months. They reported that use of restriction was not associated with fruit or vegetable intake at either time point. However, less use of pressure when the child was one year old was associated with a greater fruit intake when the child was two years⁽¹⁰⁴⁾.

Ogden *et al*, suggests that the contradictory nature of the findings on the influence of parental feeding practices is due to it being a more complex issue than is acknowledged by measures of pressure and restriction. They hypothesised that whilst it may be possible to control food intake by monitoring and restricting what a child eats, it is also possible that mothers control what their child consumes by managing their food environment, and it is this second element which was being missed by the traditional measures of feeding practices⁽¹⁰⁵⁾. Therefore they redeveloped the concept of feeding practices to consider two main styles of control that mothers use over their

children's eating habits; overt and covert control. Overt control is similar to the feeding practices previously studied and involves limiting or encouraging the child's intake of certain food in a way that can be detected by the child e.g. being firm about how much the child eats. Covert control describes the management of the child's environment as a way to control intake and thus may go undetected by the child e.g. not purchasing undesired foods or avoiding taking the child to cafes or restaurants which sell such foods. The measure of overt and covert control has been used in only a few studies to date. Ogden *et al*, assessed the role of covert and overt control in children's snacking behaviour. The covert and overt control scale was completed along with questions relating to child's snacking behaviour by 297 parents of children aged between four and eleven years old. They found that parents who reported using more covert control methods had children who consumed fewer 'unhealthy' snacks and if parents reported using more overt control, then their child was more likely to consume more 'healthy' snacks. Brown *et al*, also investigated the role of the overt and covert control practices on the diets of young children. Similarly, they found that mothers who used covert control methods had children who consumed fewer unhealthy snacks, and that eating more fruit and vegetables was related to higher use of both covert and overt control. This suggests that use of both overt and covert control practices could have beneficial effects on a child's quality of diet⁽⁹⁰⁾.

The relationship between parental feeding practices and children's diets appears to be an important one, although consistent relationships between feeding practices and child's quality of diet have not yet been demonstrated. It seems that some practices, such as restriction and pressure, can elicit the opposite response to that intended. Many researchers suggest that this could be because foods that the mother wishes to restrict are often offered in positive social contexts e.g. at a party or as a reward for good behaviour, leading to an increase in preference for those foods. Using pressure on a child to consume foods a mother wishes them to eat more of creates a stressful situation during experiences with those foods, thus decreasing the preference for and consumption of them⁽⁹⁹⁾. The concept of overt and covert control offers a different way of considering control over a child's food environment, but further research is needed to explore these concepts.

2.2.7 Maternal smoking status

The association between smoking status and quality of diet has been described in adults. Research has shown that adults who smoke are more likely to consume a diet of lower quality, characterised by higher intakes of white bread, sugar, butter and whole milk as well as fewer intakes of wholemeal bread, high-fibre breakfast cereals and fruit, these results remain significant after taking account of covariates such as age, sex, and occupation group⁽¹⁰⁶⁾. However, few studies have assessed the association

between maternal smoking status and children's quality of diet. Those that do exist tend to show that mothers who smoke are more likely to feed their children a poor quality diet. This finding appears to be independent of factors which could confound this association such as socioeconomic position and maternal education, hence the reason for the association is not clear. In ALSPAC, food intakes in 993 preschool children and smoking status of their mothers were assessed. The study reported that children of mothers who were smokers (reported during the child's 21 month follow-up) were more likely to have consumed sugar-sweetened soft drinks, buns and cakes and processed meat products, and fewer intakes of fruit, wholemeal bread and breakfast cereal. Additionally in the Southampton Women's Survey cohort study maternal smoking status (assessed when the child was six-months old) and preschool children's dietary patterns were assessed in 1640 mother-child pairs⁽⁴⁾. The authors observed that mothers who were smokers tended to have children who consumed a poorer quality diet characterised by high intakes of white bread, crisps, chips and soft-drinks and low intakes of fruit, vegetables, wholemeal bread and water.

There is limited information on the effect of maternal smoking status on the dietary quality of preschool children, although these few studies suggest that the association mirrors observed effects of smoking on quality of diets in adults⁽⁵⁶⁾ suggesting that it could be an important influence. However, the pathway is not clear and more research is required to establish and understand this relationship.

2.2.8 Home food environment

Children, especially preschool children, spend a considerable amount of time at home and thus experience many eating occasions in the home environment. The presence of certain foods and drinks in the home has been considered in a number of studies assessing influences on the quality of young children's diets. Perhaps unsurprisingly the results have consistently suggested that increased availability of a food in the home tends to be associated with an increased consumption of that food by children.

In a study of home environment characteristics and preschool child's diet, a telephone survey was conducted during which home fruit and vegetable availability was assessed by parents reporting how many of 19 fruits and 24 vegetables they had in their house at the time of the interview⁽⁹¹⁾. Wyse *et al* reported that as the variety of fruits and vegetables in the home increased so did the child's fruit and vegetable intake score. Interestingly however, the association was stronger if the fruits and vegetables that were available were made accessible. Parents were asked whether or not fruit and vegetables were accessible to their child e.g. kept in a 'ready to eat' format and in a place where they could help themselves. An affirmative response to having the fruits and vegetables accessible equated to a 1.8 portion increase in child's fruit and

vegetable intake score compared to those children whose parents reported that fruits and vegetables were not accessible in the home. However, a recent UK study by McGowen *et al* found that consumption of fruits and vegetables by 2–5 year old children was not associated with their availability⁽¹⁰⁷⁾. It is of interest that in this study they found that availability of snacks high in fat, salt or sugar, and sweetened carbonated drinks was associated with greater consumption of these food and drink items. The authors suggest that the lack of consistent findings could be due to the reliability of parental reports to measure food availability. In this study there was limited variability in reported availability of fruits and vegetables which could possibly be caused by social desirability, that is mothers reporting what they think they 'should' be doing. Alternatively, it may be due to the lack in variation of socioeconomic status of the families in this study given that 64% of mothers had a university degree.

Positive results were reported in a study which used an objective measure of home food availability. Spurrier *et al*, visited the homes of 280 parents with preschool children and measured home food availability through direct observation⁽¹⁰⁸⁾. All foods which fell into the groups 'fruits and vegetables', 'high fat/sugar snack foods', 'fat content of dairy products', and 'sweetened drinks' were identified in participants' kitchen pantries, cupboards, refrigerators and freezers. Each item found which fell into one of the categories was weighed on standardised scales and total amounts of foods in each category were summed. Child's dietary assessment was in the form of an administered questionnaire. The results showed that availability of foods in each food group was positively, associated with consumption of those foods. However, in this study the analysis did not take into consideration confounding factors, such as mother's quality of diet.

The availability of foods in the home seems to be associated with the quality of preschool children's diets, however, the studies to date have been cross-sectional and therefore cannot determine whether having a food available in the home increases a child's consumption of that food or *vice versa*. It is possible that the relationship is in fact bidirectional, that the child is more likely to consume foods that are available, but that parents also make available foods that their child has a preference for. Longitudinal and qualitative studies could be used to explore this further.

2.2.9 Mealtime environment

Parents have a key role in shaping their children's food environment and their early experiences with food and eating. Many studies have suggested an association between the environment in which a person consumes food and their quality of diet, although the evidence is limited in preschool children. However, the few studies which exist have identified factors such as whether the child eats meals at a table⁽⁸⁵⁾, eats with

other family members^(61;91;108), regularly consumes take-away food⁽¹⁰⁸⁾ or eats with the television on^(91;108;109), as possible influences on aspects of a young child's diet. Eating together as a family and without the television on appear to have a positive influence on children's quality of diet. A study from Australia assessed aspects of the home food environments of 280 families with preschool children. They considered frequency of eating meals with the family, eating with the television on and frequency of purchasing take-away foods. They found that children who ate with one or both of their parents more often, were consuming fewer sweetened beverages. They also reported that the more frequently take-away foods were purchased the fewer fruits and vegetables were consumed by the children, and children consumed fewer fruits and vegetables and more sweetened beverages, the more often mothers allowed food to be eaten in front of the television⁽¹⁰⁸⁾. Interestingly, a study of 1336 low-income mother-child pairs in the USA which assessed frequency of eating as a family, eating with the television on and child's fruit and vegetable intake, reported that the beneficial effects of eating with the family was not evident if the television was on. Each additional night families reported consuming a meal together was associated with increased intakes of child's fruits and vegetables, however, on the nights where the television was reported as being on during the meal the child's intake of fruits and vegetables decreased⁽¹⁰⁹⁾. This could be because the child's focus was on the television and not on the food, but also because the child was less likely to be observing the modelling of eating from the other family members.

Sitting at a table to eat meals is also associated with a better quality diet in younger children. A study of 100 mother-toddler pairs from disadvantaged families found that sitting at a table to consume food was positively associated with the child's quality of diet score. Mother's who reported that their child ate food sitting down on three meal occasions on both days of recording had children with the highest quality of diet scores⁽⁸⁵⁾. However, this analysis did not allow for effects of possible confounding factors, such as maternal quality of diet which was also positively associated with child's quality of diet score. Confounding was important in a study looking at maternal factors which influenced the diets of two year old children living in deprived areas in Scotland; children whose family had not eaten a meal together in the previous week were more likely to have a poor quality diet⁽⁶¹⁾. However, when this association was considered in a multivariate model, that included maternal nutrition knowledge and perceptions of difficulties feeding children, the effect of the family eating together lost significance. Similarly, a study by Wyse *et al*, in Australia, assessed associations between meal-time practices (eating together as a family, eating in front of the television and eating at a table) and preschool children's fruit and vegetable intake. In addition they assessed parental fruit and vegetable intake, fruit and vegetable availability and accessibility and parental feeding practices. Whilst the meal-time

practices, eating as a family and without the television on, were both associated with increased children's fruit and vegetable intake, these associations were no longer evident when other factors, such as food availability, were considered⁽⁹¹⁾.

The influence of the family feeding environment on the quality of diets of young children is not straight-forward. Studies which do not control their analyses for possible confounders report consistent, significant results. However, as demonstrated in the last two studies reviewed, family feeding environment factors may not be as important as some other familial factors in influencing children's quality of diet. These findings highlight the complex nature of interrelationships between factors which influence the quality of children's diets, and more comprehensive studies of the family feeding environment, which consider other familial factors, would add to the evidence base. More research on these factors needs to be carried out in a longitudinal study to assess changes in environmental factors and the subsequent impacts on young children's diets.

2.2.10 Screen-time

Spending time watching a screen may also indirect effects on the quality of children's diets as time spent in front of a screen has been associated with children's diets even when the screen-time is not during meal times. Screen time is classified as time spent watching television or DVD's, or playing on a computer or games console. Research with preschool children has tended to focus on television/DVD time rather than on computer use because of their age. There have been a number of studies which have assessed the relationship between screen-time and diet quality in young children and all the results suggest a negative association^(78;107;110-113). Many of the studies have considered child's snack intake as the dietary outcome. Brown *et al*, assessed television use and 'unhealthy' snack intake in children aged 4-5 years, and then followed them up two years later. At both time points, television use was significantly associated with higher snack intake, although the relationship was weak after controlling for socioeconomic status⁽⁷⁸⁾. This is the only longitudinal study of screen-time and diet in this age group, but as child BMI, not diet, was the primary outcome, the relationship between television and snacking over time was not explored in the path analysis. A similar relationship with snacking was reported in a study of 434 2-5 year old children, however in this study fruit and vegetable consumption was also assessed. Here they found that children who watched, on average, more than two hours of television per day tended to consume more 'unhealthy' snacks and sugary drinks but they did not consume less fruit and vegetables than those who watched fewer than two hours per day⁽¹⁰⁷⁾. This was not the case in a recent study by Cox *et al*, who reported that pre-schoolers who tended to watch more television consumed more 'unhealthy' snacks and fast food as well as fewer vegetables⁽¹¹²⁾. This finding was also

reported in a large cohort study which assessed television viewing and consumption of 'unhealthy' snacks, sugar sweetened drinks and fruit and vegetable consumption in 2276 two year old children. Those who watched television more often tended to consume more snacks and sugary drinks as well as fewer fruits and vegetables⁽¹¹³⁾. The differences in the findings could be due to the way the two studies considered the television viewing data. McGowen *et al*, transformed the data into a categorical variable (more or less than 2 hours per day) and only 24% (n=99) participants fell into the >2hours per day group, thus the sample size may not have been big enough to detect a difference in fruit and vegetable consumption⁽¹⁰⁷⁾, whereas the studies by Cox and Gubbles *et al*, created a continuous variable from minutes per day of television viewing time which may have given them more power to detect differences^(112;113).

Fast food consumption has also been shown to be associated with television viewing in preschool children. In 240 young children, the odds of consuming fast-food at least once per week increased with each extra hour of television viewed per week. This association was independent of family socioeconomic status and perceived neighbourhood access and cost of fruits and vegetables (a proxy for availability of these items)⁽¹¹⁰⁾. Finally Miller *et al* (2008) reported an association between television/video viewing and overall diet quality in a large sample of three year old children. A total of 1203 children were included in the study. Mothers of the children completed a semi-quantitative food frequency questionnaire about their child's diet and they reported how many hours, on average, their child watched television/videos on a weekday and a weekend. They found that for each hour increase in television/video viewing, children were more likely to consume more sugar sweetened drinks (0.06 servings/day), fast food (0.32 servings/month), red and processed meat (0.06 servings/day), have a greater total energy intake (48.7kcal/day) as well as fewer fruits and vegetables (-0.18 servings/day), lower calcium (-24.6mg/day) and dietary fibre(-0.44grams/day)⁽¹¹¹⁾ intakes. These results were independent of mothers' socioeconomic position, BMI, and children's age, sex, race, BMI, sleep duration and duration they were breastfed.

Some authors have suggested that one possible reason for the association between television viewing and poorer dietary behaviours is that children who watch more television are exposed to more food advertisements, which are mainly for 'unhealthy' foods. A randomised controlled experiment, which assessed the effect of television advertisement viewing and preschool children's food preferences, found that children who were exposed to food advertisements during a cartoon video were more likely to choose advertised foods when offered a choice of a number of foods after the video session, compared to children who watched the cartoon without embedded adverts⁽⁴²⁾.

2.2.11 Conclusion

To date, the literature on the effect of watching television and the quality of young children's diets suggests there is a relationship between the two. There is a lack of evidence about the direction of this association as the studies reviewed were cross-sectional. Longitudinal analyses and a consideration of other diet-related factors may permit further exploration of this association.

In summary, micro-environmental factors appear to play an important role in shaping the quality of children's diets. The research into these factors is abundant and some clear associations have been identified. Evidence suggests that mothers, in particular, have a pivotal influence on their children's diets as not only are they often the food provider and choose the foods their children are offered and exposed to, but they also create the environment within which children have many of their food experiences. However, it is clear that the interplay between home and familial factors and the effect of this in shaping the quality of children's diets is complex. More comprehensive and longitudinal studies considering a number of factors in this context are needed to explore the hierarchy of different influences on children's quality of diet and assess mediators and moderators of some of the established relationships. In addition there are few studies which have been carried out with disadvantaged populations. Studies which addressed these issues would enhance the development of future interventions or initiatives developed to improve the quality of preschool children's diets.

2.3 Child characteristics

The nature and characteristics of the child may also have some influence on their diet quality, although the literature on this is limited.

2.3.1 Birth order

Birth order is a person's rank by age among their siblings. The findings about birth order and preschool children's quality of diets have been consistent, although the amount of literature on this subject is limited. Studies have found that children who have older siblings are more likely to have a poorer quality of diet than children who have younger or no siblings. In two large UK prospective cohort studies, birth order has been assessed with child's diet pattern. In one study, four year old children were more likely to consume a 'junk' style pattern characterised by higher intakes of fizzy drinks, chips, processed meat and confectionery if they had one or more older siblings⁽⁹²⁾. Similarly, in SWS, Fisk *et al*, reported that three year old children were more likely to consume an 'imprudent' diet characterised by high intakes energy dense, nutrient poor foods such as white bread and chips and low intakes of nutrient rich foods such as fruit and vegetables, if they were not the first born in the family⁽⁴⁾, in

addition, this was a continuous relationship. The authors speculate that this finding may reflect the relationship observed between mother's quality of diet and the number of children she has, mother's tend to have a poorer quality of diet if they have more children thus children in larger families may be exposed to more unhealthy foods and have hence have poorer quality diets⁽⁴⁾.

These studies suggest that children who have no or fewer older siblings tend to have better quality diets. Further research is needed to explore differences in maternal and child eating behaviour that underlie this association.

2.3.2 Nibbling behaviour

There is a small literature on the effect of snacking or nibbling on the quality of young children's diets. Food is not just consumed at mealtimes. Snacking behaviour patterns develop from infancy. A study by Skinner et al (2004) which looked at snacking patterns in 3022 infants and toddlers in the USA found that snacking patterns emerged between at 7–8 months old and that 80% of the toddlers aged 12–24 months were consuming snacks, which accounted for 25% of their daily energy intake. The main types of snacks provided to children were fruit drinks, sweets, crisps, crackers and milk, no child in the study was given a vegetable for a snack⁽¹¹⁴⁾. This suggests that for some children their snacking occasions could contribute negatively to their overall quality of diet. In SWS, Fisk *et al* found that, in 1640 three year old children, independently of other influences, those who consumed more snacks between, or instead of meals, were more likely to have diets involving frequent intakes of crisps, chips and white bread as well as lower intakes of fruits, vegetables and whole-grains⁽⁴⁾. Similarly a large study assessing dietary patterns of children in Spain found that those who had a 'snacky' dietary pattern tended to consume greater quantities of cakes, crisps, sweets and sweetened beverages⁽¹¹⁵⁾.

Skinner *et al*, suggest that young children require more eating occasions than three set meal times because they have smaller stomachs and high levels of activity, therefore many young children consume snacks in between meals⁽¹¹⁴⁾. However, the research that there is to date suggests that some children consume snacks instead of meals which reduces their quality of diets. More research, possibly of a qualitative nature, is required to explore why some children are 'nibblers' and snack more often than they eat meals, and what influences the types of foods parents provide for snacks.

2.3.3 Food neophobia

Food neophobia is defined as a rejection of foods that are novel or unknown⁽¹¹⁶⁾. It has been identified as an inherent adaptive personality trait serving a protective function to reduce the possibility of poisoning from unfamiliar foods⁽¹¹⁷⁾. However, in the present

environment where foods are usually safe to eat, neophobia in children seems to primarily have an adverse effect on diet, particularly on the consumption of fruits and vegetables^(118;119). It has been suggested that rejection often does not occur based on the taste of the food so much as the look of it. Children build up an idea of how an acceptable food should look, and perhaps smell, and so foods that do not suit their notion of 'safe' are rejected⁽¹¹⁶⁾. Food neophobia has been shown to be related to age, and the literature suggests that it is at its peak between the ages of two and six years old, gradually declining during childhood and adolescence⁽¹²⁰⁾. The effect of food neophobia on the diets of young children has been explored in numerous studies which tend to produce consistent findings. In one study by Cooke *et al* child food neophobia was explored in relation to food consumption in two–six year old children. A total of 564 mothers completed a questionnaire about their child's food neophobia and a brief 9–item food frequency questionnaire to assess the relationship between food neophobia and consumption of vegetables, fruit, meat, eggs, sweet/fatty snacks and starchy foods. They found that children who had higher food neophobia scores consumed fewer fruits, vegetables and meat, but there was no significant association with consumption sweet/fatty snacks or starchy foods⁽¹²⁰⁾. These findings are consistent with their second study where 109 parents of four–five year old children completed a questionnaire about their child's food neophobia after which the children were given three test lunch meals at weekly intervals at preschool. Foods were weighed before and after the lunch to assess the amount consumed. Children were presented with chicken, cheese, bread, cheese crackers, chocolate biscuits, grapes and tomatoes or carrot sticks. Again they found that children with higher levels of neophobia consumed fewer fruits, vegetables and less protein and had lower energy intakes but there was no association with the starch or snack foods⁽¹¹⁸⁾. Similarly a study by Russell *et al* explored associations between child food neophobia and food preferences in preschool children. Parents of 371 children completed a questionnaire about their child's food neophobia and food preferences. Neophobia was assessed using the validated child food neophobia scale. Food preferences were measured using a 176–item food list and the parent indicated on a five–point Likert scale from 'dislike extremely' to 'like extremely'; but they could also indicate 'never tried' or 'do not know'. They found that higher food neophobia was associated with negative preferences for all food groups but the correlations were strongest for the vegetable, meat and fruit groups⁽¹¹⁹⁾.

These studies provide evidence that there is an association between food neophobia and poorer dietary quality. However, it is not known how patterns of diet and neophobia change over time or during periods of transition e.g. starting school. A longitudinal study is needed to explore these relationships further.

Preschool children are unable to provide food and eating environments for themselves and their quality of diet is not wholly dictated by their own preferences. Whilst this section has identified three child-centred characteristics which may influence diet, it is clear that children at this age largely rely on caregivers to make food choices on their behalf.

2.4 Conclusion and research questions

There are clearly many influences on children's diets. The primary influence is the mother. Not only is she so often the purchaser and provider of food, but also because the food she provides is the product of her personal characteristics and her history and reflects the society and community in which she and her family live. In addition, she is largely responsible for the creation and maintenance of the home food environment. In comparison, the contribution of child characteristics to shaping their diets is relatively small. Given the complex of influences that act upon the mother and her child, it is surprising that so few attempts have been made to bring together what is known and determine the relative strength of this range of factors, or the patterns amongst them. Equally surprisingly, little is known about how these influences change over time and how children's diets alter in response.

Figure 2.2 brings together the influences on children's diets identified by this review and presents a hypothetical model of how they might work in combination. Though the literature suggests that the wider policy and social environment have an important role to play in shaping the food experiences and quality of diet of young children, intervention at these levels would be challenging. It would require large scale trials which need substantial funding and the support of many stakeholders and evaluating the effect of change at these levels and impact on diet would be a challenge. Therefore whilst it is important to consider these wider level influences when developing interventions it is more practical to focus behaviour change at the family level. In addition the overwhelming influence of the mother on a child's quality of diet suggests that intervening to improve her quality of diet is likely to result in a desirable change in the family mealtime environment and ultimately the quality of her child's diet.

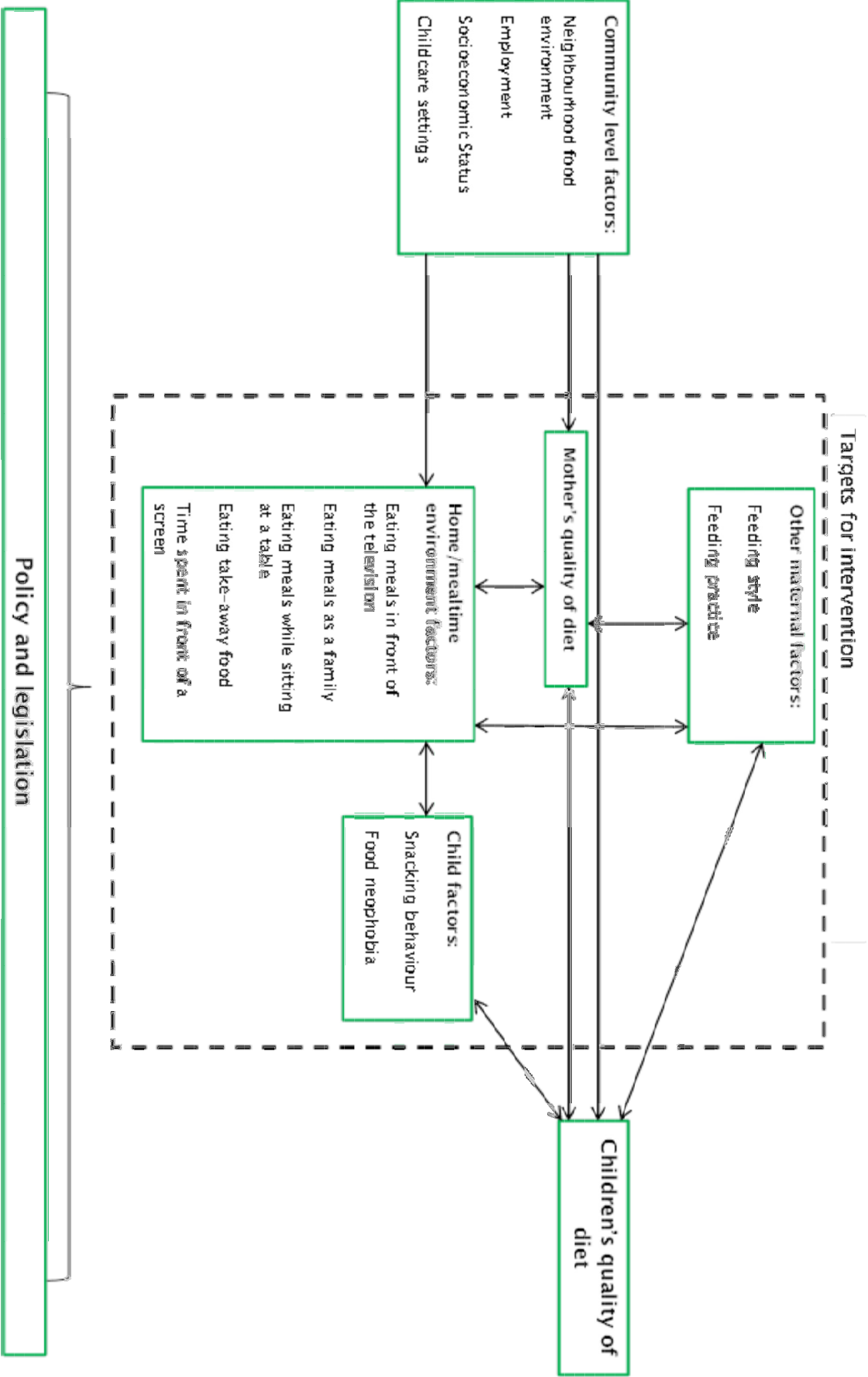


Figure 2.2 Hypothetical model showing determinants of preschool children's quality of diet and possible targets for change

Based on the conclusions of the literature review, this thesis addresses the following two questions:

Research question 1: How do maternal, child, and mealtime environmental characteristics interrelate to influence preschool children's quality of diet?

Research question 2: Does an intervention aimed at improving the diet and lifestyles of women impact on their preschool children's quality of diet

These research questions were able to be addressed in The Southampton Initiative for Health, an intervention which aimed to improve the diets and lifestyles of mothers with young children. The Southampton Initiative for Health is described in more detail in the next chapter.

3 The Southampton Initiative for Health intervention

This chapter describes the Southampton Initiative Health intervention which is an intervention which aimed to improve the diets and lifestyles of women with young children. This intervention provided me the opportunity to address the research questions developed as a result of the literature review in the previous chapter.

3.1 Background to the intervention

The Southampton Women's Survey (SWS), is a prospective study of mothers and children that was started in 1998; 12,500 women aged 20 to 34 years were recruited to the study before pregnancy⁽¹²¹⁾. In this study poorer quality diets were found to be more common in women from disadvantaged backgrounds⁽⁵⁶⁾. Specifically, the SWS has shown that women who are disadvantaged by leaving school with few or no educational qualifications are far more likely to have a less balanced or more 'imprudent' diet than women with qualifications. An 'imprudent' diet is characterised by low intakes of vegetables and fruit and high intakes of chips and roast potatoes, sugar, white bread, red and processed meats, full-fat dairy products, crisps, sweets, tinned vegetables, cakes and biscuits. The relationship between diet and education was not explained by social class or by being in receipt of benefits⁽⁵⁶⁾. Similar findings have been reported in a study by Estaquio *et al* who found that higher educational attainment was positively associated with consumption of a variety of vegetables and meeting the 5-a-day recommendations in male and female adults in France⁽¹²²⁾. Importantly dietary patterns have been found to track from mothers to their children. Children born to mothers in the SWS were followed up at age three years. After taking account of a range of maternal and family characteristics, the most important influence on the quality of the diet of a child at 3 years of age was the quality of the mother's diet – defined by her prudent diet score⁽⁴⁾.

Focus groups and surveys carried out with women from Southampton alongside the SWS have shown that those who have the poorest quality diets feel they lack control over food choices they make for themselves and their families, feel less positive about the potential benefits of eating healthily, are less interested in food shopping, preparation and consumption, and have less social support for eating healthily than women with better quality diets^(123;124). In a regression analysis sense of control over life was the strongest of these determinants of quality of diet; this was particularly true of women of lower educational attainment⁽¹²⁵⁾. Self-efficacy is defined as an individual's belief in their ability to carry out certain behaviours. Self-efficacy is a prerequisite for a sense of control, and experience of exercising control in turn builds up a sense of self-

efficacy⁽¹²⁶⁾. It is this increase in self-efficacy and control which enables people to make changes to their lives. Whilst acknowledging that other psychological factors were found to be predictors of quality of diet⁽¹²⁷⁾, an intervention to improve self-efficacy, and thus sense of control, in this population, could have significant effects on their diet and might be a particularly effective lever for change.

3.2 The intervention

The Southampton Initiative for Health (SIH) is a non-randomised controlled trial of an intervention, that aimed to improve the diets and lifestyles of disadvantaged women in Southampton, UK⁽¹²⁸⁾. The intervention builds on a 'patients as experts' approach. This approach intends to empower participants, through providing knowledge and skills, to manage their own health, and has been shown to be effective in clinical settings. Programmes that have adopted this approach have been found to be more effective than standard patient care in improving clinical outcomes and enhancing physical and psychological well-being in chronic conditions such as arthritis and asthma⁽¹²⁹⁾. It has been suggested that these programmes work because empowering patients increases their self-efficacy^(130;131). The SIH aimed to apply this approach to improve the diets and lifestyles of a non-clinical population in a community setting.

The SIH project was designed in collaboration with the City Council and the Primary Care Trust and those working in Sure Start Children's Centres in Southampton. The target population for this intervention was women attending Sure Start Children's Centres in Southampton. Women attending Children's Centres in Gosport and Havant were used as the control group. Gosport and Havant are towns in Hampshire with similar population demographics as Southampton. A map displaying the geography of the intervention and control areas is displayed in Figure 3.1 Sure Start Children's Centres were set up as part of a UK government initiative which aims to support families from pregnancy until the child is four years old through early education, health and family support services, with an emphasis on outreach and community development. The families attending Sure Start Children's Centres tend to live in 'core areas' defined by their poor health profile as being priority areas for intervention⁽¹³²⁾. Sure Start Children's Centres have spent years building relationships in local and disadvantaged communities and therefore Sure Start Children's Centres presented the SIH with an opportunity to access the intervention target population.

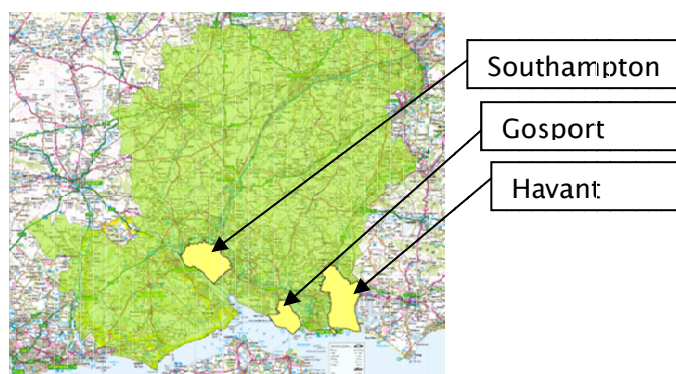


Figure 3.1 Map showing the location of the intervention and control areas in the SIH

In preparation for the SIH, Lawrence and colleagues carried out observations of Sure Start Children's Centre activities which revealed that many of the staff who work there have frequent contact with the women who attend sessions. They suggested, firstly, that these contacts represented opportunities for interactions that might initiate a process of behaviour change and secondly, that these interactions could be made more effective if staff had more skills at their disposal⁽¹³³⁾. As a consequence of this work, the SIH focused on training staff working in Sure Start Children's Centres to improve their behaviour change skills, with the overall aim of improving the diets and physical activity levels of disadvantaged women who attend the Children's Centres in Southampton.

3.2.1 Intervention Delivery – Healthy Conversation Skills training

A training package of skills to support behaviour change was delivered to Children's Centre staff. The training was termed 'Healthy Conversation Skills' and staff learnt skills that encouraged them to hold more effective 'healthy conversations' with women attending the Children's Centres. These conversations were intended to assist women in exploring their own barriers to, and opportunities for, eating healthily and being physically active. The aim of the training was for staff to achieve 'Healthy Conversation Skills' competencies. The competencies are detailed in Table 3.1. These competencies were designed to reflect staff development of three core skills: reflective practice, asking 'open discovery' questions, and goal-setting.

Competencies for trained staff	
<i>'As a result of this training I am able to...'</i>	...Use open discovery questions in a manner that helps others explore and reflect on what they do, why they do it and whether there is potential for change
	...Identify key (timely) opportunities for the use of health conversation strategies
	...Reflect on my own practice in relation to both my beliefs regarding key messages, and ability to engage women and families in 'healthy conversations'
	...Spend more time in a conversation asking open discovery questions rather than giving information
	...Use a structured goal-setting approach (incorporating SMARTER action-planning) when the woman I am talking to identifies a need to change

Table 3.1 Competencies from the Healthy Conversation Skills training

Reflection was encouraged throughout the training. From the beginning, staff were asked to explore their expectations of the training course, their beliefs about aspects of human behaviour (such as how and when people change) their understanding of key nutrition and physical activity messages and whether these are useful in supporting change. Then, as the training progressed, staff were encouraged to reflect on their activities, skills they learnt and how they thought these could be incorporated into their practice.

Open discovery questions are a specific type of open question that encourages an individual to explore their life and circumstances. These questions normally begin with 'how' or 'what', are non-judgemental, and require the recipient to reflect on their issues of concern. Throughout the training staff were given the opportunity to observe open discovery questions being used and practise using them in small groups.

At the end of every session staff were asked to complete a "Reflection and Next Steps" worksheet (to develop goal setting skills). This guided them through the steps in how to set a SMARTER goal which was reviewed at the next training session. SMARTER goals are Specific, Measurable, Action-oriented, Realistic, Timed, Evaluated and Reviewed. By making a specific plan to change a given behaviour, and allowing time to reflect on the outcome and processes involved in making such a change, enabled staff to understand about the process of planning and change.

All activities in the training package related to specific behaviour change techniques as set out in Abraham and Miche's Taxonomy of Behaviour Change⁽¹³⁴⁾. For instance, one activity involved exploring what resources or support staff felt they needed to ensure the new skills could become embedded in their usual practice. For this activity the following behaviour change techniques were used:

- prompt intention formation,
- prompt barrier identification,
- prompt practice,
- plan social support/social change,
- prompt identification as role model,
- relapse prevention,
- time management.

The training was delivered by a team of researchers who had experience in group work and behaviour change. The 'Healthy Conversations Skills' training consisted of three 3-hour group sessions held over three to five weeks to allow time for staff to practice the new skills and then reflect on practice. The training was also followed by a period of on-going support, which included a telephone call and a three hour follow-up workshop approximately five weeks and three months after training respectively. The whole training package has been described in more detail elsewhere⁽¹²⁸⁾.

3.2.2 SIH training evaluation

The intervention was accompanied by an evaluation of changes in staff practice. This was important as if the training did not result in a change in staff practice, then there could not logically be changes in the diets and lifestyles of the women who came into contact with these staff.

In total 148 staff members were trained between May 2009 and January 2011, which represented 69% of all Sure Start Children's Centre staff in Southampton. One to two months after their last training session staff were followed up with a telephone call and invited to attend a follow-up workshop, which was held three to five months after their last training session. Nearly a year after the training intervention was completed, observations of staff took place to assess whether the staff were using the skills in their normal practice. Observations were also carried out of staff in the Sure Start Children's Centres in a control area where the staff had not received Healthy Conversation Skills training. Figure 3.2 details the evaluation tasks at the different stages of the training.

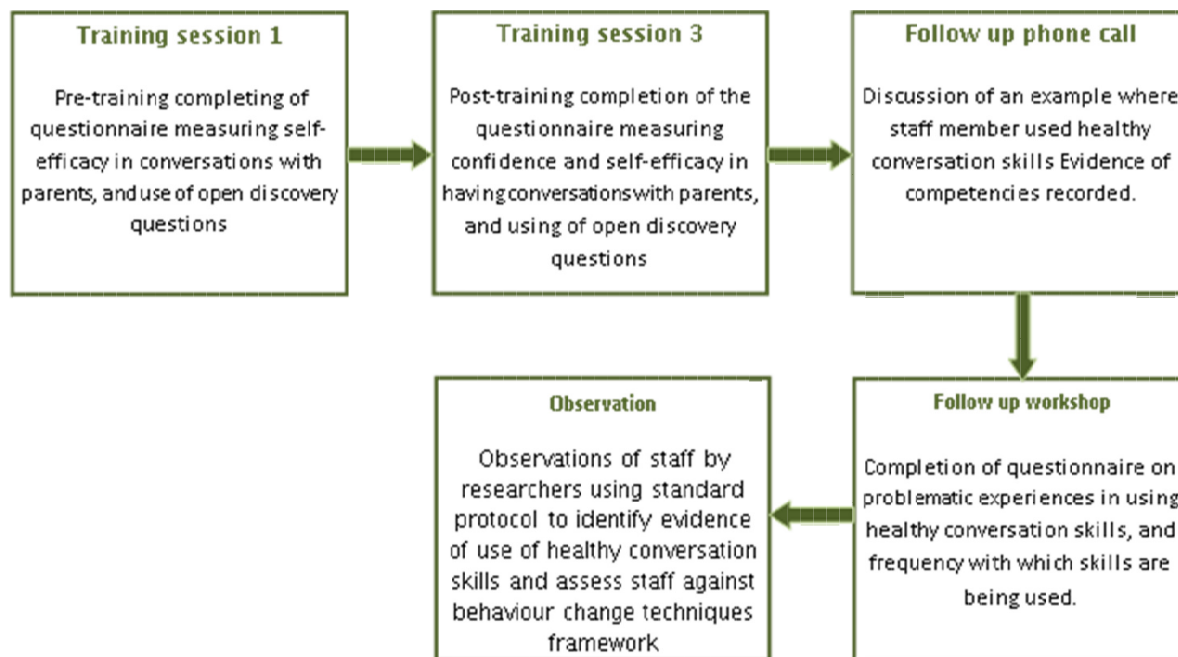


Figure 3.2 Evaluation activities during different stages of the training

The questionnaire, which was completed by all staff before and after the training, asked them to write down what their response would be to a statement that could have been made by a women attending one of their sessions. This included questions such as “how would you respond to the following statement?” ‘*There are lovely vegetables outside the shop but I don’t know what they are*’. Researchers coded the responses into one of seven categories which described, for example, telling/suggesting, empathising, open discovery questions. Staff were also asked to indicate, on a scale of one to ten, how confident they felt about having conversations with women about healthy eating and physical activity. The follow-up telephone call was made between five to eight weeks after completion of the training, researchers followed a semi-structured interview to encourage staff to reflect on using open discovery questions during their practice, and to talk about specific scenarios where they had used the skills. In total phone calls were made with 139 (94%) trained staff. Researchers recorded the conversations and were able to ‘score’ the staff from zero to four, according to how well they were meeting each of the training competencies⁽¹³⁵⁾. The follow-up workshop was completed by 101 (68%) staff members and offered them the opportunity to discuss barriers and facilitators to using the skills from the training and again offered support to practice reflection on the way they were working. Finally the observation work was completed one year after the training and gave researchers the opportunity to assess how the staff were actually applying the skills in their practice and to compare their performance with that of a group of untrained staff in similar job roles in Children’s Centres in the control area. In total 168 conversations involving 70 (47%) of the trained staff were observed in 12 children’s centres in the intervention

area and 89 conversations of 41 staff members were observed in 10 Children's Centres in the control area⁽¹³⁶⁾.

Results from the evaluation show that immediately following the training, staff were more likely to respond to statements made by mothers about healthy eating or physical activity with open discovery questions, compared to before the training began when most responded with 'telling or information giving' statements. The number of open discovery questions used by staff, in response to the statements in the evaluation form, increased after the training from 16 to 321 ($p < 0.001$)⁽¹³⁶⁾. Staff members were also more likely to report being more confident in having conversations with women about healthy eating and physical activity after they completed the training. During the follow-up phone call staff who demonstrated more competence in using open discovery questions were more likely to score themselves higher in how confident they felt in having conversations with parents⁽¹³⁵⁾.

The results from the follow-up phone calls also showed that staff had moderate to high scores for the competencies 'Identify key (timely) opportunities for the use of health conversation strategies' and 'Spend more time in a conversation asking open discovery questions rather than giving information'. These results indicate that up to eight weeks following their last training session most staff had changed their practice in accordance with the skills learnt as a result of the training.

Results from the follow-up workshops, showed that 90% of staff reported using the skills 'often' in their practice and none of the staff reported 'never' using the skills. This suggests that the skills were still being used around three months following their last training session⁽¹³⁷⁾.

Finally, observation work, carried out a year post-training, showed that staff in the intervention group 1) created more opportunities to have healthy conversations with mothers ($p = 0.02$) 2) used more than two open discovery questions during more conversations with mothers (< 0.001) 3) spent more time listening than giving information to mothers ($p = 0.02$) and 4) spent at least half of the time that they were talking asking open discovery questions ($p < 0.001$) compared to staff observed in the control area. These results suggest that staff were using the skills a year post-training.

In conclusion, whilst it is challenging to collect objective data on change in staff practice, the evaluation which has been carried out consistently suggests that the majority of staff who attended the 'Healthy Conversation Skills' training are capable of having more productive conversations with women, who attend Sure Start Children's Centres, about diet and physical activity. Though this does not guarantee that all women attending Sure Start Children's Centres were supported by staff trained in healthy conversation skills, being able to demonstrate change staff practice as a result

of training was necessary in order to justify looking for change in women's diets and lifestyles post-intervention.

3.2.3 SIH outcome evaluation

A PICO was generated to describe the population, intervention, controls and outcome involved in the SIH (Table 3.2).

Population	Intervention	Comparison	Outcome
Women attending Sure Start Children Centres.	All staff members in the Sure Start Children's Centres trained in	Women attending Sure Start Children's Centres in neighbouring	Improvements in women's sense of control over life
Women who were attending the Children's Centre with their own child e.g. child-minders were not eligible	behaviour change skills.	towns where staff members did not receive our	Improvements in women's feelings of self-efficacy, both general and specific for healthy eating
Staff are able to have more empowering conversations with		behaviour change skills training	
Women with a good understanding of English language	women about their health		Improvements in women's quality of diet and levels of physical activity

Table 3.2 PICO table describing the population, intervention, comparison and outcome in the main SIH study

The intervention was accompanied by a before and after non-randomised controlled trial to evaluate the impact on the diets and lifestyles of women. Figure 3.3 is a flow diagram outlining the outcome evaluation process. The control group were recruited from the areas of Gosport and Havant which are towns in close proximity to Southampton and were chosen as the control areas due to their similar demographic profile.

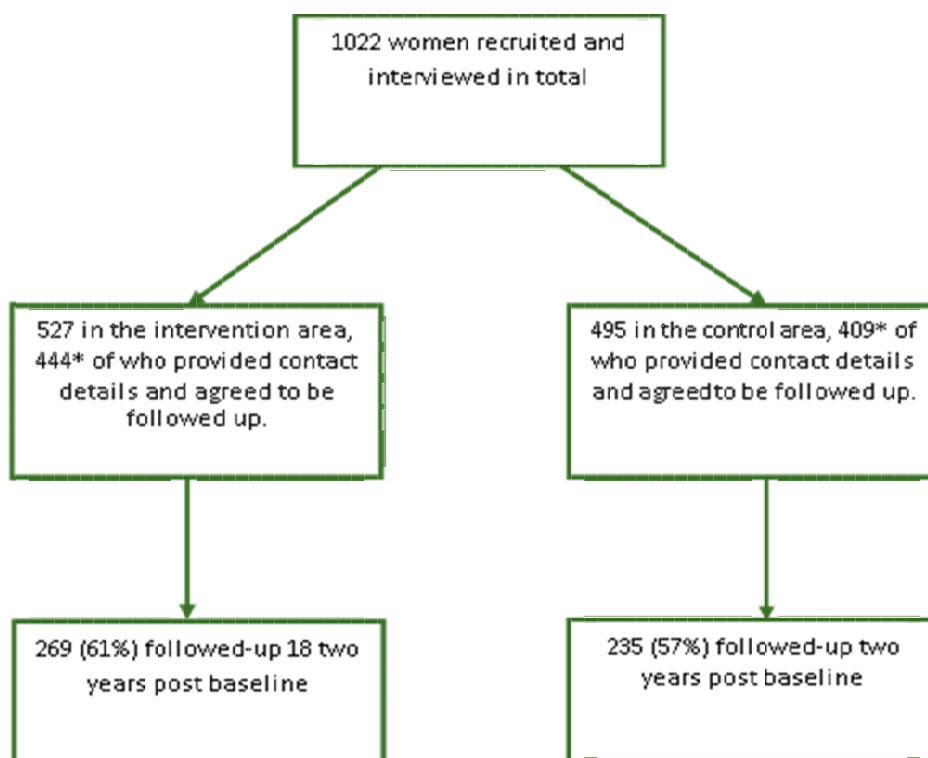


Figure 3.3 Flow diagram showing the process of the SIH outcome evaluation

*Excludes those who provided incorrect contact details; 59 and 60 participants in the intervention and control groups respectively

Women were recruited into the study by researchers who attended baby and toddler groups at Sure Start Children's Centres. Women were presented with a study information sheet and asked if they would like to take part. If the woman agreed then the researcher asked her to complete a consent form and then the questionnaire was completed in an interview with the woman. A copy of the information sheet and questionnaire can be found in Appendix B. An interview approach was used, rather than self-complete, to accommodate literacy issues, common in this disadvantaged population. Following this, women were asked if they consented to be contacted again for future waves of the study.

The questionnaire included questions about the women's own diet, physical activity and health-related psychosocial behaviours. Diet was assessed using a food frequency questionnaire (FFQ). The FFQ assessed compliance with the prudent diet pattern observed in the SWS women. Data from the FFQ was used to calculate a 'prudent diet' score which reflected the woman's dietary quality⁽¹³⁸⁾. A high score described a diet high in vegetable, wholemeal bread and salad, conversely a low score describes a diet high in crisps, chips and white bread⁽¹³⁹⁾. Physical activity was assessed using the General Practice Physical Activity Questionnaire (GPPAQ)⁽¹⁴⁰⁾. Health-related

psychosocial factors were assessed using validated instruments. The psychosocial factors assessed included self-efficacy^(141;142) and perceived control over life⁽¹⁴³⁾. In addition, the questionnaire included some questions about demographic factors including educational attainment, age, and being in receipt of benefits, clothing size as a proxy for BMI⁽¹⁴⁴⁾, and also number and age of children who lived with the woman.

In order to assess the impact of the SIH on women's diet, physical activity and general well-being, a cohort of the women was followed-up and the questionnaire repeated two years post baseline (18 months post intervention). These data enabled the researchers to assess whether women in the intervention group increased their feelings of self-efficacy and control over their lives, compared to those in the control group, and whether this was reflected in improvements in their diets and levels of physical activity.

3.3 The effect of the SIH on children's diets

The SIH aims to improve the diets and lifestyles of women of child-bearing age. It was hypothesised that the intervention would increase the levels of self-efficacy and perceived control of women who were exposed to the staff who had been trained in the conversational behaviour change skills, and that because of this increase in their sense of self-efficacy and control, women would feel able to improve their quality of diet. As these women were recruited through Sure Start Children's Centres, each woman was by definition a mother of at least one child under five years old. The literature review clearly indicated that mothers play a vital role in determining the quality of their young children's diets, not only through feeding her child a similar diet to her own but also being the person who controls her child's diet and who decides on the environments within which her child consumes food, all of which appear to be associated with children's quality of diet^(4;81;91;92;105;111). In the SIH, changing the health-related behaviours of mothers would therefore be expected not only to affect their own food choices but would in turn impact on the diet of their children. Improvements in a mother's diet quality might be expected to have a direct impact on her child's diet, and through increasing her levels of self-efficacy and sense of control over life, might also impact on the way she controls her child's diet and feeding environment. Figure 3.4 is a logic model showing the hypothetical effect of the SIH on the diets of young children. In the context of this larger scale intervention a separate investigation to evaluate its impact on the quality of diet and home environmental and familial factors which influence quality of diet has been carried out, in preschool children of the women who are part of the intervention.

This chapter has described the SIH in detail and introduced the mechanism through which I expect the SIH to impact on young children's quality of diet. The next chapter describes the methods and materials used for this PhD project.

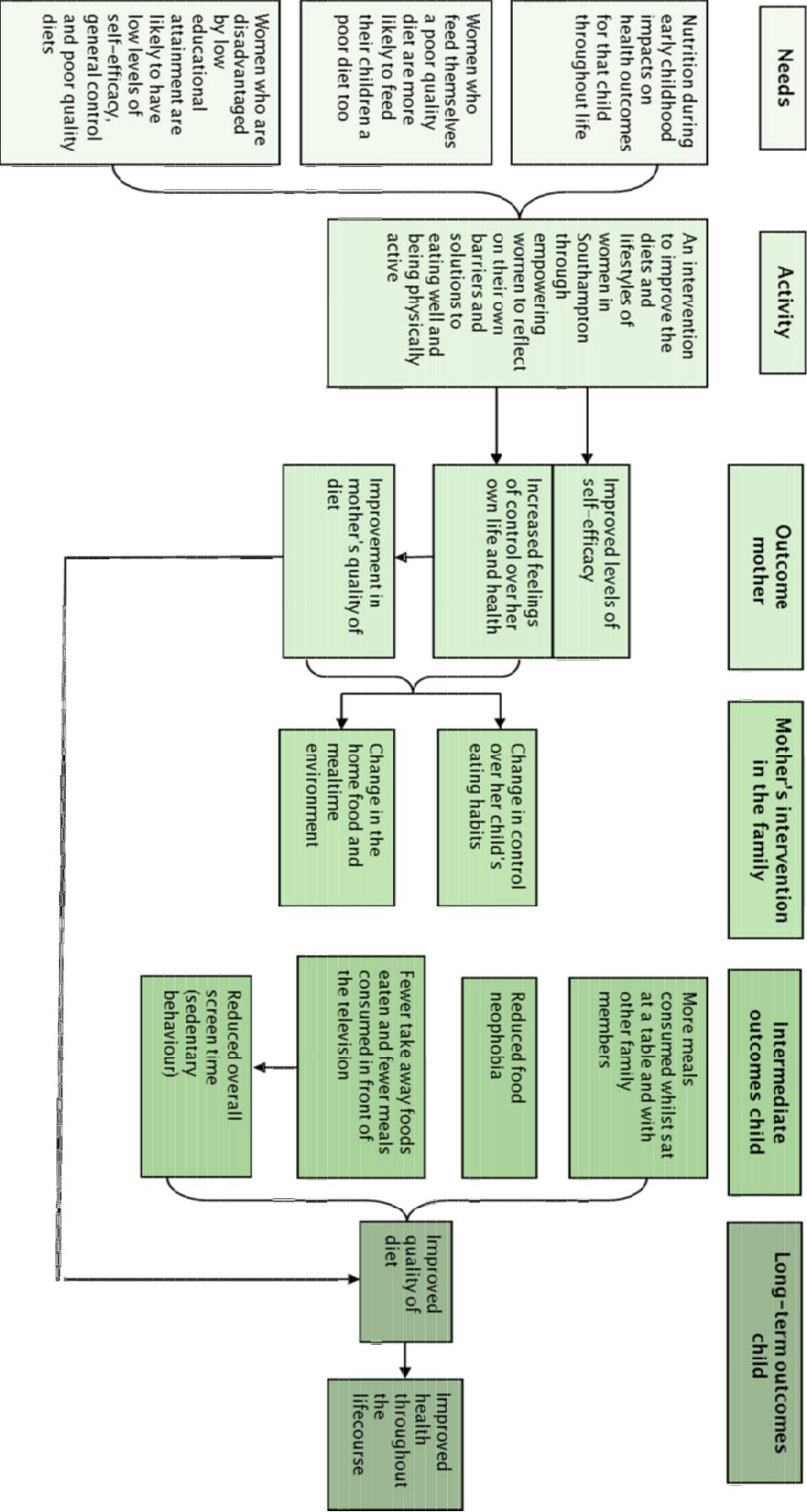


Figure 3.4 Logic model showing the mechanism of the SIH intervention

4 Methods

As explained in the previous chapter, the research questions for this project will be addressed in a sub-study of the SIH intervention. This chapter describes the detail of the study design, participants, methods and materials used in this project to address the following research questions:

Research question 1: How do maternal, child and mealtime environmental characteristics interrelate to influence preschool children's quality of diet?

Research question 2: Does an intervention aimed at improving the diet and lifestyles of women impact on their preschool children's quality of diet?

4.1 Study design

This project is a before and after non-randomised controlled trial within the SIH intervention.

4.2 Sample size

The sample size for this study was determined by the number of women who were interviewed at baseline as part of the SIH study, and who had one to four year old children and provided contact details for follow-up. Therefore a post-hoc power calculation was necessary which used the sample size available for this study and calculated the size of the effect necessary to see a significant difference in the change between the groups. This provided a sample of 273 women in Southampton and 299 in the control area. Assuming approximately 20% attrition and allowing for a correlation of 0.75 between individual children's prudent diet scores before and after the intervention, at a 5% significance level, a sample size of 177 in the cohort of children at baseline and one year would provide 91% power to detect a change of 0.25 SD (standard deviation) in prudent diet score. A change of this size should be achievable. For example for a child who has a poorer quality diet (score of -0.77 SD) a 0.25 SD change could result from an increase in their consumption of fresh fruit from 6 times per week to 10, as well as a reduction in their chocolate or sweet consumption by 5 times per week, from 7 to 2 times. In this example it could be achieved by exchanging their chocolate or sweets for a piece of fruit during the week. For a child with a better quality of diet (score of 0.58 SD) they could improve their diet by 0.25 SD by increasing their vegetable intake by 4 times per week from 10 to 14 times, thus equating to having vegetables twice per day, and exchanging white bread for brown bread.

4.3 Materials

A structured questionnaire was developed to assess child's quality of diet and factors which have been shown to be associated with child's quality of diet (Appendix C). The questionnaire was created using previously published scales or questions which were generated following discussion with an expert in that field. These included questions on: household composition, nibbling behaviour, mealtime environment, child food neophobia, style of parental control over the child's eating habits, screen-time and maternal employment. Information had already been gathered about the mother's diet, perceived control over life, general self-efficacy, and self-efficacy for eating healthily, well-being, food involvement, social support, food security and educational attainment, during interviews with these women in the SIH. Information on the validated scales used for measuring general self-efficacy, self-efficacy for healthy eating, child food neophobia, food involvement, social support, maternal well-being and overt and covert control over child's eating habits are described in Table 4.1, the other factors were not assessed on scales but they are described in detail in the following section.

Scale	Authors	Example Item	Scoring	Cronbachs Alpha
Child food neophobia scale	Adapted from Pliner ⁽¹¹⁷⁾	"My child is afraid to try new foods"	6 items assessed on a 4-point scale. 'Strongly agree – strongly disagree'	0.90
Covert control scale	Ogden <i>et al</i> ⁽¹⁰⁵⁾	"How often do you avoid buying sweets and crisps and bringing them into the house?"	5 items assessed on a 5-point scale. 'Never – always'	0.76
Overt control scale	Ogden <i>et al</i> ⁽¹⁰⁵⁾	"How often are you firm about what your child should eat?"	5 items assessed on a 5-point scale. 'Never – always'	0.59
General self-efficacy scale*	Adapted from Schwarzer & Jerusalem ⁽¹⁴²⁾	"If I am in trouble I can usually find a way out"	5 items assessed on a 4-point scale. 'Strongly agree' – 'strongly disagree'	0.71
Self-efficacy for healthy eating scale*	Adapted from Brenner & Schwarzer ⁽¹⁴¹⁾	"I know I could stick to eating healthy foods even if I don't receive much support from others"	5 items assessed on a 4-point scale. 'Strongly agree' – 'strongly disagree'	0.87
General Sense of control scale*	Bobak <i>et al</i> ⁽¹⁴³⁾	"I feel that what happens in my life is often determined by factors beyond my control"	9 items assessed on a 4-point scale. 'Strongly agree' – 'strongly disagree'	0.69
Food involvement scale*	Bell & Marshall ⁽¹⁴⁵⁾	"Compared to other decisions in my life my food choices are not very important"	12 items assessed on a 5-point scale. 'Strongly agree – strongly disagree'	0.63
Well-being scale*	WHO ⁽¹⁴⁶⁾	"Over the last two weeks I have felt cheerful and in good spirits"	5 items assessed on a 5-point scale. 'At no time – all of the time'	0.82

Table 4.1 Cronbachs Alpha, example items and references for scales included in the surveys; *scales were included in the main SIH baseline questionnaire about the women (see Appendix B)

4.3.1 Child food neophobia

The Child Food Neophobia Scale assesses how willing a child is to try novel and unknown foods⁽¹¹⁷⁾, children with higher levels of neophobia are less likely to be willing to try new foods and tend to have poorer quality diets⁽¹²⁰⁾. It was developed as a ten-item tool but, as in previous studies, our questionnaire included a reduced six-item

version as four of the items were deemed inappropriate for preschool children⁽¹¹⁸⁾. Parents were asked to indicate how much they agree with statements relating to their child's reaction to novel foods. Responses are recorded on a 4 point Likert scale from 'strongly disagree' to 'strongly agree' and are coded from 1 to 4 respectively, two items require reverse scoring then responses are summed to provide an overall score ranging from 6–24.

4.3.2 Covert and Overt control

Parental use of covert and overt control methods was measured using the scale developed and validated by Ogden and colleagues⁽¹⁰⁵⁾. Covert control methods relate to maintaining a child's food environment. Overt control methods are those which involve restriction or encouragement of the child to consume certain foods. Research has shown that mothers who used more covert control methods had children who consumed fewer unhealthy snacks and mothers who used more overt control methods had children who consumed more healthy snacks⁽¹⁰⁵⁾. Participants were asked how often, on a 5-point Likert scale from 'never' to 'always', they carried out behaviours indicative of covert and overt control styles. The measure contains 10 items, 5 of which relate to covert control and 5 of which relate to overt control. Responses were summed for the five covert control items and five overt control items separately which provides each participant with a covert and an overt control score, both ranging from 0–20.

4.3.3 Mealtime environment

Questions were collated from a number of publications^(61;147) which focused on the feeding environment and quality of diet. All of the items have been shown to be associated with children's quality of diet. Eating meals with the family and at a table have been shown to be positively associated with child's quality of diet^(91;109), whereas eating with the television on and eating take-away foods have been found to have a negative association with a child's quality of diet^(108;109). The questions assessed different aspects of the environment within which the child consumed meals. Mothers were asked how often in the last month has your child: 'eaten an evening meal with the family?'; 'eaten meals whilst the television was on?'; 'eaten take away food, including fish and chips?'; 'eaten whilst sat at a table?' The response categories were the same as those in the FFQ to maintain consistency and ranged from 'never' to 'more than once per day'. Responses were coded from 0 to 6. Items were analysed separately, as in previous studies which assess the home environment, because they are not necessarily related⁽¹⁰⁸⁾.

4.3.4 Mealtime battles

Battles and arguments between mother and child about food during mealtimes was assessed by asking 'how often in the last month have you and your child had battles about food?' Responses were recorded on a 5-point Likert scale from 'never' to 'always' and were coded 0–4 respectively.

4.3.5 Screen-time

Screen time in most studies included in the review assessed child time spent in front of a screen in hourly increments. Children who spend more time in front of a screen have been found to consume a poorer quality diet characterised by higher intakes of sugar sweetened soft-drinks and fast-food and fewer fruits and vegetables⁽¹¹¹⁾. Participants were asked to indicate how many hours, on average, their child spends watching television or DVD's per day and how many hours, on average, their child spends on a computer or games console per day. Participants were prompted to consider weekend days as well as weekdays. Responses were '0', '<1', '1–2', '2–3' etc up to >5 hours per day. Time spent watching television/DVD's and playing on a computer was summed for each child to give a total 'screen time' variable.

4.3.6 Maternal employment

Questions regarding maternal employment were developed with advice from an expert working on the Millennium Cohort study⁽⁷⁶⁾. Although the evidence is limited, it has been shown that mothers who work part-time have children with healthier dietary habits in terms of snacking less, than children of mothers who worked full-time or were unemployed⁽⁷⁸⁾. Participants were asked to indicate if they had been employed since the birth of the study child, and if affirmative, how old (in years and months) the child was when the mother returned to work and how many hours she had worked in the last seven days.

4.3.7 Maternal diet

Maternal diet was assessed in the main SIH baseline survey. The questionnaire which was used in the main baseline survey asked the women about their own diet and health-related psychosocial factors and is included in Appendix B. Maternal diet was assessed by a 20-item food frequency questionnaire⁽¹³⁹⁾. Participants were asked to identify how often they had consumed each of the 20 food items in the past month. Possible responses were 'never', 'once per month', 'once every two weeks', 'one to two times per week', 'three to six times per week', 'once per day' and 'more than once per day'. The 20 food items in the FFQ were those that characterised the 'prudent' dietary pattern and contributed most to the prudent diet score in the analysis of the Southampton Women's Survey data collected using a 100-item FFQ⁽¹³⁸⁾. A prudent diet

score was calculated for each woman using her standardised frequency of consumption of each of the 20 foods in the FFQ, multiplied by the coefficient for that food produced by principal components analysis of the 100-item FFQ⁽¹³⁸⁾. A high score represented a 'prudent diet' which was characterised by high intakes of fruit and vegetables, wholemeal bread, rice, pasta, yoghurt and breakfast cereals. Low scores represent an 'imprudent diet' which was described as one with low intakes of these foods and high intakes of chips, roast potatoes, sugar, white bread, red and processed meat and full fat milk.

4.3.8 Maternal self-efficacy

As with maternal diet, maternal self-efficacy was assessed during the main SIH survey (questionnaire in Appendix B). Both general and healthy eating self-efficacy were assessed on scales developed by Schwarzer^(141;142). The general self-efficacy scale assesses a person's belief in their ability to cope with adversity or perform difficult tasks in general life. The specific self-efficacy for healthy eating scale assesses whether an individual feels they could overcome adversity and carry out challenging tasks but with a specific focus on eating a healthful diet. The general self-efficacy scale was shortened from 10 to 5 items in consultation with the scale author. Responses were coded from 1 'strongly disagree' to 4 'strongly agree' and summed in order to provide a score from 4–20 for both types of self-efficacy.

4.3.9 General sense of control

General sense of control was also assessed during the main SIH survey (questionnaire in Appendix B). The scale is a 9 item tool which assesses a person's perceived control over their lives⁽¹⁴³⁾. The scale is a shorter version of the assessment used in the Whitehall II study. Six of the items in the scale refer to control over life in general and three refer to feeling of control over one's health. Responses were recorded on a 4-item Likert scale from 'strongly disagree' to 'strongly agree', coded 1 to 4 respectively. Four items in the scale require reverse coding and responses to all items are summed to give each participant a general control score ranging from 9–36.

4.3.10 Maternal food involvement

Maternal food involvement was assessed during the main SIH survey using the food involvement scale which was developed by Bell and Marshall⁽¹⁴⁵⁾. It consists of 12 items in the form of statements which refer to one of the five areas of the feeding cycle: 1) acquisition 'I do most or all of my own food shopping'; 2) preparation 'I do not like to mix or chop food'; 3) cooking 'cooking or barbequing is not much fun'; 4) eating 'talking about what I ate or am going to eat is something I like to do'; 5) disposal 'I do most or all of the cleaning up after eating'. Respondents indicated how much they agreed or disagreed with these statements on a five-point scale. Responses were

coded from 1–6, half of the items required reverse coding and then all responses were summed in order to give each participant a score from 12–60.

4.3.11 Maternal well-being

Maternal psychological well-being was assessed in the main SIH survey using the WHO-5 tool. This scale was developed by the World Health Organisation as a screening tool for depression. The scale consists of five items and participants are asked to indicate how often, from ‘at no time’ to ‘all of the time’, in the last two weeks they: ‘felt cheerful and in good spirits’, ‘felt calm and relaxed’, ‘felt active and vigorous’, ‘woke up feeling fresh and rested’, ‘felt that my daily life has been filled with things that interest me’. Responses were coded from 0–5 resulting in an individual score from 0–25; when used in General Practice a score of 13 or below would result in the person being referred to be assessed for clinical depression.

4.3.12 Food security

Food security was assessed using the 6-point short form of the US Household Food Security Scale as developed by Blumberg et al⁽¹⁴⁸⁾. As with other studies in the UK the phrasing was altered slightly to suit the UK population⁽⁵²⁾. An example item from the scale is ‘in the last 12 months did you ever reduce the size of your meals or skip meals because there wasn’t enough money for food?’ The assessment was scored by totalling the number of affirmative responses (including the answers ‘often’ and ‘sometimes’ to questions 5 and 6, and ‘some months’ and ‘almost every month’ to question 2). Scores ranged between 0 and 6. The total score was used to categorise households: ≤ 2 = food secure, >2 and <5 = food insecure without hunger, ≥ 5 = food insecure with hunger.

4.4 Children’s dietary assessment

This study required a dietary assessment method which would characterise the quality of young children’s diets, which was suitable for a population with low levels of education and was minimally burdensome to the participant.

4.4.1 Issues with assessing diet in children

There are a number of problems associated with measuring dietary intake in surveys. An additional challenge for young children is that they lack the cognitive skills required for assessment. For example children aged two to five years are unlikely to have an adequately developed concept of time, a good enough memory, an attention span long enough or knowledge of the names of food in order to be able to accurately describe their own diets⁽¹⁴⁹⁾. Therefore it is necessary that dietary assessment of young children is completed by their main caregiver, often the child’s mother⁽¹⁵⁰⁾. There are, however,

problems associated with this. Firstly, some foods or beverages may be forgotten or unknown. This is especially likely to be an issue if the main caregiver shares responsibility for the child⁽¹⁵¹⁾. Secondly, dietary assessment is open to social desirability bias. The reporter may under or overestimate the consumption of some foods or drinks in order to reflect what they feel their child 'should' be eating rather than reporting the situation accurately⁽¹⁵²⁾. Thirdly, the parent may report the foods that were given to the child as opposed to foods that were actually consumed. For instance if the child attends a preschool and the parent provides the child with a lunchbox, the parent would report that the child ate the items in the lunchbox. However, it is possible that the child swapped foods or threw some of the food away and did not actually consume the contents of the lunchbox. Finally, food habits change frequently in childhood, making assessment of habitual diet difficult⁽¹⁵³⁾.

4.4.2 Comparison of dietary assessment tools

Food records have been regarded for many years as the 'gold standard' of dietary assessment⁽¹⁵⁴⁾. Measuring dietary intake of children using food records requires the caregiver to document all food and drinks that the study child has consumed over a certain time period, usually a few days. This is ideally done at the time of consumption in order to reduce the likelihood of the reporter forgetting. However, this is a very burdensome method for the reporter and there is also the possibility that the method itself will change normal food habits as a consequence of recording all food and beverage intake⁽¹⁵⁴⁾. Food records may not be a good dietary assessment tool to use with disadvantaged populations. A study comparing the use of dietary assessment methods in materially deprived households in London found that food records were the least liked and completed method by participants (compared to food recalls or food checklists) and yielded the lowest estimates of intake⁽¹⁵⁵⁾.

Food recalls require the caregiver to report all foods and beverages that the study child has consumed over a set time period, often the previous 24hours⁽¹⁵⁶⁾. A single 24hour recall is short and quick to administer and is versatile. It can be used with people of differing levels of education as no writing or numeracy skills are required, and the recall can be administered either face-to-face or over the telephone⁽¹⁵⁷⁾. However, foods can be omitted when recalling diet. Research suggests these are most likely to be snack foods or beverages which could cause misclassification of participants when considering their overall quality of diet⁽¹⁵⁸⁾. Also foods consumed in the last 24hours may not reflect the normal diet of that person. To overcome this issue researchers often repeat recalls on 3 or more occasions, ideally with a mixture of mid-week and weekend days. However this increases the costs of data collection and participant and interviewer burden.

Food frequency questionnaires are designed to capture data on usual, long-term diet and can be used for assessing individuals or populations⁽¹⁵⁴⁾. FFQs assess diet over a longer time frame (from one week to one year) and therefore may provide a better approximation of habitual diet. Also FFQs have a relatively low participant burden, as the reference period is longer, usual dietary intake can be inferred from a single questionnaire and therefore participant involvement is less than for the other methods. FFQs may be particularly suited for 'hard to reach' populations who are notoriously difficult to engage with research⁽¹⁵⁹⁾. However, as FFQs contain a predetermined list of foods it is important to consider which foods and beverages are appropriate to be included in the list. Another issue with FFQs lies in assumptions that have to be made about the analysis of mixed dishes such as pizza e.g. thick or thin base, meat or vegetable topping⁽¹⁵⁴⁾. Measurement error associated with use of FFQs is widely recognised⁽¹⁶⁰⁾ and of particular relevance in this project, previous studies evaluating the use of FFQs to assess the diets of children have raised concerns that they overestimate intakes⁽¹⁵³⁾. However children's nutrient intakes assessed using an FFQ appear to show reasonable ranking when compared with 24hour recalls⁽¹⁵⁰⁾, food diaries⁽¹⁵¹⁾ and some bio-markers⁽¹⁶¹⁾. One particular feature of the FFQ is its ability to characterise dietary patterns. Dietary patterns analysis considers foods consumed in combination and describes a person's dietary habits and patterns of food choice⁽¹⁶²⁾. FFQs have been used successfully to describe dietary patterns in infants⁽¹⁶³⁾, children⁽¹⁶⁾ and adults⁽¹⁶⁴⁾ in a way that is comparable to other assessment methods. Most commonly FFQs include a list of foods to cover the whole diet, however, there is growing use of shorter tools designed to assess particular aspects of diet. For example a recent study in Norway a 23-item FFQ demonstrated reasonable ability to rank 9–13 year old children according to their intakes of the 23 food items when compared with a pre-coded food diary⁽¹⁶⁵⁾.

The assessment method required for this study aimed to rank children in terms of their quality of diet. Using the dietary data collected from women in the SWS, a short FFQ was developed to assess women's compliance with the prudent pattern, as explained in section 4.3.7. Prudent diet scores were calculated using data from both a full 100-item and a 20-item FFQ and were compared. The scores were highly correlated ($r=0.94$) suggesting that the shorter tool provided useful information with respect to compliance with the prudent dietary pattern. Both scores also showed comparable associations with the biomarker red-cell folate, suggesting that women who had a higher prudent diet score consumed a more healthful diet⁽¹³⁹⁾.

A similar prudent pattern has been described in the SWS children at the age of three years⁽⁴⁾. Using these SWS data provided an opportunity to develop a new short FFQ to

assess the quality of young children's diets for use in the present study. This would limit participant burden and provide ability to assess compliance with the prudent pattern. The following sections describe the development and evaluation of the short FFQ.

4.4.3 Development of a short food frequency questionnaire to assess quality of diet in preschool children

Diets of 1640 three year old children in Southampton were assessed using an 80-item FFQ⁽⁴⁾. The most important pattern of diet in the children was termed the 'prudent' pattern. A score was calculated for each child indicating their compliance with the prudent diet pattern. Children with a high score had diets characterised by frequent intakes of foods such as vegetables, fruit, wholegrain and water; the diets of children with low scores were characterised by frequent intakes of crisps, chips, white bread and soft-drinks.

The new short FFQ designed for the present study was developed from the SWS data collected using the full, 80-item FFQ when the children were aged three years. The short FFQ was designed to be less resource-intensive and to reduce participant burden, whilst still providing robust information about children's adherence to the prudent diet pattern. The short questionnaire assesses the frequency of consumption of foods within the food groups that have the greatest influence on children's prudent diet scores at 3 years. The 80-items from the full FFQ were collapsed into 51 food groups. The short FFQ was developed by including the 20 food groups that had the greatest influence (coefficients of the highest magnitude) on the 'prudent' diet score. The food groups and their coefficients from the full FFQ are displayed in Table 4.2; the food groups highlighted show the items which were included in the short FFQ.

Food group	Coefficient	Food group	Coefficient
Green vegetables	0.26	Boiled potatoes	0.05
Root Vegetables	0.25	Soup	0.04
Water	0.23	Full-fat milk	0.04
Non-citrus fruit	0.23	Cream	0.04
Salad vegetables	0.23	Reduced-fat spread	0.03
Wholemeal bread	0.22	Sauces and salad dressings	0.01
Dried fruit	0.19	Offal	0.01
Fish and Shell fish	0.19	Reduced-fat milk	0.00
Fruit juices	0.17	Yorkshire pudding and savory pancakes	-0.02
Vegetarian food	0.16	Quiche and pizza	-0.02
Rice and pasta	0.16	Puddings	-0.03
Crackers	0.14	Yogurt	-0.04
Other vegetables	0.14	Full-fat spread	-0.05
Cooked and tinned fruit	0.12	Milky drinks	-0.08
Chicken and turkey	0.12	High energy soft drinks	-0.08
Nuts and seeds	0.11	Tea and coffee	-0.11
Cheese and cottage cheese	0.11	Added sugar	-0.12
Baby foods	0.10	Tinned vegetables	-0.12
Citrus fruit	0.10	Cakes and biscuits	-0.13
Eggs	0.08	Confectionary	-0.18
Beans and pulses	0.07	Low energy soft-drinks	-0.19
Red meat	0.07	Processed meat	-0.19
Breakfast cereals	0.07	Chips and roast potatoes	-0.23
Marmite and Bovril	0.06	Crisps	-0.25
Sweet spreads	0.06	White bread	-0.26
Fruit purées	0.05		

Table 4.2: Coefficients for the first ‘prudent’ component in a principal component analysis of SWS data for 1640 children whose diets were assessed using the full 80-item FFQ. Food groups in bold are those with the coefficients with the greatest magnitude and were therefore included in the short FFQ.

In order to check that 20 food groups would be appropriate to create the short FFQ diet scores were calculated using a reduced number of food groups, starting with a score based on 2 and then increasing to 30 groups. The scores calculated in each of these cases were correlated with the prudent diet score calculated from the 51 groups. Figure 4.1 is a scatter plot showing that the correlation increased as the diet scores were calculated from a greater number of food groups, reaching a plateau between 15–20 food groups, when the correlation coefficient reached $r > 0.90$. This suggests that the short FFQ could provide useful information about compliance with the prudent diet in a way that is very comparable to the full FFQ assessment.

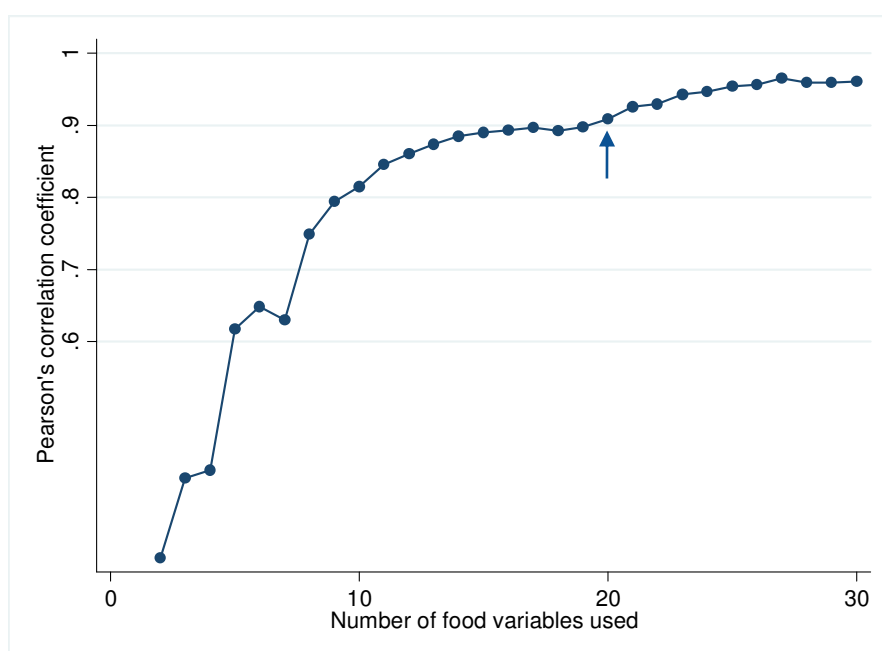


Figure 4.1 Scatter plot showing the Pearson correlations between the prudent diet score from the full FFQ and diet scores created with a reduced number of food group variables

Finally, prudent diet scores calculated using the 20 food groups, were correlated with nutrient intakes derived from the full FFQ. These were compared with correlations between prudent diet scores calculated using all 51 food groups and nutrient intakes from the full FFQ. Table 4.3 displays the Spearman correlation coefficients between the prudent diet scores, from the 20 food groups, and from the 51 food groups, and the energy adjusted nutrients from the full FFQ. This shows that the prudent diet score created from the 20 food groups was positively correlated with all the nutrients, and that the correlations were comparable with those from the prudent diet score calculated from 51 food groups.

Nutrient	Prudent diet scores from the 51 food groups		Prudent diet scores from the 20 food groups	
	r_s	P value	r_s	P value
Calcium	0.21	<0.001	0.21	<0.001
Iron	0.37	<0.001	0.34	<0.001
Zinc	0.53	<0.001	0.50	<0.001
Retinol	0.16	<0.001	0.16	<0.001
Beta carotene	0.25	<0.001	0.26	<0.001
Vitamin D	0.14	<0.001	0.14	<0.001
Thiamine	0.32	<0.001	0.30	<0.001
Folate	0.42	<0.001	0.40	<0.001
Vitamin C	0.11	<0.001	0.11	<0.001

Table 4.3 Spearman correlation coefficients between prudent diet scores calculated using the 20 food groups, and using all the food groups, and energy adjusted nutrient intakes from the full FFQ in 1640 three-year old children in SWS

4.4.4 Evaluation of the short children's food frequency questionnaire

The comparisons above are based on assessment of consumption of 20 foods within a full FFQ assessment. In order to evaluate the utility of the short FFQ and its ability to assess children's prudent diet scores when used as an independent tool, an evaluation study was set up in which children's diets were assessed using both the short FFQ and the original full FFQ. Mothers completed both versions of the FFQ at different time points, on behalf of their preschool aged child.

4.4.4.1 Participants

Participants who took part in this study were women who were enrolled in the SWS, a large prospective study of diets and lifestyles of women and children in Southampton⁽¹²¹⁾, who had completed the full FFQ on behalf of their child, when aged three years, between March 2010 and January 2011.

4.4.4.2 Procedure

During the 3-year home visit the SWS research nurse explained the short FFQ evaluation study to the child's mother and requested consent to telephone her to ask if she would be willing to complete the short FFQ over the telephone. Of the 73 women visited, all gave consent. In total 47 (64%) were contactable and of those 45 completed the short FFQ. The two women who refused to complete the questionnaire gave lack of time as their reason. Responses to the FFQ were entered directly into an Access database by the researcher whilst administering the questionnaire. Ethical approval for

this study was granted by the Southampton and South West Hampshire Local Research Ethics Committee.

4.4.4.3 Statistical analysis

Prudent diet scores from the short FFQ were calculated using the standardised frequencies of consumption of the food groups listed on the short FFQ and the coefficients for those groups from the principal components analysis of the full FFQ. Prudent diet scores calculated from the short FFQ were compared with scores obtained from the full FFQ. Prudent diet scores were standardised using the mean and standard deviation of the initial scores from the full FFQ. Pearson correlation coefficients were used to assess the association between the prudent diet scores and a Bland–Altman test was used to assess the limits of agreement between the two questionnaires.

4.4.4.4 Results of the evaluation

The characteristics of the 45 children and their mothers who completed the short FFQ are displayed in Table 4.4. Children in the study were three years old and nearly half were male. The majority of their mothers were educated above GCSE level and were normal weight.

Characteristics of mothers and children who completed the long and short FFQ	
Child age in years (mean(SD))	3.6 (0.2)
Child gender (n(%))	
– Male	21 (47)
Mothers age in years (mean(SD))	35.5 (3.1)
Mothers educational attainment† (n(%))	
– ≤GCSE*	13 (29)
– >GCSE	32 (71)
Mothers BMI† (n(%))	
– Underweight (<18.5)	1 (2)
– Normal weight (18.5–25)	33 (73)
– Overweight/obese (>25)	11 (25)

Table 4.4: Descriptive characteristics of mothers and children who took part in the FFQ evaluation. *GCSE = General Certificate of Secondary Education. †Data collected during initial interview in the Southampton Women’s Survey

The prudent diet scores calculated from the short and full FFQs were highly correlated ($r=0.68$, $p<0.001$). This suggests that comparable ranking of children in terms of

their compliance with the prudent diet pattern can be achieved when using the short, telephone administered FFQ.

The Bland Altman plot (Figure 4.2) shows that 95% of the differences in prudent diet scores lie within -1.51 and $+1.51$ standard deviations suggesting a moderate level of agreement between the two FFQ's.

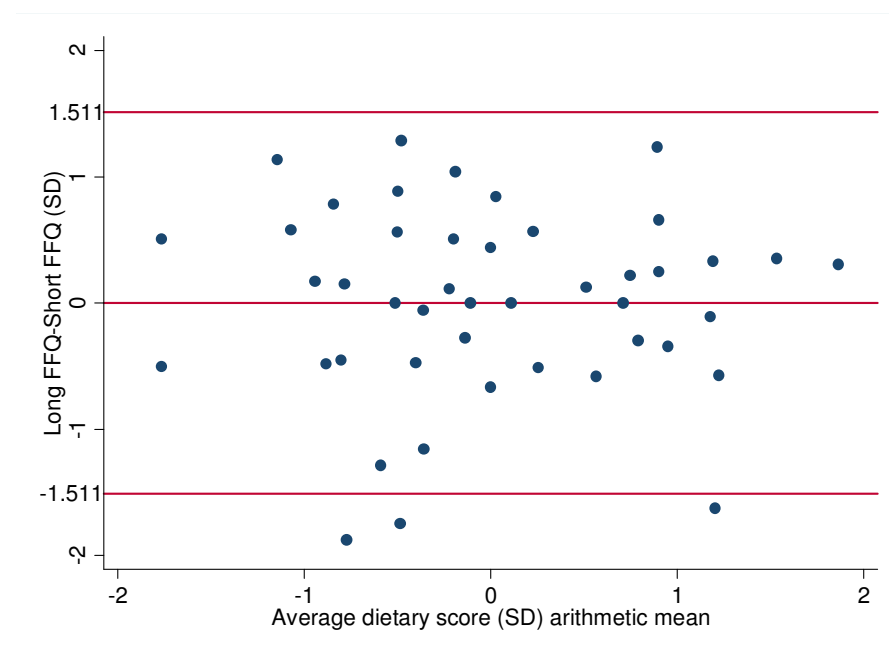


Figure 4.2 Bland Altman plot showing agreement between children's diet scores assessed by the long and short FFQs

4.4.4.5 Discussion

This is the first study to evaluate the ability of a short FFQ to assess preschool children's compliance with a dietary pattern. The study has shown that a 20-item FFQ could be generated using the most influential food groups from the prudent diet score, assessed using the full FFQ, in the SWS. The high correlation ($r=0.68$) between the prudent diet scores assessed using the full and short FFQ indicates comparable ranking of the children in terms of the assessment of their prudent diet scores by the two dietary assessment tools. In total the short FFQ took around 7–10 minutes to complete which is considerably quicker than the full FFQ, and importantly, could be administered successfully by telephone.

A limitation of the short FFQ is that it only assesses children's compliance with the prudent diet pattern. Whilst the prudent diet pattern was the most important pattern in explaining the variance in the diets of three year olds in the local Southampton population this is probably not the case in other settings and it may not be appropriate

for use elsewhere. However, the foods included in the prudent diet pattern describe a diet which conforms to healthy eating guidelines in the UK, and the pattern is a consistent finding in other UK studies^(16;166). Using the SWS data prudent diet scores were positively correlated with intakes of a number of micro-nutrients.

The short FFQ requires minimal time to complete and is thus less burdensome than other dietary assessment methods, which is preferable when considering the target population and study setting for the SIH children's evaluation. The short FFQ is comparable to the full FFQ in its ability to assess preschool children's prudent diet pattern. Therefore the short FFQ was deemed a suitable dietary assessment tool for this study

This chapter has detailed the methods and materials used in this project. The next chapter is the first of the results chapter which will address the first of the two research questions.

5 The baseline survey

5.1 Introduction

In this chapter data from the baseline survey, collected using the methods described in the previous chapter, are used to begin to address research question one. The first phase of this project was to complete a survey of children's diets and influences on children's diets, at baseline, before the SIH began.

Research question one: How do maternal, child and mealtime environmental characteristics interrelate to influence preschool children's quality of diet?

The literature review in Chapter 2 demonstrated that there have been many factors identified which appear to influence the quality of young children's diets. Influences in the child's immediate environment, including characteristics of parents, the child and the home and mealtime environment are commonly the focus of studies of the determinants of young children's diets. However, these factors are often studied in isolation or with the consideration of only a few others, which limits understanding of their relative importance and whether they interact to determine children's quality of diet. The few studies which have considered factors across the domains of maternal, child and environmental characteristics, and their influence on children's quality of diet, have demonstrated that parenting practices were associated with the management of children's food environment. For instance parents who used food as a reward were more likely to allow children access to unhealthy foods at home and thus these children tended to have poorer quality of diets⁽¹⁰⁸⁾. In contrast, a study of older children found that parents who set rules about fruit, vegetable, snack and sugar sweetened beverage intakes were less likely to have unhealthy snacks and drinks visible or accessible to the children at home, which in turn was associated with children consuming fewer of these undesirable foods⁽¹⁶⁷⁾.

In addition, and as described in more detail in Chapter 2 section 2.2.1, a number of studies have demonstrated a strong association between a mother's quality of diet and that of her child's^(4;5;83). Maternal psychological factors have been shown to play an important role in how a mother feeds herself. Factors such self-efficacy⁽¹⁶⁸⁾, perceived control over life, food involvement and well-being^(123;169) have all been shown to be associated with the quality of diet of mothers. To date, however, these psychological factors have not been explored in relation to how mother's feed their children.

Therefore this chapter aims to:

- 1) Explore how maternal psychological and behavioural factors and child and mealtime environmental characteristics interrelate.
- 2) Determine whether these patterns are associated with children's quality of diet.

5.2 Methods

5.2.1 PICO Table

The following PICO table (Table 5.1) was developed to describe the population, intervention, comparison and outcome in my sub-study of the SIH.

Population	Intervention	Comparison	Outcome
Mothers who were enrolled in the SIH intervention study	All staff members in the Sure Start Children's Centres trained in behaviour change skills.	Mothers who were enrolled in the control group of the main SIH study attending Children's Centres in neighbouring towns where staff members did not receive our behaviour change skills training.	Improvements in mother's sense of control over life and feelings of self-efficacy
Mothers who reported having a one to four year old child at the main SIH baseline survey	Staff are able to have more empowering conversations with these mothers about their health	Mothers in the control group who had a child in the target age-range	Improvements in mother's quality of diet
Mothers who had provided contact details, and agreed to follow-up		Mothers in the control groups who had provided contact details, and agreed to follow-up.	Improvements in children's quality of diet
Mothers with a good understanding of English language			

Table 5.1 PICO table describing the population, intervention, comparison and outcome in the sub-study of the SIH for this PhD project

5.2.2 Materials

The materials used in this project were described in detail in Chapter 4 section 4.3

The children's questionnaire (Appendix C) was compiled using validated questions and scales. Children's diet was assessed using the 20-item FFQ, described in section 4.4.3, from which a prudent diet score was calculated. A high score represented a diet high

in fruits, vegetables, wholemeal bread and water; a low score represented a diet high in white bread, savoury snacks, processed meat and soft drinks.

Child food neophobia was assessed using a six-item scale, a higher score indicating more food neophobia and more refusal to try new foods. Mothers' use of overt and covert feeding practices was assessed on a ten-item scale with five items relating to overt and five relating to covert control. Scores were calculated separately for overt and covert control; higher scores indicate mothers more frequent use of techniques pertaining to each type of feeding practice. Home/mealtime environmental characteristics were assessed using questions which enquired about how often children ate meals with the family, while sitting at a table, and while the television was on, as well as how often children consumed take away food, how often mothers had battles with their child during mealtimes and how much time, on average, their child spent in front of a television or computer. Demographic information such as child's age and birth order was also collected using this questionnaire.

Mother's diet, general sense of control, self-efficacy, well-being and food involvement, and household food security were assessed as part of the main SIH baseline survey. The questionnaire used in the survey of the mothers is listed in Appendix B. Maternal general sense of control was assessed on a nine-item scale. The scale assessed whether an individual feels 'in control' of what happens in their life in general. A higher score indicates a greater sense of control. Maternal general and specific self-efficacy were assessed on five-item scales from which a score for each were calculated. A higher score indicates increased feelings of self-efficacy for coping with adversity in life in general (general self-efficacy) and when trying to adopt a healthy diet (self-efficacy for healthy eating). Well-being was assessed on a five-item scale from which a score was calculated with a higher score representing a woman who feels happier about herself and her life. Food involvement was assessed using a 12-item scale from which a score was calculated. A higher score describes a woman who places a higher priority on food in their lives. Household food security was assessed using six questions, an affirmative response was given a score of one and responses were summed. A total score above two indicates a woman who is unable to afford food each month.

5.2.3 Procedure

Between December 2009 and May 2010 women who were eligible were contacted via telephone. During the telephone call they were invited to complete the questionnaire about their child. If the mother had two children in the eligible age category then she was asked to answer the questionnaire on behalf of the younger child. The consort diagram shows study recruitment and response rates (Figure 5.1).

The interviewers who carried out the telephone interviews were trained in how to administer the questionnaire in standardised way over the telephone and were required to follow the study protocol (Appendix E) on every occasion. At the beginning of the phone call the interviewer read out a participant information sheet (Appendix D) and answered any questions that arose. Consent to complete this questionnaire was gathered verbally by the interviewers. If the woman agreed to take part, the researcher either commenced with the interview straight away or agreed a convenient time to phone again. During the completion of the questionnaire the interviewers read out information from a prompt card (Appendix F) for the questionnaire, for instance for the FFQ these included all a list of the foods included, and excluded, in each of the food groups included in the FFQ, to encourage the participant to consider the questions in the same way. At the end of the interview participants were asked if they agreed to continue to participate in the SIH and to be contacted again in the future. Only one participant completed the interview and then asked to be withdrawn from the SIH.

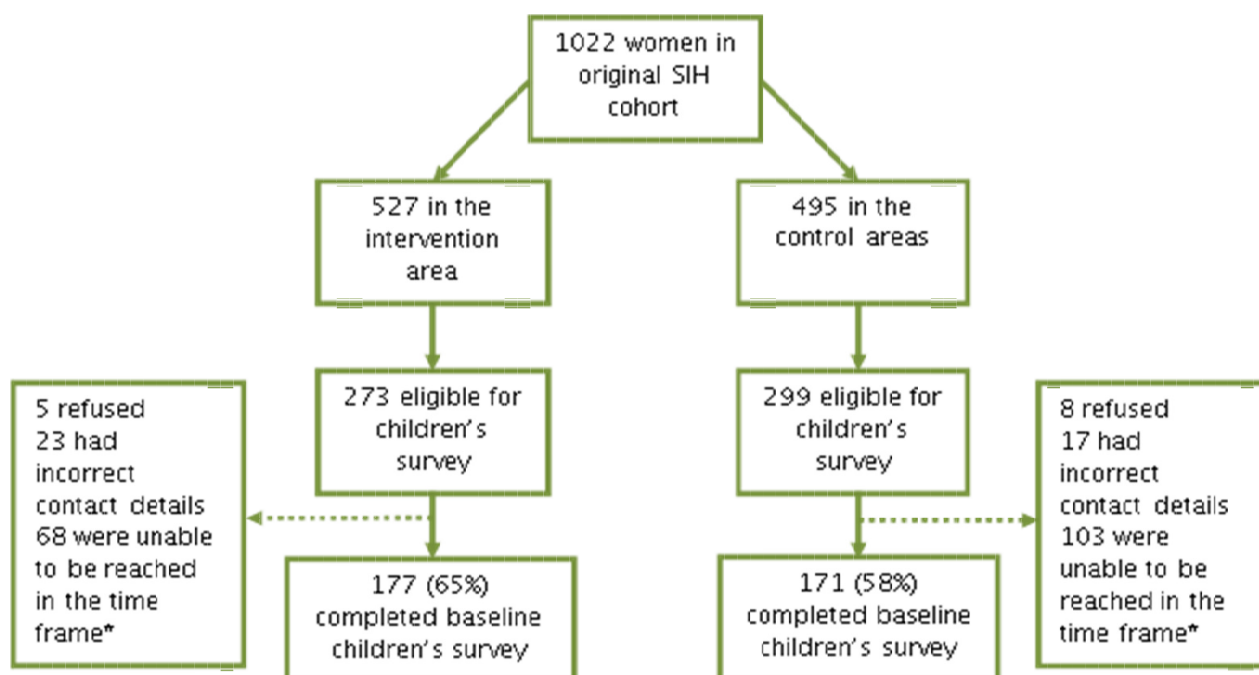


Figure 5.1 A flow diagram showing the Children's Survey recruitment and response rates. *The study protocol stated that, for every participant that was eligible, contact should be attempted a minimum of 5 times during the study time frame.

5.2.4 Statistical analysis

Statistical analysis was carried out using Stata version 12⁽¹⁷⁰⁾. Scores for each of the scales (general and health specific self-efficacy and sense of control) and prudent diet scores for both mother and child were calculated as outlined in Chapter 4 section 4.3. Children's prudent diet scores were transformed using Fisher-Yates normal scores. This has the effect of mapping the scores onto a normal distribution with a mean of 0

and a standard deviation of 1. Mothers' prudent diet scores were also transformed in this way but using the data for the whole SIH study sample. Child's prudent diet scores were divided by quartiles and median weekly consumption of foods in the FFQ were derived for each quarter of diet score. Trends in food consumption across the quarters were assessed using Spearman test for trend. A Spearman rank correlation matrix was used to assess the relationships between the maternal, child, and environmental variables. Principal components analysis was then carried out on the correlation matrix, which included maternal psychological factors, child neophobia and home environment characteristics. Principal components analysis has been described as "a multivariate technique that analyses a data table in which observations are described by several dependent variables which are inter-correlated, with an aim to extract the important information and to express this information as a set of new orthogonal variables called principal components"⁽¹⁷¹⁾. The first component is the combination that describes the largest variance and it is independent of the other components. The second component accounts for as much of the remaining variance as possible, and so on. The strength of the association between the variables and the component is indicated by a coefficient for each variable. The coefficients explain the pattern of variables described by each component. Standardised scores on each interpretable component were calculated for each person. Component scores were entered into linear regression models with children's prudent diet scores as the dependent variable. PCA is recommended as a precursor to carrying out a cluster analysis, such that PCA will determine the most important variables from correlated data upon which to perform a cluster analysis⁽¹⁷²⁾. The cluster analysis was performed on the psychological variables, sense of control, well-being, general self-efficacy, self-efficacy for healthy eating and food involvement, using Wards linkage to generate initial clusters. The resulting dendrogram from this hierarchical procedure was used to determine the number of clusters. Following this K-means analysis based on squared Euclidean distances, was used as a further iterative process, as recommended by Milligan and Cooper⁽¹⁷³⁾. Differences in child's median weekly food consumption by mothers cluster membership was explored using median tests for difference. Differences in maternal and mealtime characteristics according to cluster membership were assessed using Chi square statistics for categorical data and t-tests for parametric continuous variables. Uni- and multi-variate linear regression models were used to assess the relationships between cluster membership and children's quality of diet.

5.3 Results

5.3.1 Participant characteristics

Characteristics of the 347 mother-child pairs are displayed in Table 5.2. Mothers varied in terms of their educational attainment, with 39% of mothers having left

education at 16 years old with GCSE qualifications or less. In addition 16% of mothers reported being food insecure, meaning they can't afford to buy food every month. The average age of the children was 3.3 years and the majority of children had at least one sibling but were the oldest child in the family. Over a third of children were reported to eat meals with the television on at least once per day and 90% of children ate while sitting at a table once per day.

Characteristics	N=347
Child age (mean(SD))	3.1 (0.9)
Gender (n(%))	
–Male	177 (51)
–Female	171 (49)
Number of siblings (n(%))	
0	66 (19)
1	194 (56)
2	54 (16)
3+	33 (9)
Birth order (n(%))	
1 st	190 (55)
2 nd	98 (28)
3 rd	39 (11)
4 th	15 (4)
5 th	5 (1)
Food neophobia score (median(IQR))	14 (12–17)
Nibbling behaviour (n(%))	
–Nibbles daily, rarely eats meals	14 (4)
–Nibbles daily, also has meals	231 (66)
–Nibbles on some days, also has meals	60 (17)
–Does not nibble much, just has meals	43 (12)
Mothers age (mean(SD))	31.8 (5.4)
Mothers educational level (n(%))	
≤GCSE	134 (39)
>GCSE;<Degree	123 (35)
Degree or above	91 (26)
Mothers clothing size (n(%))	
6–8	10 (3)
8–10	63 (18)
10–12	95 (27)
12–14	70 (20)
14–16	60 (17)
16–18	31 (9)
18–20	9 (2)
20+	10 (3)
Mother employed* (n(%))	
No	148 (43)
Yes	200 (57)
Sense of control score (median(IQR))	27 (25–29)
Food involvement score (median(IQR))	45 (42–48)
Well-being score (median(IQR))	13 (10–17)
Overt control score (median(IQR))	19 (17–21)
Covert control score (median(IQR))	12 (9–16)
General self-efficacy score (median(IQR))	15 (14–16)

Self-efficacy for healthy eating score (median(IQR))	15 (14–15)
Food security (n(%))	
–Food secure	290 (84)
–Food insecure/hungry	57 (16)
Frequency of evening meals eaten with the family (n(%))	
–Never	6 (2)
–Monthly	6 (2)
–Weekly	98 (28)
–Daily	238 (68)
Frequency of meals eaten with the TV on (n(%))	
–Never	115 (33)
–Monthly	18 (5)
–Weekly	98 (28)
–Daily	117 (34)
Frequency of take away meals consumed (n(%))	
–Never	121 (35)
–Monthly	169 (49)
–Weekly	58 (17)
–Daily	0
Frequency of meals eaten at a table (n(%))	
–Never	10 (3)
–Monthly	1 (0.3)
–Weekly	25 (7)
–Daily	312 (90)
Frequency of battles about food (n(%))	
–Never	63 (18)
–Rarely	111 (32)
–Sometimes	104 (30)
–Often/always	70 (20)
Amount of time daily spent in front of a screen (n(%))	
Never	2 (0.6)
<1hour	73 (21)
1–2hours	133 (38)
2–3hours	82 (23)
3–4hours	39 (11)
>4hours	19 (5)

Table 5.2 Characteristics of the 347 mother–child pairs

5.3.2 Children's food consumption

The weekly median consumption of the foods listed in the FFQ by the children is displayed in Table 5.3 according to quarters of prudent diet score. As expected there are clear differences in the frequency of consumption of the foods that characterise the prudent pattern across the distribution of the scores. For instance the median weekly consumption of green vegetables is six times per week for children in the top quarter of the distribution of prudent diet scores but only once per week for those in the bottom. In contrast the median weekly consumption of crisps is seven times per week and twice per week in those in the bottom and top quarters of prudent diet score respectively.

Prudent diet score quartile					
	Poorest			Best	
Foods	<-0.67 SD (n=87)	>-0.67 <-0.003 SD (n=87)	>-0.003 <0.67 SD (n=87)	<0.67 SD (n=86)	P value†
White bread	6.0 (0.5, 10.0)	1.0 (0.0, 7.0)	0.5 (0.0, 3.0)	0.0 (0.0, 2.0)	<0.001
Green vegetables	1.0 (0.0, 3.0)	3.0 (2.0, 4.0)	4.0 (2.0, 6.0)	6.0 (4.0, 7.0)	<0.001
Crisps and savoury snacks	7.0 (3.0, 7.0)	4.0 (2.0, 7.0)	3.0 (2.0, 5.0)	2.0 (1.0, 3.0)	<0.001
Root vegetables	1.0 (0.5, 3.0)	3.0 (1.0, 4.0)	4.0 (3.0, 6.0)	5.0 (3.0, 7.0)	<0.001
Chips/Roast potatoes	4.1 (2.2, 5.7)	3.1 (2.3, 4.9)	2.7 (1.7, 4.0)	2.3 (1.2, 3.1)	<0.001
Water	4.0 (0.0, 14.0)	7.0 (2.0, 21.0)	14.0 (7.0, 21.0)	17.5 (14.0, 21.0)	<0.001
Fruit (excluding citrus)	10.0 (7.0, 14.0)	11.0 (8.5, 15.0)	13.0 (9.0, 16.0)	14.0 (11.0, 18.0)	<0.001
Salad Vegetables	0.5 (0.0, 2.0)	2.0 (0.0, 4.0)	3.0 (0.0, 4.0)	5.0 (2.0, 7.0)	<0.001
Wholemeal bread	1.0 (0.0, 6.0)	5.0 (2.0, 7.0)	7.0 (3.5, 12.0)	7.0 (4.0, 14.0)	<0.001
Processed meat	2.0 (1.0, 4.0)	2.0 (1.0, 4.0)	2.0 (1.0, 3.0)	1.0 (0.5, 2.0)	<0.001
Low calorie soft drinks	14.0 (5.0, 21.0)	7.0 (2.0, 21.0)	7.0 (0.5, 14.0)	2.0 (0.0, 7.0)	<0.001
Dried fruit	1.0 (0.0, 2.0)	2.0 (0.5, 7.0)	3.0 (1.0, 7.0)	3.5 (2.0, 7.0)	<0.001
Fish/shellfish	1.0 (1.0, 2.0)	1.0 (1.0, 2.0)	2.0 (1.0, 2.0)	2.0 (1.0, 3.0)	<0.001
Confectionary	4.0 (2.0, 7.0)	3.0 (2.0, 4.0)	3.0 (2.0, 4.0)	2.0 (2.0, 4.0)	<0.001
Fruit juice (not from concentrate)	0.5 (0.0, 3.0)	1.0 (0.0, 7.0)	1.0 (0.0, 7.0)	3.5 (0.0, 7.0)	<0.001
Vegetarian food	0.0 (0.0, 0.0)	0.0 (0.0, 0.5)	0.3 (0.0, 1.0)	1.0 (0.0, 3.0)	<0.001
Rice/pasta	1.0 (1.0, 2.0)	3.0 (2.0, 4.0)	3.0 (2.0, 3.0)	4.0 (3.0, 5.0)	<0.001
Crackers	0.5 (0.0, 2.0)	0.5 (0.0, 2.0)	0.5 (0.0, 2.0)	1.0 (0.0, 3.0)	0.008
Other Vegetables	1.0 (0.0, 2.0)	2.0 (0.5, 3.0)	3.0 (2.0, 4.0)	3.0 (2.0, 5.0)	<0.001
Cakes and biscuits	4.0 (2.0, 7.0)	3.0 (2.0, 5.0)	3.0 (2.0, 5.0)	3.0 (1.0, 4.0)	0.020

Table 5.3: Children's median (inter-quartile range) weekly consumption of foods on the FFQ according to quarters of the distribution of prudent diet scores. † P-value derived from a Spearman test for trend

5.3.3 Associations between maternal, child and mealtime characteristics and children's quality of diet

Univariate associations between maternal background and psychological characteristics and children's prudent diet score are displayed in Table 5.4. Most of

these associations reached statistical significance. For each increase in mother's educational attainment child's prudent diet score increased by 0.25 standard deviations (SD); for each unit increase in mother's covert control score child's prudent diet score increased by 0.29 SD. The only associations which did not reach statistical significance were mothers' employment status, clothing size, and overt control score.

Characteristics	β Coefficient	95% confidence intervals	P Value
Age in years	0.03	0.01, 0.05	0.002
Educational attainment*	0.25	0.12, 0.32	<0.001
Clothing size**	-0.06	-0.12, 0.01	0.100
Employment status	0.19	-0.02, 0.40	0.075
Prudent diet z-score	0.58	0.50, 0.67	<0.001
Sense of control score	0.11	0.08, 0.15	<0.001
General self-efficacy score	0.08	0.03, 0.14	0.003
Self-efficacy for healthy eating score	0.10	0.06, 0.15	<0.001
Well-being score	0.06	0.04, 0.08	<0.001
Food involvement score	0.05	0.03, 0.07	<0.001
Overt control z-score	0.06	-0.04, 0.15	0.242
Covert control z-score	0.29	0.19, 0.40	<0.001

Table 5.4 Univariate associations, from linear regression models, between maternal factors and children's prudent diet score * None = 0 to Degree = 6;

**6-8 = 0 to 20+ = 8;

Table 5.5 shows the univariate associations between child-related factors and child's prudent score. This shows that the only association which was statistically significant was child's child food neophobia score showing that for each unit increase in neophobia score child's prudent diet score decreased by -0.07 SD.

Characteristics	β Coefficient	95% confidence intervals	P Value
Age in years	-0.04	-0.16, 0.07	0.441
Gender	0.14	-0.07, 0.35	0.182
Number of siblings*	-0.10	-0.23, 0.02	0.111
Birth order**	-0.10	-0.21, 0.02	0.095
Nibbling behaviour***	0.03	-0.11, 0.17	0.667
Neophobia score	-0.07	-0.10, -0.04	<0.001

Table 5.5 univariate associations, from linear regression models, between child factors and children's prudent diet score *None = 0 to 3 or more = 3; **1st = 0 to 5th = 4;

***Nibbles rarely eats meals = 0 to rarely nibbles = 3

Finally, Table 5.6 shows the univariate associations between home and mealtime environmental characteristics and child's prudent diet score. This shows that for each

unit increase in the frequency with which a child ate their meals while sitting at a table, the prudent diet score increased by 0.26 SD. Conversely, for each unit increase in the frequency with which a child ate with the television on child's prudent diet score decreased by -0.15 SD. The only association that did not reach statistical significance was the frequency with which the child ate evening meals with the family.

Characteristics	β Coefficient	95% confidence intervals	P Value
How often child eats evening meal with the family *	0.02	-0.09, 0.13	0.710
How often child watches TV during mealtimes*	-0.15	-0.19, -0.11	<0.001
How often child eats take-away food*	-0.21	-0.30, -0.12	<0.001
How often child eats while sitting at a table*	0.26	0.17, 0.34	<0.001
How often child and mother have battles during mealtimes**	-0.17	-0.27, -0.08	<0.001
Average number of hours spent in front of a screen per day	-0.21	-0.30, -0.13	<0.001
Household food insecurity***	-0.51	-0.78, -0.23	<0.001

Table 5.6 Univariate associations, from linear regression models, between home/mealtime environment factors and children's prudent diet score * Never = 0, $\leq$ weekly = 1, once per day = 2, more than once per day = 3; **Never = 0, Always = 4; ***Food secure = 0 food insecure = 1;

5.3.4 Relationships between maternal, child and mealtime characteristics

A Spearman correlation matrix is displayed in Table 5.7. This shows the correlations between maternal, child and mealtime characteristics. Figures in bold are statistically significant indicating that many of these factors are correlated with one another.

	Neophobia	Sense of Control	Gen Self-efficacy	Spec Self-efficacy	Food involvement	Food security	Well-being	Overt control	Covert control	Eat with family	Eat with TV	Eat take away	Eat at table	Battles during meals	Daily screen time
Neophobia	1														
Sense of control	-0.1904	1													
Gen Self-efficacy	-0.0420	0.2270	1												
Spec Self-efficacy	-0.0791	0.1956	0.2562	1											
Food involvement	-0.0697	0.2869	0.1550	0.1602	1										
Food sec	0.0833	-0.3732	-0.0520	-0.0465	-0.1375	1									
Well-being	-0.1726	0.3710	0.2843	0.2786	0.2565	-0.2858	1								
Overt control	0.0910	0.0860	0.0664	0.1115	0.1496	0.0155	0.0544	1							
Covert control	0.0490	0.0789	0.0382	0.1533	0.1409	0.0293	0.1003	0.1684	1						
Eat with family	-0.2129	-0.0736	-0.0055	0.0305	0.0160	0.0472	0.0748	0.0149	-0.0837	1					
Eat with TV	0.0492	-0.2739	-0.1288	-0.1480	-0.1213	0.1052	-0.1435	-0.1099	-0.1224	-0.0031	1				
Eat take away	-0.0108	-0.1581	-0.1295	-0.1427	-0.1403	0.0904	-0.0619	-0.0223	-0.1168	0.1385	0.1837	1			
Eat at table	-0.1604	0.2643	0.0151	0.0933	0.1216	-0.1794	0.1531	0.1607	0.1601	0.0795	-0.2676	-0.1776	1		
Battles during meals	0.4946	-0.0885	-0.0645	-0.0369	-0.0064	0.0869	-0.1719	0.2167	0.1022	-0.1497	0.1230	0.0782	-0.1330	1	
Daily screen time	0.0703	-0.1281	-0.0709	-0.0991	0.0659	0.1277	-0.1483	0.0346	-0.1041	-0.0368	0.2028	0.0769	-0.2042	0.1540	1

Table 5.7 Spearman correlation matrix showing relationships between maternal, child and mealtime environmental characteristics

Principal components analysis was performed on the correlation matrix and the resulting scree plot of eigenvalues is displayed in Figure 5.2. The sharp decreases in eigenvalues following components 1 and 2 on the graph suggest that the first two components, which accounted for the most variance in the data, were the most important.

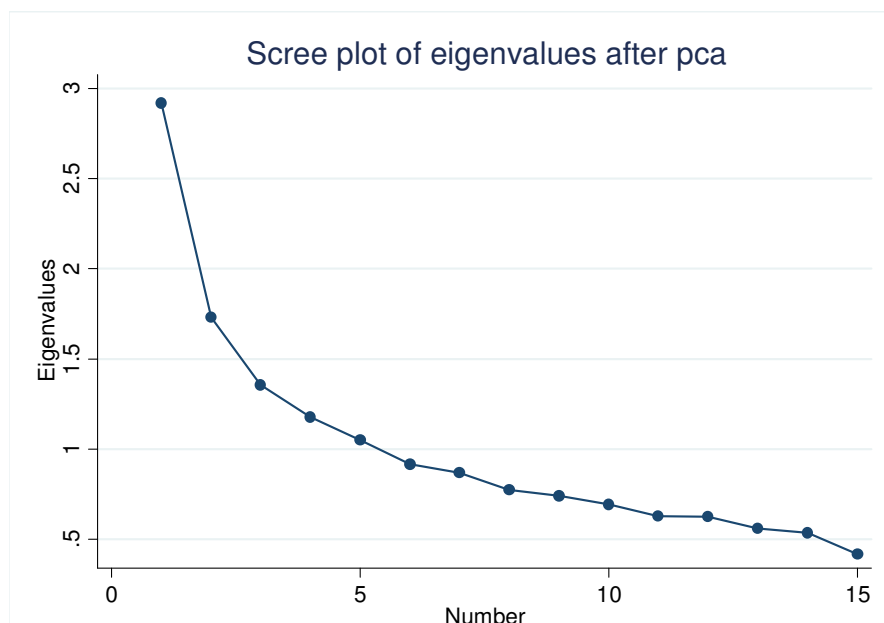


Figure 5.2 Scree plot of the eigenvalues resulting from the PCA

The variables and their corresponding coefficients for components one and two are displayed in Table 5.8 and Table 5.9, respectively. Component 1 explained 19% of the variance in the data. Variables with a coefficient above 0.25 (and below -0.25) are highlighted in bold as these factors have the greatest influence on the pattern. This pattern is characterised by mothers with high levels of sense of control, well-being, food involvement and general and specific self-efficacy for healthy eating, who in addition, encourage their children to eat meals while sitting at a table and not while watching television. These women are also more likely to live in a food secure household. This pattern was termed the ‘empowered mother’ pattern.

Component 1	Coefficient
Sense of control	0.4027
Well-being	0.3789
Food involvement	0.2990
General self-efficacy	0.2910
Self- efficacy for eating healthily	0.2800
Eating meals at the table	0.2738
Covert control	0.1514
Overt control	0.1049
Evening meal with the family	0.0564
Eating take away food	-0.1970
Battles over food	-0.1984
Average daily screen time	-0.2313
Neophobia	-0.2325
Food insecurity	-0.2547
Eating meals with the TV on	-0.2814

Table 5.8 Coefficients for each of the variables in component one

The second pattern explained 11% of the variance and by definition, is independent of the empowered mother pattern. The second pattern is characterised by children who tend to have battles with their mothers during mealtimes, have higher levels of food neophobia, and whose mothers adopt overt and covert control strategies, in addition these children are less likely to consume meals with their family. This pattern was termed the ‘neophobic child’ pattern.

Component 2	Coefficient
Battles over food	0.5446
Neophobia	0.4925
Overt control	0.4245
Covert control	0.3147
Self-efficacy for health eating	0.1651
Food involvement	0.1434
General self-efficacy	0.0923
Food insecurity	0.0937
Sense of control	0.0589
Daily screen time	0.0302
Well-being	0.0019
Eating at a table	-0.0302
Eating with TV on	-0.0802
Eats take-away	-0.1219
Eats with family	-0.2997

Table 5.9 Coefficients for each of the variables in component two

Table 5.10 shows the association between the empowered mother pattern and child's prudent diet scores. This model was adjusted for confounders including mother's educational attainment, number of children, mother's age and employment status. This model shows that the empowered mother pattern has an independent, positive, association with children's quality of diet such that for each SD increase in the empowered mother pattern score child's prudent score increased by 0.45 SD.

	β coefficient	95% confidence intervals	P Value
Empowered mother z-score	0.45	0.36, 0.55	<0.001

Table 5.10 Multivariate linear regression model showing the association between empowered mother pattern score and children's prudent diet score, adjusted for mothers' educational attainment, number of children, mothers' age and employment status.

Table 5.11 displays the univariate association between the neophobic child pattern and child's prudent diet score. Although there was a negative association between this pattern score and children's prudent diet score it did not reach statistical significance.

	β coefficient	95% confidence intervals	P Value
Neophobic child z-score	-0.09	-0.20, 0.02	0.095

Table 5.11 Univariate linear regression model showing the association between neophobic child pattern score and children's prudent diet score

5.3.5 Cluster analysis of maternal psychological characteristics

The rest of the analysis focused on the factors which most explained the empowered mother pattern as this pattern was associated with children's prudent diet score. The cluster analysis was performed on the maternal psychological characteristics; these factors had the highest coefficients in the empowered mother component. This was to determine whether mothers cluster according to psychological traits and to then explore how these relate to the management of children's home/mealtime environments and quality of diet. Figure 5.3 displays the dendrogram resulting from the cluster analysis. This shows that there were two clear clusters in the data.

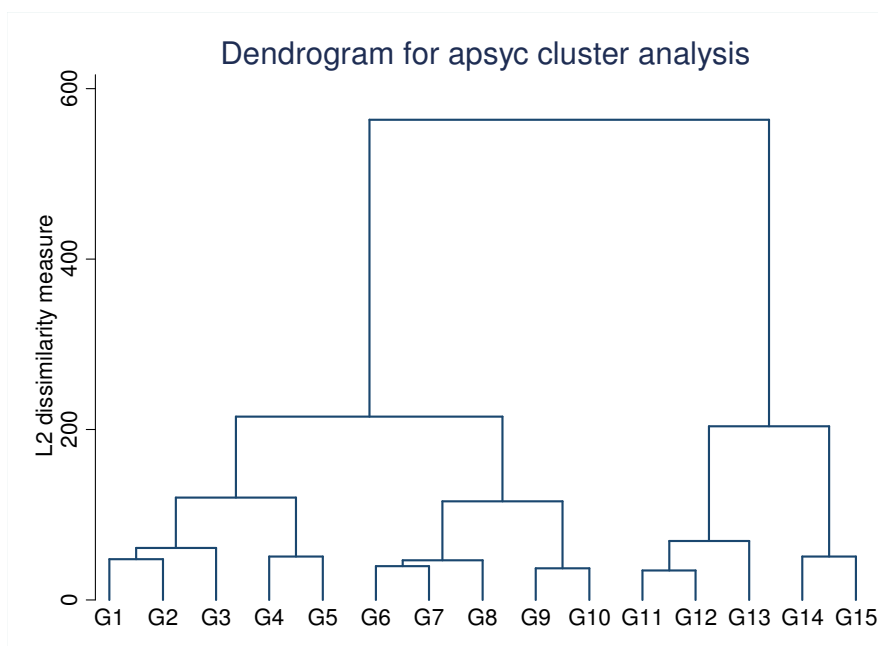


Figure 5.3 Dendrogram resulting from the cluster analysis on maternal psychological characteristics

Differences in the psychological characteristics according to cluster membership are displayed in Figure 5.4. This shows the percentage of women in each cluster with psychological scores above the median. There were differences between the clusters in all of the psychological scores showing that those in cluster two tend to have lower levels of control, well-being, general self-efficacy, self-efficacy for healthy eating and food involvement. However, the clearest difference is seen in their levels of well-being with 79% of those in cluster one having well-being scores above the median versus 7% of those in cluster two.

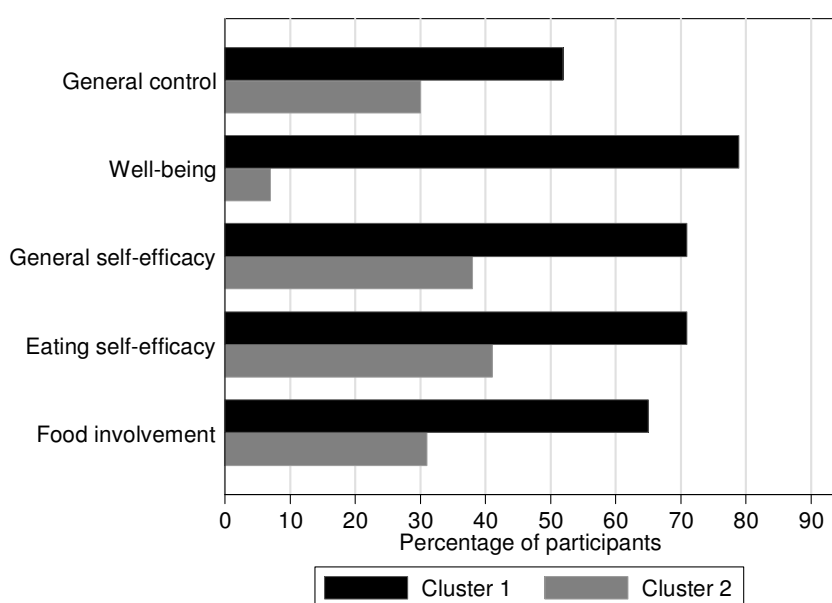


Figure 5.4 Histogram showing the percentage of women with psychological scores above the median, according to cluster membership

Women in cluster one were therefore termed ‘more resilient’ and in cluster two ‘less resilient’.

5.3.6 Maternal cluster membership, mealtime environment and children's quality of diet

The differences in maternal and mealtime characteristics between the clusters are detailed in Table 5.12. This shows that mothers with degree level education and with fewer children were more likely to be in the more resilient cluster. Mothers in the less resilient cluster were less likely to have their children eat while sitting at a table more than once per day and more likely to have a clothes size above 16 and live in a food insecure household.

Characteristic	Resilient	Vulnerable	P Value
Mothers with university level education† (n(%))	63 (31)	19 (15)	<0.001 ^a
More than 3 children in the house† (n(%))	33 (16)	37 (30)	0.03 ^b
Mothers clothing size > 16 (n(%))	22 (11)	28 (23)	0.004 ^a
Household is food insecure/hungry† (n(%))	20 (10)	35 (28)	<0.001 ^a
Mothers Overt control score (mean(SD))	19 (3)	18 (4)	0.08 ^b
Mother's Covert control score (mean (SD))	13 (5.1)	11 (4.5)	0.002 ^b
Child eats meals with the family daily (n(%))	143 (71)	80 (65)	0.33 ^a
Child has not consumed take away food in the past 3 months† (n(%))	80 (40)	35 (28)	0.052 ^a
Child eats meals in front of the television at least once per day (n(%))	60 (30)	52 (42)	0.07 ^a
Child eats meals while sitting at a table more than once per day† (n(%))	164 (84)	88 (71)	0.03 ^a
Child's average daily screen time in hours (mean(SD))	2 (1.1)	3 (1.3)	0.01 ^b

Table 5.12 Maternal and mealtime characteristics according to mothers cluster membership. ^aChi-squared statistic ^b t-test for difference in the mean.

Table 5.13 shows the differences in median food consumption of the children according to their mothers cluster membership. Children of mothers in the less resilient cluster tended to consume crisps, white bread, sweets and chocolate and low-calorie soft drinks more often, and vegetables, water and fruit less often, than those with mothers in the more resilient group.

Food	Median (IQR) weekly consumption		P Value†
	More resilient	Less resilient	
Water	14 (7–21)	7 (0.5–21)	0.02
Green vegetables	4 (2–6)	3 (1–5)	<0.001
Root vegetables	3 (2–5)	3(1–4)	0.03
Other vegetables	2 (1–4)	2 (0.3–3)	0.049
Salad vegetables	2 (0.3–5)	1 (0–4)	0.03
Wholemeal bread	6 (2–8)	5 (0.5–8)	0.69
Rice or Pasta	3 (2–4)	2 (1–3)	0.07
Fish	1 (1–2)	1 (1–2)	0.91
Fruit (excluding citrus)	13 (9–16)	11 (8–15)	0.02
Pure fruit juice	1 (0–7)	1 (0–5)	0.08
Dried fruit	3 (1–5)	2 (0–5)	0.15
Vegetarian dishes	0 (0–1)	0 (0–1)	0.09
Crisps	3 (1–5)	4 (2–7)	0.003
Roast potatoes or chips	3 (2–4)	3 (2–7)	0.47
Chocolate or sweets	3 (2–4)	3 (2–7)	0.054
Processed meat	2 (1–3)	2 (1–4)	0.33
White bread	0.5 (0–4.5)	2 (0–7)	0.050
Crackers	0.5 (0–2)	0.5 (0–2)	0.27
Cakes and biscuits	3 (2–5)	3 (2–7)	0.35
Low calorie soft-drinks	7 (0.5–14)	7 (2–14)	0.04

Table 5.13 Child's median weekly consumption of foods according to mothers cluster membership. †P value relates

In a univariate analysis, mothers being in the less resilient cluster was associated with a reduction in children's prudent diet score of -0.61 SD (95% CI -0.82 , -0.40 , $p < 0.001$). A multivariate model showing this association, adjusted for maternal and mealtime/home environment characteristics, is displayed in Table 5.14. This shows that the effect of cluster membership on children's prudent diet score is attenuated, but remains significant, such that being in the less resilient cluster is associated with a reduction of -0.27 SD in children's prudent diet score. In addition to cluster

membership, some of the other maternal and home/mealtime environment characteristics are significantly associated with children's prudent diet score. Mothers' use of covert feeding practices is associated with increases in children's prudent diet score. Children eating while sitting at a table is also associated with increases prudent diet scores, whereas eating in front of the television more often and eating more take-away food is associated with reductions in children's prudent diet scores.

Variable	Coefficient	95% Confidence intervals	P Value
Mother's cluster membership*	-0.27	-0.47, -0.07	0.006
Mother's education**	0.14	0.07, 0.21	<0.001
Number of siblings***	0.02	-0.09, 0.12	0.76
Food insecurity****	-0.05	-0.11, 0.01	0.14
Covert control z-score	0.19	0.09, 0.29	<0.001
Frequency of child sitting at a table to consume meals*****	0.17	0.05, 0.28	0.004
Frequency of child eating take-away food*****	-0.13	-0.26, -0.00	0.06
Frequency of child eating meals in front of the television*****	-0.14	-0.21, -0.06	<0.001
Child's average daily screen-time in hours	-0.07	-0.14, 0.01	0.09

Table 5.14 Multivariate regression model showing the relationship between mothers cluster membership and children's quality of diet, adjusted for maternal and mealtime environment characteristics *More resilient = 1 less resilient = 2 **None = 0 to Degree = 6; ***None = 0 to 3 or more = 3 ****Food secure = 0 food insecure = 1; ***** never = 0, ≤weekly = 1, once per day = 2, more than once per day = 3

5.4 Discussion

5.4.1 Overview of the results

This chapter has explored the interplay between maternal, child and home/mealtime environmental factors and whether there are patterns in these factors that are determinants of preschool children's quality of diet. A principal components analysis of all the factors showed that there were two key interpretable patterns, which accounted for 19% and 11% in the variance respectively. The first pattern, termed the 'empowered mother', described mothers who felt in control their lives, had higher levels of well-being, made food a priority and had high levels of self-efficacy, both general and specific for eating healthily. These mothers were also more likely to create

healthy food environments for their child by encouraging them to eat at a table and not in front of the television; in addition these mothers and children lived in food secure households. This pattern was strongly related to the child's quality of diet. The second pattern, which was independent of the first pattern and termed the 'neophobic child', described mothers with neophobic children who battled about food, whose child did not eat with the family and who tried a range of strategies to control their child's diet. However, the neophobic child pattern was not associated with children's diet quality.

5.4.2 The empowered mother pattern

The first pattern which emerged from the data described mothers who tended to have higher levels of control, general self-efficacy, self-efficacy for healthy eating, well-being and food involvement, in addition they were more likely to encourage their child to eat while sitting at a table, less likely to let them eat in front of the television and less likely to live in a food insecure household.

The interrelationships between the psychological factors are not entirely surprising. It has been reported in previous studies that some maternal psychological factors tend to cluster. Studies have demonstrated that women who feel more in control of life tend to have higher levels of self-efficacy and a greater sense of well-being⁽¹⁶⁸⁾, and in addition that women who have higher levels of well-being also tend to have a higher level of food involvement⁽¹⁶⁹⁾.

This pattern score was positively associated with children's diet quality, independent of other influences. As the PCA analysis revealed the psychological factors in the empowered mother pattern to be the most discriminating, a cluster analysis was subsequently performed on these factors to determine whether mothers formed distinct groups based on these psychological factors.

5.4.3 The neophobic child pattern

The second pattern focused on child food neophobia, having battles during mealtimes, maternal strategies to control children's diets and a lack of eating meals as a family and was called the neophobic child pattern. The nature of PCA means that this pattern was uncorrelated with the empowered mother pattern which suggests that food neophobia in children can arise regardless of mothers' psychological characteristics. Researchers suggest that the rejection of unfamiliar foods is a trait within all humans which developed through evolution in order to reduce the likelihood of being poisoned⁽⁹⁹⁾. It tends to surface around the age of two years when children are beginning to consume the same meals as the rest of the family. The other factors that had high coefficients in this pattern were maternal use of feeding practices, mealtime

battles and infrequently eating meals as a family. These factors have been shown to relate to one another in other studies. There are some studies which have demonstrated the importance of role modelling in the development of food preferences^(86,87) and have shown that young children were more likely to try a new food if they first observed their mother eating it. This could explain why in this study child food neophobia was more common in families who ate together less. Parental feeding practices have also been shown to be associated with child food neophobia⁽¹⁰¹⁾ in that children with higher levels of neophobia tend to have parents who report using more feeding strategies. This is reflected in the positive association with overt and covert control in the neophobic child pattern. Surprisingly there was no association between the neophobic child pattern and child's quality of diet. The factors indicative of this pattern such as food neophobia, mealtime battles and maternal feeding practices have, individually, been found to be associated with children's quality of diet. However, some of these factors seem to be beneficial and others detrimental to children's quality of diet. As displayed in tables 5.3 and 5.4, our data showed that food neophobia and having more battles at mealtimes were negatively associated with children's quality of diet, whereas covert control was positively associated. It is therefore possible that, when considered together, the effects of these variables of quality of diet cancel each other out.

5.4.4 Cluster membership and children's quality of diet

Mothers fell into one of two clusters which were termed 'more resilient' and 'less resilient'. Those in the less resilient cluster felt less in control of their life, less able to overcome challenges both in general life and specifically to having a healthy diet, they had lower levels of well-being and gave food less priority in their lives. The opposite was observed in those in the more resilient cluster. In addition, the cluster to which mothers belonged influenced the mealtime environment and quality of diet of preschool children. Mothers in the less resilient group managed aspects of their child's food/mealtime environment differently than those who were more resilient. Mothers in the less resilient cluster were less likely to use covert techniques to control their child's diet e.g. limiting exposure to undesirable foods, and to encourage their child to eat meals while sitting at a table. Their children were also more likely to consume take-away foods and spend more time in front of a screen. Finally, mothers in the less resilient cluster tended to have children who consumed more crisps, chocolate/sweets, white bread and low-calorie soft drinks as well as fewer vegetables, water and fruit, and thus these children tended to have lower prudent diet scores.

Psychological resilience refers to a personality trait which is characterised by an ability to respond to and overcome challenges and adversity. It has been suggested that positive emotions are an important component of resilience⁽¹⁷⁴⁾ and thus it is likely to

be aligned with well-being. In addition, the coping disposition of resilient individuals may be reflected in higher levels of self-efficacy and sense of control. Research has also shown that those who are more resilient tend to adopt a more positive profile of health behaviours and have better health outcomes⁽¹⁷⁵⁾. Labelling the clusters of women as more or less resilient seemed therefore, to reflect the essential differences between them.

Mothers in the less resilient cluster tended to have lower levels of education, and to have more children in the home. These findings are consistent with literature which has shown that women with lower levels of education tended to have lower levels of control, self-efficacy⁽¹⁷⁶⁾, food involvement and well-being⁽¹²³⁾.

Cluster membership was also associated with the way in which mothers managed their child's mealtime environment, which in turn was associated with children's diet quality. It is possible that this management of the child's mealtime environment could be partly attributed to mothers' higher levels of food involvement. The concept of food involvement reflects the importance someone places on food at all stages of the feeding cycle, from its acquisition to its disposal⁽¹⁴⁵⁾. This feeding cycle includes the eating environment, and therefore it is possible that someone with higher levels of food involvement would consider it more important that food is consumed while sitting at a table. However, while this could be a motivator for carrying out the behaviour, research with parents with young children suggests that feeding situations are challenging and often result in conflict⁽¹⁷⁷⁾ and therefore it is likely that mothers also require a coping disposition to manage this conflict, which could be reflected in their higher levels of self-efficacy and well-being. Research has suggested that adults with lower levels of well-being may be more likely to cease carrying out a behaviour if faced with stress or conflict⁽¹⁷⁸⁾. Therefore mothers in the less resilient cluster may have felt less able to control their child's mealtime environment if, in the past, this has resulted in conflict with their children. Evidence from a large cohort study suggests that mothers with lower well-being feel generally less able to control their children's diet⁽¹⁷⁹⁾.

In this study, while the relationship between cluster membership and quality of diet was independent of mealtime environment, its inclusion in the model did attenuate the effect. In addition, the independent effects of the mealtime environment characteristics on children's quality of diet were attenuated with the inclusion of maternal cluster membership. This suggests that some of the effect of mothers' psychological characteristics on children's quality of diet may be mediated by the way they manage their child's mealtime environment. The association between mealtime environment and children's quality of diet has been described in other studies. For

example, mothers who manage their children's food environment by using covert control techniques tend to have children who consume fewer unhealthy snacks and more fruits and vegetables. In addition, eating meals while sitting at a table has consistently been demonstrated to have a positive effect on children's quality of diet⁽¹⁸⁰⁾. Conversely, consumption of take away foods and time spent in front of a screen have been shown to have a negative influence on children's diets, with children who watch more television and consume more take-away food being also more likely to consume unhealthy snack foods and sugar-sweetened beverages and less likely to consume fruit and vegetables^(111;147;181).

This is the first study to have considered how maternal psychological factors work, in combination, to determine young children's quality of diet. The independent contribution of the psychological cluster into which mothers were grouped suggest that it is a key influence on child's quality of diet. Demonstrating that the relationship between cluster membership and child's diet was not completely mediated by the way she controlled her child's mealtime environment highlights the importance of maternal psychological factors as an influence on preschool children's quality of diet.

5.4.5 Strengths and limitations

The questionnaires were carried out in an interview style with a researcher rather than being self-completed by participants. This is likely to have reduced the possibility of misunderstanding of the questions as the researcher was present to discuss any queries with throughout, which may therefore have reduced reporting error.

The sample size for this study was set by the number of women recruited to the SIH , and who had children of preschool age. A limitation of this study is that it cannot be assumed that the study population was representative of the wider population. However, the average age of the women in this study was 32 years (5.4 SD) and the proportion of women with low levels of education ($\leq$ GCSE) was 39%. In the SIH study population as a whole the average age of the women was 31 years (5.9SD) and 42% were educated to $\leq$ GCSE⁽¹⁶⁹⁾. In terms of introducing bias from differences in the outcomes of interest e.g. the maternal psychological factors, the 348 women in this sub-study did not differ greatly from the 1022 in the main SIH study. Sense of control, food involvement and general well-being levels were slightly higher in the main SIH population compared to my sub-study, although none of the differences were significant. Levels of general and specific self-efficacy for healthy eating were the same in both groups. Therefore it can be concluded that the women in this study were largely representative of those in the SIH population as a whole, although the data may not be generalisable beyond Southampton.

As discussed in detail in chapter 4, section 4.4.2, there are challenges with assessing diet in preschool children and with using an FFQ as the dietary assessment tool. As the child cannot report on their own diet, dietary information is provided by a caregiver, which may increase reporting error. Often FFQ's overestimate intakes, although they have been found to be effective at ranking children according to their dietary patterns⁽¹⁵⁰⁾. The short FFQ was developed for this study using dietary data from a large general population of children living in Southampton. It was administered by trained researchers according to standard protocols. Its relative validity in describing the prudent diet pattern of young children was established as part of this PhD project (see Chapter 4 section 4.4), and it has shown comparable positive associations with some micronutrients to a full FFQ. While the short FFQ only describes variation in compliance with the prudent diet pattern, the evaluation work showed that it was able to do this well. This provides a valid method of assessing diet quality in a population of children who may have been harder to reach. It is unlikely that the nature of the dietary assessment tool explains the strong associations with maternal psychological characteristics that were found in this study.

As these data are cross-sectional causality of the relationships cannot be determined, although I speculate that mothers' psychological characteristics determine how and what she feeds her child these data cannot be used to test the direction of association.

5.5 Conclusion

Data in this chapter suggest that mothers form two distinct groups based on their psychological characteristics, which in turn are associated with how and what they feed their young children. Mealtime environmental characteristics and socio-economic indicators are important determinants of children's diet; however, the mothers' psychological resilience continues to predict their children's quality of diet even after mealtime environment and socio-economic factors have been taken into account.

The next chapter will describe the evaluation of the impact of an intervention, which aimed to improve mothers' diet and lifestyle through increasing aspects of psychological resilience, namely their sense of control over life and self-efficacy, on the quality of diets of their young children. Mother's psychological resilience will be used to predict change in children's quality of diet following the intervention

6 The follow-up survey

6.1 Background

This chapter aims to address research question 2. This chapter will explore the impact of the Southampton Initiative for Health (SIH) intervention (described in Chapter 3) on mother's health related psychological factors and their children's diets

Research question two: Does an intervention aimed at improving the diet and lifestyles of women impact on their preschool children's quality of diet?

As described in detail in Chapter 3, the SIH training package, termed 'Healthy Conversation Skills', aimed to teach staff skills that encouraged them to hold more effective 'healthy conversations' with mothers attending the Children's Centres. At the core of these healthy conversations was the staff members ability to ask open ended or 'open discovery' questions in conversations with mothers about having a good quality diet or being physically active. This approach was intended to assist mothers in reflection and in exploring their own barriers to having a healthy lifestyle and to support them to identify their own solutions and set goals to make improvements. The intervention was intended to empower mothers which would then impact the diets and lifestyles of mothers and children who were exposed to staff trained in healthy conversation skills. A first step was therefore to determine that the training had an impact on staff practice. As described in more detail in section 3.2.2, the SIH was accompanied by a process evaluation to determine whether the training changed the way staff interacted with the mothers they encountered at the Sure Start Children's Centres.

Results from the process evaluation⁽¹³⁶⁾, suggested that at three time points following the training (immediately following, five to eight weeks following and one year following) staff trained in the Healthy Conversation Skills were using more of the skills compared to untrained staff in a similar setting in the control areas. The core skills from the training were creating opportunities to discuss health behaviours, using open discovery questions, listening, reflecting and goal-setting. These were assessed using questionnaires immediately following training, a semi-structured interview over the phone five to eight weeks following training, and direct observation of trained and untrained staff during their normal practice up to a year following the training. The observations revealed significantly greater use of these skills to support behaviour change used by trained staff compared to untrained staff⁽¹³⁶⁾.

These results suggest that the majority of staff who attended the 'Healthy Conversation Skills' training had skills to have more productive conversations with mothers who attended Sure Start Children's Centres. Mothers who attended Children's Centres in Southampton were therefore being exposed to staff who were practicing in a more empowering way.

Chapter 3 outlined the mechanism through which it was hypothesised that the SIH intervention would impact on the diets of young children (Figure 3.4: the logic model). The hypothesis expressed in the logic model is displayed in Figure 6.1, it suggested that if the SIH intervention succeeded in increasing maternal self-efficacy and general sense of control, this might improve mother's quality of diet and therefore, as suggested by the literature on the relationship between mother's and child's diet, her young child's quality of diet. Though these assumptions are based on observational data and were at this point untested in intervention studies, the cross-sectional analyses in Chapter 5 provided additional support for the importance of mothers' psychological factors and children's quality of diet. An intervention to change mothers' feelings of self-efficacy and sense of control may therefore be expected also to have an influence on children's quality of diet.

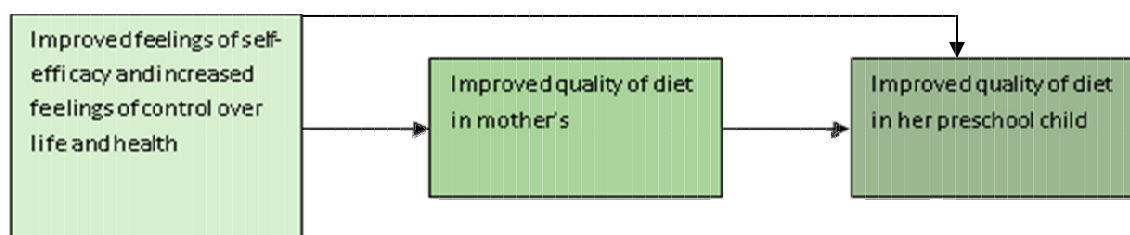


Figure 6.1 Extract from the logic model showing how the SIH intervention was expected to impact on young children's quality of diet

Data from baseline and follow-up surveys with a sub-set of mother-child pairs recruited to the SIH, will be used to explore effects of the intervention on psychological characteristics of mothers and quality of diet of both mothers and their children. Results in the intervention group will be compared to those in a control group who were not exposed to staff trained in 'healthy conversation skills'.

6.2 Method

6.2.1 Participants

Participants were mothers who had completed the SIH children's baseline survey and the main women's follow-up survey and who had agreed to be contacted again. The consort diagram showing response rates for the SIH surveys, for the mothers included in the children's study, is detailed in Figure 6.2.

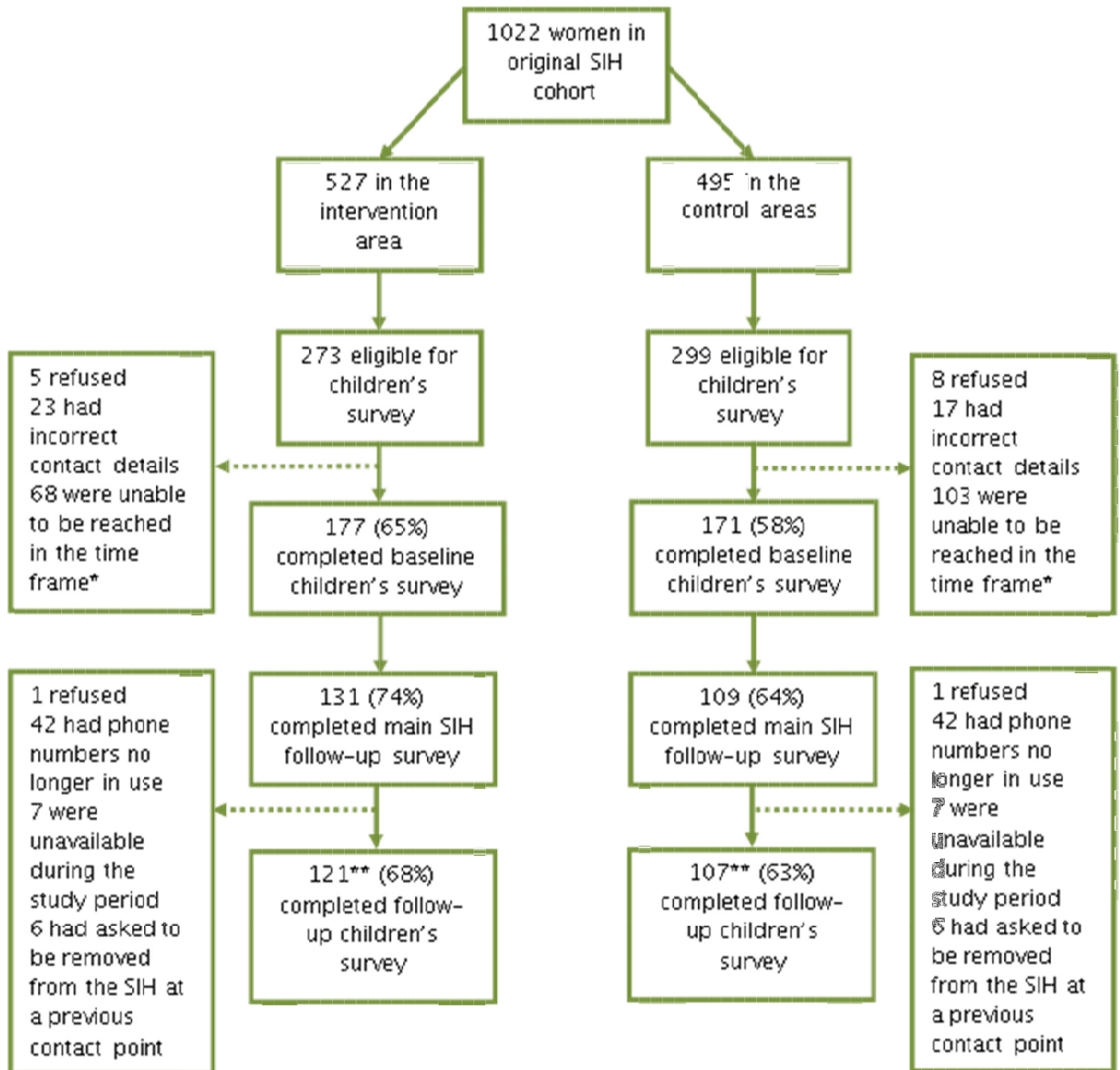


Figure 6.2 Consort diagram showing the SIH surveys recruitment and response rates of those included in the children's study

*Protocol stated that contact had to be attempted on a minimum of 5 occasions within the survey time-frame

**Some participants did not complete the main SIH follow-up survey, due to not being reached over the survey period but were able to complete the children's follow-up survey.

6.2.2 Procedure

Between October 2011 and February 2012 mothers who were eligible were contacted via telephone. Mothers were telephoned by trained fieldworkers; they were reminded about the study and asked if they were willing to complete another questionnaire about their child's diet and lifestyle. If they agreed they were asked whether it was more convenient to complete the questionnaire straight away or be contacted again on a day and time more suitable for them. Verbal consent to complete the follow-up survey was obtained and the fieldworkers followed a set protocol (Appendix G) during every phone call. During the completion of the questionnaire the interviewers used prompts (Appendix F), as they did during the baseline survey phone calls, to help standardise responses to the questionnaire. For instance, for the FFQ these included a list of the foods included and excluded in each of the food groups in the FFQ.

6.2.3 Materials

Assessments were repeated from the baseline survey. These are described in detail in section 4.3. The assessments included in the children's follow-up questionnaire (Appendix H) are summarised below. Children's diet was assessed using the 20-item food frequency questionnaire (FFQ), described in section 4.4.3, from which a prudent diet score was calculated. A high score represented a diet high in fruits, vegetables, wholemeal bread and water; a low score represented a diet high in white bread, savoury snacks, processed meat and soft drinks.

Child food neophobia was assessed using a six-item scale, a higher score indicates more food neophobia and these children refuse to try new foods more often. Mothers' use of overt and covert feeding practices was assessed on a ten-item scale with five items relating to overt and five relating to covert control. Scores were calculated separately for overt and covert control; higher scores indicate mothers use techniques pertaining to each type of feeding practice more often. Home/mealtime environmental characteristics were assessed using questions which enquired about how often children ate their meals with the family, while sitting at a table, and while the television was on, as well as how often children consumed take away food, how often mothers had battles with their child during mealtimes and how much time, on average, their child spent in front of a television or computer. Demographic information such as child's age and birth order was also collecting on this questionnaire.

Repeat assessments of mother's diet, general sense of control, self-efficacy, well-being and food involvement, and household food security were completed as part of the main SIH follow-up survey. Mother's diet was also assessed using a 20-item FFQ, from which a prudent diet score which describes a similar pattern of diet to that in the children was calculated. Maternal general sense of control over life was assessed on a nine-item scale. A higher score indicates a greater sense of control. Maternal general

and specific self-efficacy for healthy eating were both assessed on five-item scales from which a score for each was calculated. A higher score indicates increased feelings of self-efficacy for coping with adversity in life in general (general self-efficacy) and for overcoming challenges when trying to adopt a healthy diet (self-efficacy for healthy eating). Well-being was assessed on a five-item scale from which a score was calculated with a higher score representing a woman who feels happier about herself and her life. Food involvement was assessed using a 12-item scale from which a score was calculated. A higher score describes a woman who places a higher priority on food in her life. Finally, household food security was assessed using six 'yes' or 'no' questions, affirmative responses were given a score of one and responses were summed. A total score above two indicates food insecurity (unable to afford food each month).

6.2.4 Statistical analysis

All data and analyses presented are based on the 228 mother-child pairs within the sub-sample recruited for this project. Scores for each of the assessments and prudent diet scores for both mother and child were calculated as outlined in section 4.3. Children's prudent diet scores were transformed using Fisher-Yates normal scores. This has the effect of mapping the scores onto a normal distribution with a mean of 0 and a standard deviation of 1. Mothers' prudent diet scores were also transformed in this way but using the data for the whole SIH study sample. Differences in characteristics between participants in the intervention and control group at baseline and follow-up were assessed using unpaired two tailed t-tests for parametric data, Mann Whitney U tests for nonparametric data and chi-squared tests for categorical data. A Fishers Exact test was used for categorical variables which contained a group with fewer than five observations in it e.g. mother's clothing size. Paired comparisons were used in change over time analyses. Differences in the outcome variables and covariates at follow-up were compared in the intervention and control groups using linear regression models adjusted for level of the corresponding variable at baseline.⁽¹⁸²⁾ Changes in median food consumption within the groups over time were assessed using Wilcoxon matched pairs tests.

6.3 Results

6.3.1 Participant characteristics in control and intervention groups

Table 6.1 displays the characteristics of the 228 participants who completed both the baseline and follow-up surveys. Results are shown at baseline and follow-up in the intervention group and control group separately. The two groups were comparable in most of the characteristics examined at baseline and at follow-up. However there were some differences between the groups. At baseline children and mothers' in the intervention group tended to have higher prudent diet scores and mothers also tended to be more highly educated. At follow-up, in comparison with children in the control group, children in the intervention group were significantly younger and had lower neophobia scores, although the differences were small. In addition mothers in the intervention group received fewer benefits than mothers in the control group. In terms of the outcomes of interest at follow-up there were no significant differences in mothers general or healthy eating self-efficacy scores according to group. However mother's sense of control score was higher at follow-up in the intervention group compared to the control group. While mother's and children's prudent diet scores remained higher in the intervention group at follow-up, the difference between the groups was no longer significant.

Characteristic	Baseline		P Value	Follow-up		P Value
	Control n=107	Intervention n=121		Control n=107	Intervention n=121	
Child age in years (mean (SD))	3.5 (1)	3.1 (0.8)	0.09	5.2 (1)	4.9 (0.8)	0.01
Child gender						
Male	51 (48)	61 (51)	0.68	–	–	–
Female	56 (52)	60 (49)		–	–	
Birth order						
1 st	61 (57)	66 (55)	0.43	–	–	–
2 nd	28 (26)	40 (33)		–	–	
3 rd	18 (17)	15 (12)		–	–	
Number of siblings						
0	23 (22)	23 (19)	0.08	19 (18)	19 (16)	0.19
1	52 (49)	77 (64)		53 (50)	75 (62)	
2	23 (22)	13 (11)		28 (26)	19 (16)	
3+	8 (7)	8 (7)		7 (6)	8 (7)	
Meals at school*						
School dinners	–	–		50 (47)	65 (53)	0.82
Packed lunch	–	–		17 (16)	24 (20)	
Child neophobia score (median (IQR))	14 (12,18)	14 (12,17)	0.53	15 (13,18)	14 (13,17)	0.02
Child's prudent diet score (mean (SD))	–0.06 (0.9)	0.21 (0.9)	0.02	–0.09 (1)	0.08 (1)	0.21
Mothers age in years (mean (SD))	32.5 (5)	33.2 (5)	0.30	34.5 (5)	35.4 (6)	0.20
Education**						
Low ($\leq$ GCSE)	41 (38)	38 (31)	0.008	–	–	–
Med ($>$ GCSE, $<$ Degree)	46 (43)	38 (31)		–	–	
High (Degree or higher)	20 (19)	45 (37)		–	–	
Clothes size**						
<14	75 (70)	85 (70)	0.98	72 (75)	78 (70)	0.44
14+	32 (30)	36 (30)		24 (25)	33 (30)	
Employed						
No	39 (36)	55 (46)	0.16	35 (33)	45 (37)	0.48
Yes	68 (64)	66 (55)		72 (67)	76 (63)	
Mothers PDS (mean (SD))**	–0.02 (0.9)	0.25 (1)	0.02	–0.07 (1)	0.05 (1)	0.39
Overt control score (median (IQR))	19 (17,21)	19 (17,21)	0.54	18 (16,21)	19 (16,21)	0.32
Covert control score (median (IQR))	12 (9,16)	14 (9,17)	0.09	11 (8–16)	12 (10,16)	0.16
Sense of control score (median (IQR))**	27 (25,29)	27 (26,29)	0.18	25 (24,26)	26 (25,27)	0.03
General self-efficacy score (median (IQR))**	15 (14,16)	15 (14,16)	0.24	14 (14,15)	15 (13,15)	0.41
Healthy eating self-efficacy (median (IQR))**	15 (13,15)	15 (14,15)	0.53	15 (14,15)	15 (14,15)	0.94
Well-being (median (IQR))**	13 (9,16)	14 (10,17)	0.25	13 (8,16)	14 (11,17)	0.17
Food involvement (median (IQR))**	45 (41,48)	45 (42,47)	0.09	45 (41,47)	45 (41,47)	0.51
Food insecurity**						
Food secure	89 (84)	104 (86)	0.68	81 (84)	94 (85)	0.95
Food insecure/hungry	17 (16)	14 (14)		15 (16)	17 (15)	

In receipt of benefits**						
No	57 (53)	78 (64)	0.09	54 (56)	82 (74)	0.008
Yes	50 (47)	43 (36)		42 (44)	29 (26)	
SS attendance between baseline and follow-up						
Never	–	–	–	18 (19)	37 (33)	0.049
Monthly	–	–		42 (44)	36 (32)	
Weekly	–	–		36 (37)	38 (34)	
Child eating evening meal with the family						
Monthly or less	3 (3)	5 (4)	0.25	3 (3)	1 (1)	0.41
Weekly	38 (35)	31 (26)		35 (33)	35 (29)	
Daily	66 (62)	85 (70)		69 (64)	85 (70)	
Child eating take away food						
Never	33 (31)	53 (44)	0.12	29 (27)	31 (26)	0.92
Monthly	54 (50)	52 (43)		64 (60)	72 (59)	
Weekly	20 (19)	16 (13)		14 (13)	18 (15)	
Child eating with the TV on						
Monthly or less	39 (36)	46 (38)	0.78	40 (37)	51 (42)	0.62
Weekly	30 (28)	37 (31)		39 (36)	37 (31)	
Daily	38 (35)	38 (31)		28 (26)	33 (27)	
Child eating while sitting at a table						
Weekly or less	6 (6)	16 (13)	0.06	9 (8)	8 (7)	0.75
Once per day	15 (14)	9 (7)		10 (9)	9 (7)	
More than once a day	86 (80)	96 (79)		88 (82)	104 (86)	

Table 6.1 Differences in characteristics between participants in the intervention and control groups at baseline and follow-up

*not all children were attending school full-time at follow-up **missing data from main SIH follow-up

6.3.2 Participants lost to follow-up

The differences between the participants who did and did not complete the follow-up survey are displayed in table 6.2. This shows that children in the follow-up survey tended to have better quality diets. Their mothers were also more likely to have better quality diets and be older. Although the differences do not reach significance the results suggest that mothers who completed the follow-up survey were of higher educational attainment and a higher proportion were food secure, not receiving benefits and were in the more resilient cluster at baseline.

Characteristic	Not in follow-up (N 122)	Completed follow-up (N 228)	P Value
Child age (mean(SD))	3.2 (0.9)	3.4 (0.9)	0.24
Number of siblings (n(%))			
0	20 (17)	46 (20)	0.34
1	66 (54)	128 (57)	
2	19 (16)	35 (15)	
3+	16 (13)	17 (8)	
Childs prudent diet score (z-score)	-0.16	0.09	0.02
Mothers age (mean(SD))	30.7 (5.6)	32.9 (5.1)	<0.001
Mothers educational level (n(%))	56 (46)	78 (34)	0.09
≤GCSE	40 (33)	83 (37)	
>GCSE; <Degree	26 (21)	65 (29)	
Mothers prudent diet score (z-score)	-0.18	0.13	0.004
Mothers cluster membership (n(%))			0.58
Less resilient	44 (40)	79 (37)	
More resilient	66 (60)	135 (63)	
Food insecurity (n(%))			0.37
Food secure	99 (81)	191 (85)	
Food insecure/hungry	23 (19)	34 (15)	
In receipt of benefits (n(%))			0.28
Yes	57 (47)	92 (41)	
No	65 (53)	134 (59)	

Table 6.2 differences in characteristics between participants who did not and did complete the follow-up survey

6.3.3 Effect of the intervention on mothers sense of control

Mothers' sense of control scores at baseline and follow-up in the intervention and control groups are displayed in Table 6.1. Figure 6.3 is a scatter plot showing mothers' sense of control scores at baseline against the corresponding score at follow-up, in the intervention and control groups. The grey line shows where the observations would lie if there had been no change in mother's sense of control score. The figure shows that most participants reduced their sense of control score, apart from those with the lowest scores whose scores increased, indicating some regression to the mean. The separation in the regression lines for the intervention and control group shows that the reduction in sense of control was less marked in the intervention group. This could indicate that the SIH intervention had a protective effect on mothers' sense of control.

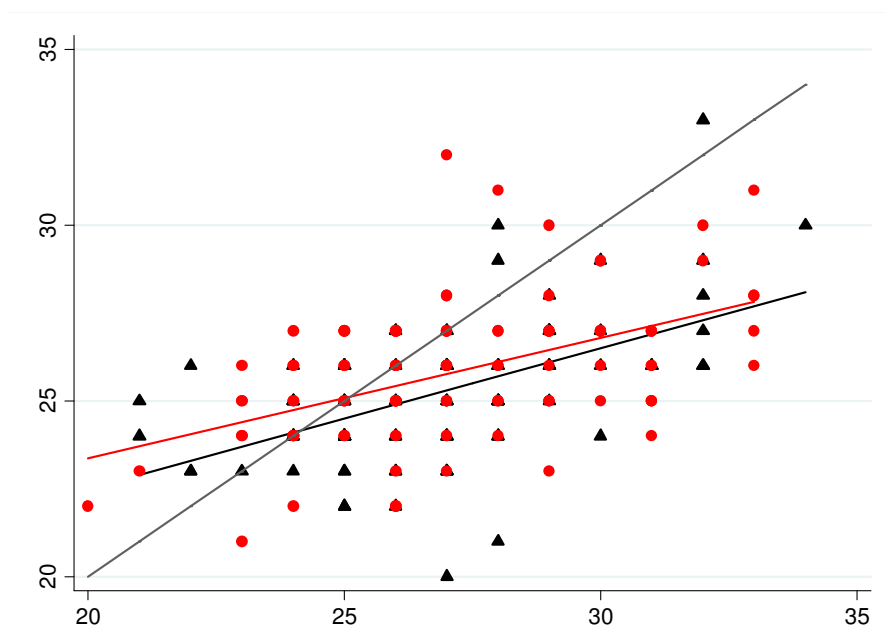


Figure 6.3 A scatter plot showing sense of control scores at baseline against sense of control scores at follow-up in the intervention group (red) and control group (black). The grey line shows the line of no change

Table 6.3 shows the association in a linear regression model, predicting sense of control score at follow-up by group membership, adjusting for sense of control score at baseline. This shows being in the intervention group was associated with sense of control at follow-up, independent of baseline sense of control score, indicating that while sense of control scores went down in both groups the decline was less marked in the mothers in the intervention group. However a formal test for interaction showed that the interaction in for this association was not statistically significant ($p=0.505$).

	β coefficient	95% confidence intervals	P value
Sense of control at baseline	0.37	0.28, 0.45	<0.001
Group*	0.47	0.01, 0.93	0.045

Table 6.3 Multivariate regression model showing association between group membership and sense of control score at follow-up, controlled for sense of control score at baseline

*Control group =0, Intervention group =1

6.3.4 Effect of the intervention on mothers quality of diet

The difference in mothers mean prudent diet score between baseline and follow-up was $-0.20SD$ and $-0.05SD$ in the intervention and control groups respectively. The association between mothers' group membership and prudent diet score at follow-up,

controlled for prudent diet score at baseline is displayed in Table 6.4. This shows that there was no association between being in the intervention group and mothers quality of diet at follow-up.

	β coefficient	95% confidence intervals	P value
Mothers prudent diet score at baseline	0.82	0.72, 0.92	<0.001
Group*	-0.09	-0.28, 0.09	0.301

Table 6.4 Multivariate regression model showing association between group membership and mothers' prudent diet score at follow-up, controlled for prudent diet score at baseline *Control = 0, Intervention = 1

6.3.5 Effect of the intervention on children's quality of diet

Table 6.5 shows children's median weekly food consumption at baseline and follow-up in the control and intervention groups. This shows that there are very few differences between the two groups of children. Differences at baseline are observed in crisps and low-calorie soft drink consumption which were lower and other vegetable consumption which was higher, in children in the intervention group. At follow-up the differences remained in that low-calorie soft drink consumption was lower in the intervention group, however the other differences were no longer significant. Frequency of salad vegetable consumption became significantly higher in children in the intervention group.

Food group	Baseline			Follow-up		
	Control	Intervention	P Value	Control	Intervention	P Value
Water	7 (2,21)	14 (7,21)	0.27	14 (7,21)	14 (7,21)	0.35
Green vegetables	3 (1,5)	4 (2,6)	0.08	3 (2,5)	4 (2,5)	0.09
Root vegetables	3 (2,6)	3 (2,4)	0.21	3 (2,4)	3 (2,4)	0.27
Other vegetables	2 (0.5,3)	2 (1,4)	0.01	2 (1,4)	2 (1,4)	0.57
Salad vegetables	2 (0,5)	2 (0.5,5)	0.11	2 (0,4)	3 (1,5)	0.007
Wholemeal bread	6 (1,7)	5 (2,7)	0.88	7 (3,14)	7 (4,14)	0.75
Rice or pasta	3 (2,4)	3 (2,4)	0.15	2 (2,3)	3 (2,4)	0.39
Fish	1 (1,2)	1 (1,2)	0.90	1 (1,2)	1 (1,2)	0.77
Fruit (excluding citrus)	12 (8,16)	12 (8,15)	0.89	11 (7,14)	10 (7,14)	0.55
Pure fruit juice	1 (0,7)	2 (0,7)	0.90	1 (0,7)	2 (0.3,7)	0.84

Dried fruit	3 (0.5,3)	2 (1,5)	0.97	2 (0,4)	1 (0,3)	0.37
Vegetarian dishes	0 (0,1)	0.3 (0,1)	0.19	0.3 (0,1)	0.5 (0,2)	0.12
Crisps	3 (2,7)	3 (1,4)	0.05	3 (2,6)	3 (1,5)	0.24
Roast potatoes or chips	3 (2,4)	2 (2,5)	0.28	3 (2,5)	3 (2,4)	0.22
Chocolate or sweets	2 (2,4)	3 (2,4)	0.42	3 (2,5)	3 (2,4)	0.48
Processed meat	2 (0.5,3)	1 (1,3)	0.56	2 (1,4)	3 (1,4)	0.27
White bread	0 (0.5,5)	1 (0,4)	0.79	1 (0,4)	1 (0,4)	0.83
Crackers	0.5 (0,2)	1 (0,3)	0.36	1 (0.3,3)	1 (0,2)	0.16
Cakes and biscuits	3 (2,5)	3 (2,5)	0.65	3 (2,5)	3 (2,5)	0.67
Low-calorie soft drinks	7 (1,14)	4 (0,14)	0.05	7 (1,14)	4 (0,14)	0.008

Table 6.5 Children's median weekly food consumption at baseline and follow-up in the intervention and control groups

The difference in children's mean prudent diet score between baseline and follow-up was $-0.13SD$ and $-0.03SD$ in the intervention and control groups respectively. Table 6.6 shows the association between mothers' group membership and children's prudent diet score at follow-up. This shows that there was no differential effect between mothers being in the intervention group versus the control group on children's prudent diet score at follow-up.

	β coefficient	95% confidence intervals	P value
Child's prudent diet score at baseline	0.78	0.68, 0.88	<0.001
Group*	-0.05	-0.23, 0.13	0.58

Table 6.6 Multivariate regression model showing the difference in the change in children's prudent diet score according to group membership

*Control = 0, Intervention = 1

The associations reported in Table 6.6 are depicted Figure 6.4. This shows that there was a general decline in children's prudent diet score, apart from in those who had the poorest quality diet scores at baseline. However, correlations between children's prudent diet scores at baseline and follow-up were $r=0.73$ ($p<0.001$) in both the intervention and control group, suggesting that there was reasonable tracking of children's quality of diet over the two year period.

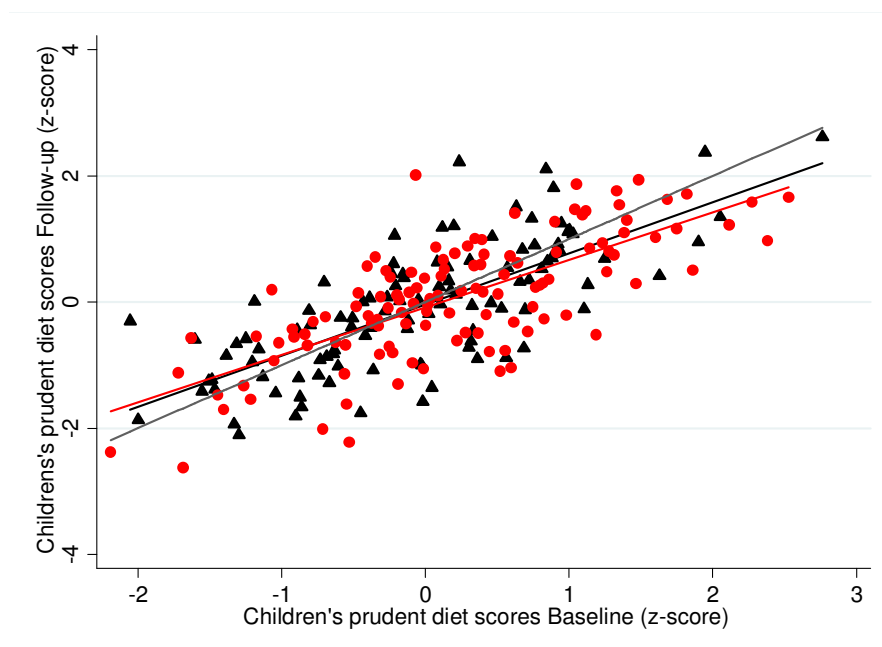


Figure 6.4 A scatter plot showing children's prudent diet scores at baseline against children's prudent diet scores at follow-up in the intervention group (red) and control group (black). The grey line shows the line of no change.

The differences in the change of food insecurity and benefit receipt were also taken into consideration. Table 6.7 shows the same model as in Table 6.6, adjusted for change in food insecurity and benefit receipt. There was no change in the difference of the effect between the groups when change in food insecurity and change in benefit receipt were included as covariates, however, the model indicated that in the whole study population, starting to receive benefits over the follow-up period was associated with an increase in children's prudent diet score.

	β coefficient	95% confidence intervals	P value
Child's prudent diet score at baseline	0.77	0.67, 0.87	<0.001
Group*	-0.04	-0.24, 0.14	0.62
Change in food insecurity**	0.12	-0.13, 0.37	0.35
Change in benefit receipt***	0.17	-0.00, 0.35	0.054

Table 6.7 Multivariate regression model showing the difference in the change in children's prudent diet score according to group membership, adjusted for changes in food insecurity and benefit receipt.

*Control = 0, Intervention = 1

**Went from food insecure to food secure = -1, no change = 0, went from food secure to food insecure = 1.

*** Stopped receiving benefits = -1, no change = 0, started receiving benefits = 1

These results suggest that there was no effect of the SIH intervention on the quality of children's diets, nor on the psychological factors or quality of diet of their mothers. Table 6.1 indicates, however, that in the intervention group a third (33%) of mother's had not attended the Children's Centres over the intervention period and therefore would not have been exposed to the intervention. Further analysis was carried out to look for differences between those who were and were not exposed to the intervention (Appendix I). The only difference between those that did and did not attend Sure Start Children's Centres over the study period was that mothers who did attend tended to be younger than those who did not (32 years and 35 years old, respectively $P=0.006$). Table 6.8 shows the association between the differences in the change in children's prudent diet score between the intervention and control groups in only those who reported attending Sure Start Children's Centres over the follow-up period. This shows that there were no differences in the change in children's prudent diet score in those exposed to the intervention.

	β coefficient	95% confidence intervals	P value
Child's prudent diet score at baseline	0.80	0.68, 0.93	<0.001
Group*	-0.07	-0.29, 0.16	0.56
Change in food insecurity**	0.16	-0.13, 0.46	0.28
Change in benefit receipt***	0.20	-0.01, 0.41	0.06

Table 6.8 Multivariate regression model showing the difference in the change in children's prudent diet score according to group membership, only including those who reported attending Sure Start Children's Centres over the follow-up period, adjusted for changes in food insecurity and benefit receipt.

*Control = 0, Intervention = 1

**Went from food insecure to food secure = -1, no change = 0, went from food secure to food insecure = 1.

*** Stopped receiving benefits = -1, no change = 0, started receiving benefits = 1

One result of particular note was the general decline in children's diet scores over the two year period of follow-up. The following analysis will explore factors underlying this decline in prudent diet scores in children and therefore analysis from this point forward will be exploring changes over time in both intervention and control groups combined.

6.3.6 Food consumption changes over time

Table 6.9 shows the changes in food consumption in children between baseline and follow-up. This shows that over the follow-up period consumption of root vegetables, fresh fruit, and dried fruit declined and consumption of water, wholemeal bread, chocolate/sweets, processed meat and crackers increased. The increases in consumption of chocolate/sweets, processed meat and crackers and the reduction in consumption of root vegetables, fruit and dried fruit will be the main causes of the reduction in children's prudent diet score. It is not clear however, what has caused this change in food consumption pattern.

Food group	Baseline	Follow-up	P Value
Water	14 (4–21)	14 (7–21)	0.01
Green vegetables	3 (2–6)	3 (2–5)	0.73
Root vegetables	3 (2–5)	3 (2–4)	0.01
Other vegetables	2 (1–3)	2 (1–4)	0.61
Salad vegetables	2 (0–5)	2 (0–5)	0.97
Wholemeal bread	6 (1–7)	7 (4–14)	<0.001
Rice or pasta	3 (2–4)	3 (2–4)	0.15
Fish	1 (1–2)	1 (1–2)	0.46
Fruit (excluding citrus)	12 (8–15)	10 (7–14)	0.001
Pure fruit juice	1 (0–7)	1 (0–7)	0.88
Dried fruit	2 (1–5)	2 (0–3)	<0.001
Vegetarian dishes	0 (0–1)	0 (0–1)	0.13
Crisps	3 (1–6)	3 (2–5)	0.91
Roast potatoes or chips	3 (2–4)	3 (2–4)	0.85
Chocolate or sweets	3 (2–4)	3 (2–4)	0.02
Processed meat	1 (1–3)	3 (1–4)	<0.001
White bread	1 (0–4)	1 (0–4)	0.16
Crackers	0 (0–2)	1 (0–2)	0.02
Cakes and biscuits	3 (2–5)	3 (2–5)	0.59
Low-calorie soft drinks	7 (0–14)	7 (0–14)	0.94

Table 6.9 Children's median weekly food consumption at baseline and follow-up

6.3.7 Predictors of change in children's prudent diet score

To explore possible influences on the decline in children's prudent diet score, change in some of the key variables which were cross-sectionally associated with children's prudent diet score at baseline and reported in Chapter 5 were assessed and these are displayed in Table 6.10.

Characteristic	N (%)
Number of siblings	
- Increased	30 (13)
Household food security	
- Went from food secure to insecure/hungry	15 (7)
- Went from food insecure/hungry to secure	13 (6)
Mother's employment	
- Went back into employment	18 (8)
Mother's cluster membership*	
- Went from 'more resilient' to 'less resilient'	35 (18)
- Went from 'less resilient' to 'more resilient'	15 (8)
Mother's covert control score	
- Increased	99 (43)
- Decreased	109 (48)
Frequency of child eating evening meals as a family	
- Increased	39 (17)
- Decreased	33 (14)

Frequency of child eating take-away food	
- Increased	85 (37)
- Decreased	55 (24)
Frequency of child eating meals with the TV on	
- Increased	58 (25)
- Decreased	79 (35)
Frequency of child eating meals while sat at a table	
- Increased	34 (15)
- Decreased	22 (10)

Table 6.10 Summary of the changes in key maternal and home mealtime environment variables between baseline and follow-up

*complete data on cluster membership at follow-up only available for 196 of mothers

Table 6.10 indicates that there were few changes in number of siblings, household food security, and maternal employment, suggesting that these characteristics are relatively stable over two years. Most mothers' covert control score changed over the two years although nearly as many increased as decreased. In terms of mothers' cluster membership, 18% of mother's went from being in the 'more resilient' cluster to being in the 'less resilient' which could be a reflection that scores of some of the psychological characteristics declined more markedly for these women. However, further analyses did not indicate any differences in these women compared to those who remained in their cluster which could have accounted for this change (data not shown). Greater numbers of children had their mealtime settings changed over the two years with the largest numbers increasing their consumption of take-away food (37%) and decreasing their frequency of eating meals with the television on (35%). Whilst there were considerable numbers of children whose mealtime environment changed, there was no consistent direction of the change. For example, even though 37% of children increased their consumption of take-away food, 24% decreased their consumption, suggesting that there was no clear pattern in changes in mealtime environment characteristics.

In Chapter 5, the significance of mothers' psychological factors, characterised in the cluster analysis, and the mealtime environment in relation to children's quality of diet was observed. Table 6.11 is a multivariate regression model which shows that these baseline factors were associated with children's prudent diet score at follow-up. Similar to the associations at baseline, having a mother in the less resilient cluster and eating in front of a television was associated with reductions in children's prudent diet score at follow-up. In addition, having a mother with higher levels of educational attainment and eating at a table were associated with increased children's prudent diet score at follow-up. Mother's use of covert control strategies at baseline was also

positively associated with children's prudent diet score at follow-up although this association did not reach statistical significance ($p=0.07$).

Characteristic	β coefficient	95% confidence intervals	P Value
Mothers cluster membership*	-0.42	-0.67, -0.18	0.001
Mothers' educational attainment**	0.20	0.12, 0.28	<0.001
Covert control (z-score)	0.10	-0.01, 0.22	0.07
Frequency of child consuming take-away food***	0.001	-0.10, 0.10	0.98
Frequency of child eating while sitting at a table***	0.14	0.05, 0.24	0.003
Frequency of child eating in front of the television***	-0.10	-0.15, -0.04	<0.001
Average hours spent watching television	0.02	-0.08, 0.12	0.69

Table 6.11 Multivariate regression model assessing baseline predictors of children's prudent diet score at follow-up.

* 'More resilient' cluster = 1 'Less resilient' cluster = 2; **GCSE = 1, >GCSE <Degree = 2, Degree = 3; *** never = 0, $\leq$ weekly = 1, once per day = 2, more than once per day = 3

In order to determine whether establishing these characteristics at baseline has a protective or detrimental effect on children's quality of diet overtime we assessed the influence of characteristics at baseline on change in children's quality of diet. Table 6.12 shows the univariate and multivariate associations between baseline characteristics and change in children's prudent diet score. This shows that mothers' cluster membership at baseline did not predict change in children's prudent diet score. However, mother's educational attainment, frequency of eating at a table and frequency of eating in front of the television were associated with change in children's diet score. Higher levels of maternal education and sitting at a table more often to eat meals had a protective effect on children's quality of diet score. However, eating while watching television was associated with significant decreases in children's prudent diet score. When these factors were included in a multivariate model eating at a table and in front of the television become non-significant ($p=0.09$ and $p=0.13$, respectively), however mothers level of education remained an independent predictor of change in children's prudent diet score ($\beta=0.11$, $p<0.001$).

Characteristic	β coefficient	95% confidence intervals	P Value for univariate associations	P Value for multivariate associations
Mothers cluster membership*	-0.09	-0.31, 0.12	0.38	
Mothers' educational attainment**	0.12	0.06, 0.18	<0.001	<0.001
Food insecurity ***	0.03	-0.22, 0.29	0.79	
Covert control (z-score)	0.02	-0.07, 0.12	0.61	
Number of siblings****	-0.01	-0.11, 0.09	0.83	
Frequency of child eating while sitting at a table*****	0.08	0.01, 0.16	0.04	0.09
Frequency of child eating in front of the television*****	-0.04	-0.08, -0.00	0.04	0.13

Table 6.12 Univariate and multivariate associations between key baseline characteristics and change in children's prudent diet score. * 'More resilient' cluster = 1 'Less resilient' cluster = 2; **GCSE = 1, >GCSE <Degree = 2, Degree = 3; *** food secure = 0, food insecure = 1; **** 0-3+; ***** never = 0, $\leq$ weekly = 1, once per day = 2, more than once per day = 3

6.4 Discussion

6.4.1 Summary of findings

In this chapter we have explored the effect of the SIH intervention on maternal sense of control, self-efficacy and quality of diet and children's quality of diet in the sub-sample who were recruited for the children's study. Results from the main outcome evaluation of the SIH intervention in the whole SIH cohort are described the outcomes paper by Baird *et al* (submitted).

Results from the follow-up surveys indicated that maternal quality of diet and children's quality of diet declined over the period of follow-up, and that there were no differences in this decline between mothers and children in the intervention and control groups. The results also showed that sense of control declined in both groups of mothers but that the decline was less marked in the intervention group. This may indicate a protective effect of the intervention on mothers' sense of control. A formal test, however, showed that the interaction between sense of control and group

membership was not significant. This evaluation therefore suggests that, in the subgroup recruited in the children's study, the intervention did not increase mother's sense of control or self-efficacy nor did it improve their quality of diet and it was therefore unlikely to have led to improvements in the quality of diet of their young children. Further exploration of the difference of the effect of the intervention on the diets of children in the intervention and control arms took account of the changes in food insecurity and benefit receipt. This indicated that there was no differential effect between change in benefits and children's prudent diet score between the intervention and control groups, however, in the study population as a whole, change in benefit receipt had a positive association with change in children's prudent diet score. Further exploration of the mean change in children's prudent diet score by mothers change in benefit receipt showed that the association was actually driven by mothers who stopped receiving benefits over the course of the study having children whose prudent diet score decreased. Such that the mean decrease in children's prudent diet score in those who had stopped receiving benefits was $-0.29SD$, compared to mean increase of only $0.03SD$ in those who had started receiving benefits, over the study period.

The next part of this discussion will consider the reasons why the intervention was unsuccessful.

6.4.2 Strengths and limitations of the intervention

The SIH intervention targeted change at two levels, firstly the Sure Start Children's Centre environment, with staff being trained in behaviour change skills, and secondly, individual level behaviour, in terms of seeking improvements in sense of control, self-efficacy and quality of diet in mothers and quality of diet in children. Evidence suggests the first of those changes was successfully achieved. The majority of staff within the Sure Start Children's Centres in Southampton were trained skills to support behaviour change and most of the staff members appeared to be using these skills in their practice⁽¹³⁶⁾. The intervention hypothesis was that changing the way staff interacted with women in Sure Start Centres, would impact on the behaviour of mother's exposed to trained staff, which would in turn influence the way they fed their young children. However, it is acknowledged that even were the intervention to have been optimally delivered by staff and mothers were maximally exposed to those staff, those effects on mother's diets and lifestyles were likely to be small. The target of the intervention activity was women's self-efficacy and sense of control. It was anticipated that increases in these psychological factors would benefit women's diets and lifestyles, but the connection between these two has yet to be established in longitudinal and intervention studies.

In reality we were unable to control the extent to which the mothers were exposed to trained staff and thus the intervention. We enquired as to their attendance at the Children's Centres over the intervention period and discovered that 33% of mothers not attended at all over the intervention period. In a separate analysis of the mothers who had attended the Centres we still observed a decline in mothers' and children's quality of diet scores however and there was no differences between intervention or control group. This could have been overcome by completing a survey with mothers before the development of the intervention to enquire about how often they used the Children's Centre services; this may then have been accounted for in the sample size calculation. A related issue was our limited ability to assess intervention 'dose'. It is likely to take a number of years to embed new practices across an organisation and in addition changes in the behaviour of mothers is unlikely to arise from just one exposure to a 'healthy conversation'. Although 35% of the mothers reported attending a Children's Centre regularly we were unable to assess how often these mothers had conversations with the trained staff, which is likely to have been important.

Using existing services and 'practitioners' (Children's Centre staff) to deliver the intervention had strengths and limitations. A major strength is that it reduced study costs as only a few members of the research team were required to train many staff members, meaning it was not resource intensive. In addition, it was easily translated from research into practice within a 'real world' setting, a rare feature of complex public health interventions⁽¹⁸³⁾. The lack of control we had over the intervention delivery was a limitation. It may have contributed the lack of effect on the outcomes. To have controlled the setting too much however, would have defeated the purpose of testing the use of behaviour change skills under 'normal practice' conditions and thus reduced the external validity of the trial. The SIH findings highlight the difficulties and challenges faced when implementing and evaluating complex interventions in 'real world' settings.

In terms of the process of translating research into practice, it is possible that we missed a vital step. The SIH intervention was implemented in the Sure Start Children's Centres before testing the efficacy of healthy conversation skills in increasing mothers' sense of control and self-efficacy. The development of the healthy conversation skills training of Sure Start Children's Centre staff to empower mothers' to take control of their own health was based on theories of behaviour change, and experiences of similar studies in clinical populations. However it would have been advantageous to assess our approach in a much more concentrated and controlled environment prior to scaling it up to a complex, community based intervention.

It is also possible that the tools used to assess the target outcomes were not sensitive enough to assess differences between intervention and control groups in changes in outcomes. The methods used to assess sense of control, self-efficacy and mothers' and children's quality of diet have all been used and tested,^(143;184) however for only the mother's FFQ has there been an evaluation of the ability to assess change in prudent diet score⁽¹⁸⁵⁾. The same studies have not, to our knowledge, been carried out to evaluate the sensitivity of these measures in assessing change in sense of control and self-efficacy.

As described in section 4.2, this project was powered to detect a 0.25SD change in children's prudent diet score. In order to achieve a change in prudent diet score of 0.25SD of a child who has a relatively poor quality of diet (score of -0.77SD) the child could increase their consumption of fresh fruit from 6 times per week to 10, and reduce their chocolate or sweet consumption from 7 to 2 times per week. Using this example this change could be achieved by exchanging their chocolate or sweets for a piece of fruit during the week. A child with a better quality of diet (score of 0.58SD) could improve their diet by 0.25SD by increasing their vegetable intake from 10 to 14 times a week, equating to eating vegetables twice per day, and by exchanging white bread for brown bread. The question remains as to whether changes of this magnitude feasible in this intervention? To our knowledge this is the first study to have focused the intervention on mothers but to evaluate the impact on young children. Therefore comparisons with other interventions are challenging. Other interventions aimed at preschool children have largely focused on the treatment or prevention of obesity and thus their outcome has been change in weight status, although many included changes in diet as an intermediary outcome. Interventions which have been delivered within Children's Centre, or similar, settings have largely involved running courses or sessions with parents of young children delivered by dietitians,⁽¹⁸⁶⁾ paediatricians,⁽¹⁸⁷⁾ nutritionists,⁽¹⁸⁷⁾ or peer-educators⁽¹⁸⁸⁾ all of which were specifically designed and delivered for the intervention and focused on obesity related behaviours in preschool children. These targeted programmes reported modest, but significant changes in children's diets, however with the exception of the Melbourne INfant Feeding, Activity and Nutrition and Trial (INFANT), these are often reported as nutrient, rather than food, intakes, which makes comparisons with the change in prudent diet score challenging. The study described by Harvey-Berino and colleagues which involved a running a parental support programme of which the emphasis was on development of appropriate eating and exercise behaviours in children observed modest but significant decreases in children's energy intakes (-39.2 Kcal per kg body weight) in the intervention group 16 weeks post intervention.⁽¹⁸⁸⁾ In another trial which consisted of a 14 week nutrition and physical activity education programme tailored to 4 year old children at pre-school showed that at 1 year follow-up percentage calories from

saturated fat were lower in the intervention children compared to the control children (11.6% vs 12.8%).⁽¹⁸⁷⁾ Finally in the INFANT trial, mother's groups in the community received 6 x 2-hour education sessions with a dietician as well as DVD's and written resources about infant and toddler nutrition and physical activity. Results indicated that child's consumption of vegetables increased and sweet snacks decreased in mothers of higher educational attainment in the intervention group (+11g/d and - 5.22g/d. respectively) and water consumption increased in children with mothers of lower educational attainment in the intervention group (+65g/d).⁽¹⁸⁶⁾ The key difference between these interventions and the SIH was that the SIH was less directive and the aim was to empower, rather than instruct parents. It was also less 'programmatic' such that a group of parents weren't selected, recruited and put through a course. Therefore the comparisons between the SIH and these other studies serves only to reflect on the fact that if these more directed interventions, which specifically aim to improve child diet, showed a modest effect on children's quality of diet, it is possible that the level of change required for an 0.25SD increase in prudent diet score was too ambitious for our study, and that a larger study was therefore required.

6.4.3 Decline in children's diet quality

To our surprise the results also indicated that over the two years of the study there was a substantial decline in children's prudent diet scores. In addition there were changes over the two years the child's mealtime environment characteristics, but no consistent patterns in the directions of these changes with nearly as many increasing as decreasing frequency of these behaviours. The findings from Chapter 5 revealed the relative importance of maternal psychological characteristics (described by a cluster analysis) and mealtime environments in determining children's quality of diet cross-sectionally, therefore the relationships between maternal cluster membership and mealtime environmental characteristics at baseline and children's quality of diet at follow-up were explored. These factors at baseline were associated with children's quality of diet at follow-up. Children whose mothers were in the less resilient cluster and who ate their meals in front of the television at baseline had lower prudent diet scores at follow-up. In addition children who ate their meals while sitting at a table at baseline had better prudent diet scores at follow-up. The effect of these factors on change in children's prudent diet score was then explored. This showed that the cluster mothers belonged to at baseline was not associated with change in children's prudent diet score. However, mothers' educational attainment and eating at a table more often assessed at baseline were both associated with increases in children's prudent diet score whereas eating while watching television more often was associated with a decline in children's prudent diet scores, although the size of the effect of the mealtime environment on change in children's prudent diet scores were modest. In addition when these factors were placed into a multivariate model the effect of

mealtime environment was no longer significant and only mothers' educational attainment remained significant.

We were unable to account for the decline in children's prudent diet score. We showed that the decline was largely characterised by increases in processed meat, chocolate and sweets, and crackers and decreases in fresh fruit and dried fruit consumption. It is therefore possible that this is an age effect and diet quality generally declines in children from age 3 to 5 years. A particular strength of this study was that diet quality was assessed using a common scale to score diet at both time points allowing an exploration of change in diet⁽¹⁸⁵⁾. The few studies which have assessed preschool children's diets over time do not report change in diet and instead report whether children track according to their quality of diet, which only reflects whether children tend to stay in the same position in the distribution, but does not allow exploration of whether there has been a shift in the whole distribution. Further investigation in larger studies is required to assess whether children's diets generally decline in quality from preschool to school age.

We observed correlations of $r=0.73$ between children's prudent diet scores between baseline and follow-up which indicates consistent tracking of children according to their quality of diet. These findings are consistent with those in other studies. In one study nutrient intakes were assessed in preschool children aged between 3–4 years, and was repeated 19 months later. Children were split into quintiles according to their energy, total fat, saturated fat, polyunsaturated fat, cholesterol, protein, carbohydrate, sodium, potassium and calcium intakes, separately. Results showed that the majority of children who were in the top quintile at baseline were in the top two quintiles at follow-up (58–83%), and those in the bottom quintile at baseline were in the bottom two quintiles at follow-up (56–81%).⁽¹⁸⁹⁾ The authors conclude that intakes in these nutrients largely track from age 3–4 years to 5–6 years. In another study which assessed energy intake, percentage energy from fat and sodium intake in 228 children at 4 years and again at 7 years old found that all three showed significant between-subject variance (all $p < 0.001$) suggesting that these intakes track also from age 4–7 years old. In terms of the stability of dietary patterns, a large UK cohort study assessed diet using long FFQ's in 6177 children at age 3, 4, 7 and again at 9 years. Dietary patterns analysis was carried out cross-sectionally at each time point. The results showed that at all time points three main patterns were identified, the 'Processed', 'Traditional' and the 'Health Conscious' patterns.⁽¹⁶⁾ In addition, there was a 'snack' pattern identified at age 3 characterised by intakes of cheese, fruit, puddings, cakes, biscuits and crisps, but this pattern was not identified at the other ages. Apart from the health conscious pattern at age 9, the three main patterns were also largely characterised by the same foods at each time point, suggesting stability within dietary patterns. In terms of tracking, the best level of agreement was seen between the ages

of 4–7 years, suggesting greatest stability between these ages. These studies demonstrate good levels of tracking of diet from preschool to school age which is consistent with results in this project.

We were able to compare diet scores in our sub-sample with those in the SIH cohort as a whole. In the main outcome evaluation of the SIH we also observed a decline in mother's prudent diet score (Figure 6.5, Baird *et al.* submitted), which suggests that determinants of the decline in children's diet score were household wide. Over the two years of the study the UK has been in an economic recession. A report from the Institute of Fiscal Studies showed that initially in 2009/2010, over the period in which the baseline surveys were conducted, inflation was low and welfare payments increased, meaning that 'real' household income continued to grow. However in 2010/2011 and 2011/2012, during the period of the follow-up surveys, raises in inflation were higher than the rises in minimum wage, and welfare payments were cut, causing the relative cost of living to increase.⁽¹⁹⁰⁾ It is possible therefore, that the economic squeeze could have influenced the general decline in quality of diet. Whilst we did not assess household income directly, there were few changes in our cohort in terms of receiving benefits or in the number who went from being food secure to insecure. On the face of it this suggests that mothers still felt able to afford food each month. The food security scale, however, assesses perceived ability to afford food each month, not necessarily 'healthy' food and therefore families' prudent diet scores may have decreased because they were spending less money on food and buying cheaper poorer quality food without them necessarily becoming food 'insecure'.

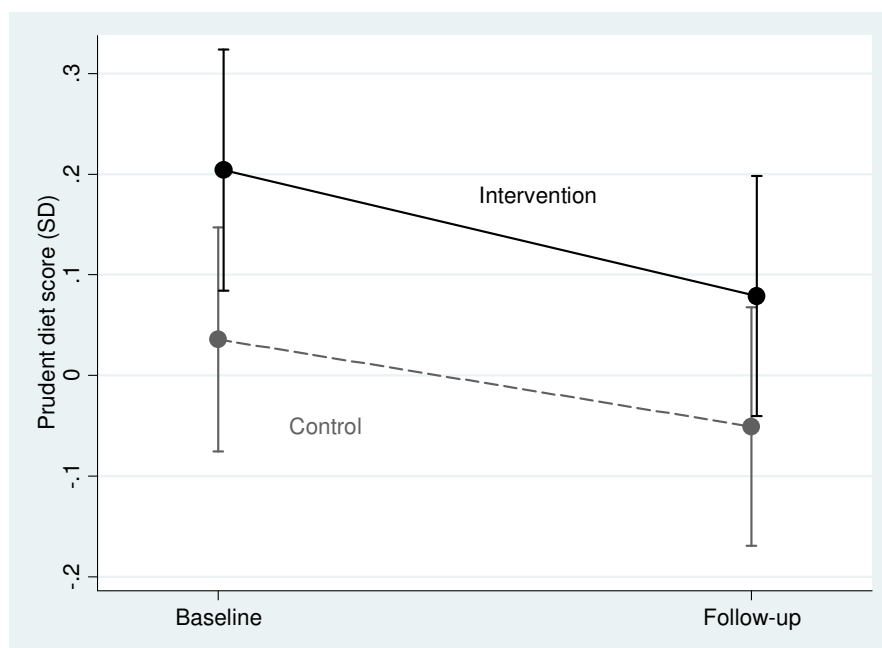


Figure 6.5 Graph showing the mean prudent diet scores of all mothers in the SIH (n=509) at baseline and follow-up in the intervention and control groups (Baird *et al.*, submitted)

The protective effect of maternal education on children's quality of diet could simply be an indication that these families had higher incomes, despite the recession. However, research on the link between education and diet has demonstrated that level of education is associated with women's own quality of diet and the quality of her children's diets after taking account of income related factors such as Index of Multiple Deprivation score. This shows that level of education has an independent relationship with quality of diet,^(4;56) suggesting that the relationship goes beyond having more money. The literature on mother's education and quality of diet brings us back to the role of health-related psychological characteristics. Higher levels of education are also associated with an increased sense of control,⁽¹⁹¹⁾ self-efficacy,⁽¹²⁴⁾ priority given to food⁽¹²³⁾ and stronger intentions to follow healthy eating guidelines.⁽¹⁷⁶⁾ It was not clear, therefore, why the cluster analysis which characterised mothers according to psychological factors reflecting resilience was not associated with change in children's quality of diet. However, maternal cluster membership at baseline was associated with higher children's prudent diet scores at follow-up suggesting that whilst it was not protective against the overall decline in children's quality of diet, it was associated with children maintaining a better quality diet compared to children whose mothers were in the less resilient cluster. The fact that higher maternal education was protective against the decline in children's prudent diet score suggest that there are factors related with educational attainment which protect child's quality of diet over and above a mother's psychological make-up.

6.4.4 Conclusions

This study has presented results from two surveys. A key strength was that we managed to collect data at two time points on 228 mother-child pairs with mothers who represented a range of demographics. It is challenging to engage and retain participants in research who have lower levels of education. In addition it was difficult to interview mothers with small children over the telephone. However, despite these barriers we managed a reasonable sample size and a response rate in the follow-up survey of 66%. This high response rate may have been due to our association with Sure Start Children's Centres. Sure Start is a 'brand' trusted by mothers in Southampton, Gosport and Havant.

The questionnaires used in this project were developed using findings from an extensive literature review of determinants of children's quality of diet, however, it was challenging to decide on what the most important influences were for mothers when making food decisions for their children, and thus what assessments to include in the questionnaires. Despite this the data collected from the surveys provided novel and useful cross-sectional insights into the complexity of influences on children's quality

of diet. However, questionnaires only collect information on factors that the researcher has decided to assess, and as they are restricted by space and time it is possible that important factors were missed. There was variation in children's quality of diet that was unable to be accounted for in these data.

It is likely that a combination of complex influences accounted for the decline in mothers and children's quality of diet, which have not been adequately captured in this project. It is not clear what these may be. Maternal educational attainment is not essentially amenable to change, so the finding that it may protect against dietary decline in children suggests that we need to specifically target mothers of lower educational attainment but does not explain how to do that.

Questionnaires, as a research tool, provide a way of collecting data to explore associations and test hypotheses; they are useful for exploring 'how' factors are associated but not 'why' they are associated. This is where qualitative methods, such as focus groups, are advantageous. These typically involve using groups of people in the target population to discuss and reflect on issues related to the research question and can provide unique insights into the context surrounding quantitative associations observed in surveys. They provide a rich data source from which researchers can draw more accurate pictures of what is happening in their target population and ultimately design more appropriate interventions.

Therefore the next part of this project was to explore, using focus group discussions, with mothers of young children attending Children's Centres, their experiences of feeding young children and what they felt were the most important influences on them, when deciding what to feed their children. The aim of this was to provide insights into what influential factors may have not been captured in the surveys and to consider what could be important levers for intervention for the future. The next chapter describes the methods and results from the focus group discussions.

7 Qualitative exploration of key influences on the food decisions mothers make for their children

Focus group discussions were completed with mothers with young children in order to provide some context to the results from the surveys described in Chapters 5 and 6, and to explore key influences which may not have been captured in the surveys. This Chapter describes a qualitative exploration of influences on the food decisions mothers make for their children.

7.1 Introduction

Qualitative methods are often used to further understanding of complex issues, such as those surrounding food choices⁽¹⁹²⁾. In order for us to better understand what it might be useful to consider when developing further intervention studies it was decided to speak to mothers with young children. The purpose of this would be to explore their experiences of feeding young children and to ascertain what they felt most influenced them when they were making food decisions for their children. Therefore the aim of this chapter was through focus groups to explore issues with feeding young children a good quality diet with mothers of young children, attending Children's Centres

7.1.1 Focus groups as a research method

Focus group discussions are a form of group interview through which the aim is to exploit communication between participants in order to generate data. Knowledge is not just encapsulated in reasoned responses to direct questions⁽¹⁹³⁾ and thus participants are encouraged to discuss and share experiences and anecdotes in response to open questions about the research topic. One unique feature of focus groups is in the group dynamic, such that the social interaction often provides data that are deeper than those collected using questionnaires or one-to-one interviews⁽¹⁹⁴⁾. Discussion groups reflect a more natural environment, than that of a one-to-one interview, where individuals influence each other through making comparisons between opinions and experiences shared in the group. The ability to consider and reflect upon others' feelings and experiences invites participants to compare their own reality with that of others. Thus focus group discussions can provide the researcher with invaluable insights into how and why participants feel and behave the way they do.

These group dynamics can, however, be considered a limitation with the method⁽¹⁹⁴⁾. Groups can be unpredictable and take the discussions off topic, although it is the job of the moderator to guide the discussions back to topic should this arise. There may be participants who feel the need to conform to the rest of the group and therefore hold back from sharing something they may otherwise have done in a more private setting. On the other hand they may tend towards ‘polarisation’ where they express views more strongly in a group than they would in private. There may be only one or two participants doing most of the discussing, where someone is very opinionated and spending more time than others expressing their views it is again the job of the moderator to facilitate the group and encourage others to speak up.

Another issue can arise from ‘group norms’, where the majority of the group share an opinion, which may silence an individual if they are not confident to challenge it even if they feel differently⁽¹⁹³⁾. While it is important for these factors to be considered, ultimately a well moderated focus group should facilitate the expression of views and experiences that may not develop in individual interviews, and highlight participants’ perceptions and perspectives through the discussions and debate within the group.

There are a number of advantages to using focus groups to collect data. Namely:

- They do not discriminate against people who are illiterate.
- They are empowering to participants because they make their opinions feel valued.
- They can encourage participation by those who do not often engage in research.

Focus group methods are increasingly being used in the field of health and medical research to explore peoples’ understanding of illness and health behaviours⁽¹⁹³⁾. As indicated from the literature review and findings from the surveys in this project, determinants of children’s quality of diets is a complex issue. Surveys are useful for observing associations between children’s quality of diet and other variables but cannot serve to explore why such associations arise and what underlies them. Focus groups can be useful for a number of circumstances, for instance, exploring opinions and feelings that a specific population group hold towards something, understanding influences on behaviour or motivations, reflecting upon ideas for intervention, or to provide context to associations seen in quantitative data. Often the aims of a focus group address many of these, which was the case in this study. Focus groups represent an opportunity to further our understanding of the complexity of influences on food decisions for young children within the context of people’s lives. In addition they often encourage people to positively engage in research⁽¹⁹³⁾.

Focus group research is centred on people's perception which makes it subjective and not 'fact', therefore it is important for the researchers to provide a detailed account of the processes involved and decisions made to demonstrate rigor. To support this Meyrick has developed a framework for qualitative researchers⁽¹⁹⁵⁾ which provides an overview of how the research should be carried out as well as how researchers can demonstrate rigor in their studies. Firstly the aims and objectives need to be clear and establish why the use of focus groups is the best method to answer the research question. Also the researcher should be clear about how and why they chose and recruited their sample and how representative the sample was of the target population. The researchers should also be clear and provide detail about how data were collected and analysed, including how codes and themes were generated and conclusions drawn. It is especially important for the researcher to reflect on how conclusions were drawn, what may have influenced this (participants, the researcher, the setting etc.) and steps in place in order to reduce bias generated by the researchers preconceived ideas about what the findings will be e.g. by having two researchers independently code the transcripts. Qualitative research should be reported with transparency such that the reader can judge whether the processes used, decisions made and conclusions drawn were reasonable.

7.1.2 Choosing Participants

The aim of qualitative research is often to examine a complex topic and therefore it is imperative that the data from the discussions accurately represent the topic of interest which is partly down to selecting an appropriate sample⁽¹⁹⁵⁾. There should be clarity about to whom the findings can be generalised and therefore not to mislead the reader. In addition the analysis method will be sensitive to the quality of the raw data and as such the sampling should be rigorous to ensure the likelihood of collecting good quality data. The appropriateness of the sample is a major consideration in the planning of the project.

While it could seem that 'getting people together to chat' is a simple research method it does require careful planning and execution by the researcher. Time and effort should be put into choosing the participants. Participants should be chosen on the basis of whether they should be able to provide insight into the topic of interest⁽¹⁹⁶⁾. As some people find sharing experiences and personal opinions challenging it is recommended that groups be as homogenous as possible, for instance including people with similar age-range, education and social-class. There is some debate about whether it is appropriate, or even advantageous that participants know each other. Some researchers suggest that if participants know each other they may be more comfortable sharing personal opinions and also challenging one another, which can produce rich insights⁽¹⁹³⁾. However, others suggest that pre-existing relationships

within the groups may inhibit honest or spontaneous views, or it may cause group leadership and those who are not part of the existing relationship share less, especially if their view or experience conflicts that of those who know each other⁽¹⁹⁴⁾.

There are logistical considerations also. Participants should feel safe and comfortable during the focus group and therefore it is considered advantageous if the group can be held in surroundings familiar to the participants⁽¹⁹⁶⁾. Also, the researcher should think about whom the participants are and whether they may struggle to travel to a venue, and what sort of time they are most likely to be available and whether there are any measures that could be put in place by the researchers to make it easier for the participants to attend. For instance, my target group was mothers with young children and therefore I had to consider having crèche facilities.

7.1.3 Number and size of groups

In quantitative studies a sample size calculation is used to determine how many participants would be required to answer a particular question. However, as numbers and statistics cannot be applied to qualitative data it is up to the researcher to determine how many discussion groups are required. While some studies include as few as one, others have reported conducting over 50⁽¹⁹³⁾. The most common way of determining this is by assessing when the 'saturation point' has been reached. This means that the researchers feel that they are not gaining any new information from the groups⁽¹⁹⁴⁾. Assessing when the saturation point has been reached requires the researchers to commence analysis very early on in the data collection process, which is unconventional in quantitative studies. Commencing analysis early on the process, however, can also be feature of the analysis itself – if using an iterative approach, which will be discussed later in this chapter in section 7.1.5. Whilst continuing until the saturation point is reached is the optimal way of determining how many groups to hold there are also often resource limitations, in terms of finance, time and ability to recruit, which may cause the data collection to cease.

Another key issue to consider is how many participants to have in each group. Guidance on focus groups suggests that the optimum number is between six and ten participants⁽¹⁹⁶⁾. However, smaller groups can also be effective, especially if the participants are likely to be interested in the research topic as it gives group members more time to talk, and there are examples of groups which have been run with as few as three participants. Ultimately groups need to be big enough to obtain a variety of perspectives but not so big that they are uncontrollable or smaller groups of people break off into their own discussions⁽¹⁹⁶⁾.

7.1.4 Role of the researchers

Whilst it may seem that after the effort of planning and recruitment for focus groups the researcher just 'sits back' and lets the participants do the work in the discussions, but this is not the case. One key element to the success of focus groups is a skilled moderator. The role of the moderator is not to influence the answers or opinions in anyway but to guide the discussion, ask questions, listen and observe; therefore keeping the discussion around the research topic and increasing the chance that the data are true and representative⁽¹⁹⁶⁾. It is a skill to create an environment in which participants feel valued and not judged, especially if they are being asked to share their personal opinions and experiences. Thus it is important that the participants notice signals from the moderator that their opinions are respected. Characteristics of a good moderator often include: empathy, a friendly manner, and the ability to listen and think simultaneously. However the moderator must also possess the ability to make sure everyone's views are represented, which may involve sensitively requesting that more dominant participants refrain from talking for a little while or at the other end of the spectrum, encouraging quieter members to share more without making them feel singled out.

The moderator is not an interviewer. They should use the discussion route as a flexible guide to facilitate the discussion such to channel the discussion as opposed to forcing the group in one particular direction. It is particularly key that the moderator does not try to steer the conversation to fit with preconceived ideas of the findings but at the same time does not let the conversation swerve too far off topic⁽¹⁹⁷⁾.

Focus groups need to be preceded with some introduction and 'ground rules' however these should be as minimal as possible so as not to get the group used to the moderator telling them what to do⁽¹⁹⁶⁾. The open questions for discussion should be framed in an unelaborate way so as not to confuse the group, the participants should feel responsible for creating and carrying on the conversation. The moderator should also appreciate the use of pauses or prompts which can serve to further the discussion and provide additional opinions from group members.

Taking all of these points into consideration, it is recommended, therefore, that focus groups are attended by two researchers. The first, the moderator, to be concerned with the discussion group and the second, to be an observer, to concern themselves with the environment such as noise, heat and timings, refreshments, taking field notes about the group dynamic and moderator, and prompting the moderator with any areas they may feel require extra exploration either in the remainder of the current group or at a following one⁽¹⁹⁶⁾.

7.1.5 Analysing focus group data

Focus groups generate a large amount of data which can feel daunting when it comes to analysis⁽¹⁹³⁾. In addition, as previously mentioned, it is subjective and open to the interpretation of the researchers and careful steps need to be taken in order to ensure that the conclusions drawn were true reflections from the raw data and not the preconceived hypotheses of the researcher⁽¹⁹⁴⁾. It is worth noting however, that surveys are also exposed to subjectivity such that the researcher chooses what to include in a questionnaire which may prevent capture of other important data. To minimise potential bias, researchers must adopt a clear procedure for the analysis, which would permit another researcher to verify the findings. The aim of the analysis process is data reduction, by means of examining, categorising and recombining the evidence, in order to address the original purpose of the study. The analysis is driven by the original study purpose and thus this must be kept in mind at all times during the analysis process. This should help both make sense of the data and eradicate irrelevant information. Analysis should be true to the data and use illustrations of conversations between participants rather than pulling quotations out of context⁽¹⁹⁸⁾. This results in study findings which are able to be presented in an uncomplicated way and supported by quotations, which can be a powerful way of conveying information.

Thematic analysis is a common approach to focus groups analysis. This involves looking for patterns or 'themes' which emerge from the data. Themes identified can either be semantic (directly observable in the statements/conversations) or latent (implied in the conversation)⁽¹⁹⁹⁾. Often a mixture of the two types is used with the aim being to understand and interpret meanings of the ideas found within the data.

Researchers independently read and reread the transcripts while coding the data. Either whole segments of conversation can be coded, or individual statements. The code development can either be driven by theory, prior research or the data. At one end the theory-driven approach involves beginning with a theory and develops codes which are consistent with it. This is similar to codes being developed driven by prior research, which often results from a literature review. Both of these enable the researcher to support, extend or challenge previous findings⁽¹⁹⁹⁾. Codes which are driven by the data are derived inductively from the raw data and require the researcher to interpret the meaning from these new findings in order to construct their own theory. The challenge when deciding which approach to use is whether one wishes to explore new insights or test theory. Being usable for the analysis, interpretation and presentation of the research is a requirement of every thematic code and every theme should accurately reflect the raw information, not what the researchers think the theme should be⁽¹⁹⁸⁾. Therefore where previous theories and research are being used to drive

the analysis it is imperative that the researcher reflects on whether these actually represent the data in the most truthful and insightful way.

Although focus groups are audiotaped the recordings of the focus groups are transcribed verbatim for the analysis. This may cause information to be lost as tone of voice and emphasis on words or phrases cannot be conveyed in written text. However, as the data need to be reviewed repeatedly it is considerably easier to do this with written material. The researchers are required to read and reread and listen to each focus group allowing the information to be consciously and unconsciously processed⁽¹⁹⁸⁾. Following this the data begin to be separated into themes and coded under each theme. As part of the data reduction it is useful to begin to cut and paste similar quotes together to look for emerging patterns. The codes are applied to the data and emerging themes are noted. The researchers can begin to make sense of quotes and look for relationships between the quotes and the whole dataset. Researchers should consider both what is said as well as how often it is said and whether it is said across groups⁽¹⁹⁹⁾.

In order to ensure the reliability of the analysis researchers are encouraged to begin analysis independently and to have regular discussions as the analysis progresses. Themes and codes are discussed, expanded or collapsed following which the data are examined again and recoded where necessary. Researchers are also encouraged to step back and look at the 'bigger picture', and always to refer back to the main study question throughout the analysis process. If there are discrepancies between the researchers independent advice can be sought from another researcher⁽¹⁹⁸⁾. It is also suggested that another researcher applies codes and themes to the same data independently, from which interrater reliability can be calculated. This will provide an indication of the consistency of the coders. If the level of agreement for a code is low then the theme should be reviewed and reconstructed or dropped. A considerable amount of time is required for the analysis of focus group data and this must be considered when planning a study and considered in the time and budget allowances within the study⁽¹⁹⁹⁾.

Overall analysis of qualitative data of this kind requires imagination, time, patience and practice, especially by those who have traditionally used quantitative methods in their research training.

7.2 Methods

7.2.1 Piloting the focus groups

To ensure that the focus groups were well planned in the present study, an initial discussion guide was developed. This was then piloted informally with a group of three

female friends who all had young children under the age of 5. The pilot focus group was run in one of the women's homes and although it was informal, adopted the same format as the planned focus groups in Children's Centres. Working through this process allowed the researchers to assess the face validity of the discussion route, estimate timings and practise the format of the focus groups. The discussion guide was adapted using feedback from the women. The primary feedback was to simplify the questions by using plain English as the women felt that some of the language used was over complicated. For example: "What techniques do you use to try and get your children to eat foods you would like them to eat?" was amended to "What things do you do to try and get your children to eat foods you would like them to eat?" However, on the whole, the content of the questions was not changed. The ice breaker was also changed. The initial 'ice breaker' was to show a photo of the contents of different people's fridges and ask the mothers to reflect on what they saw e.g. were they similar to their own fridges? This ice breaker had been used in previous focus groups and had proved successful. However, the mothers taking part in the pilot stated that it made them feel uncomfortable as felt they were being asked to pass judgement on what was healthy and what was not. Therefore the icebreaker was changed when the focus groups took place in Children's Centres to a topical newspaper article on children's eating habits.

7.2.2 Procedure

Focus groups were held in Children's Centres, as we wanted to recruit mothers who used these services and to sample mothers from disadvantaged backgrounds. Managers of Sure Start Children's Centres in Southampton, Gosport and Havant were contacted to enquire whether, in principle, they would be happy to have a focus group run at their Children's Centre with mothers who attended their sessions. Focus groups were run in Children's Centres for two main reasons: 1) they are a useful way to access mothers with young children who are likely to come from more disadvantaged backgrounds and 2) we had already built relationships with the Children's Centre managers during the SIH intervention.

Meetings were arranged with managers to discuss how they felt the focus groups could run most successfully in their centre and, after discussing our target population, all agreed to recruit participants on our behalf. In total 20 managers across Southampton, Gosport and Havant were contacted from which five (three in Southampton, one in Gosport and one in Havant) agreed to have focus groups run in their Centres, however one in Southampton withdrew their offer after the manager left the Centre. At the two centres which agreed in Southampton, the focus group discussions were integrated into an existing parenting course that was being organised. In Gosport and Havant the managers suggested recruiting members from their parents' forum. In Southampton

the parenting group was visited by the focus group facilitator two weeks before the group was to be held to explain the process, hand out information sheets (Appendix I) and answer any questions. It was made clear that participation was voluntary and would not affect the rest of the parenting course they were attending. In Gosport and Havant managers gave the information sheet to potential participants and also explained that participation was voluntary.

Between February and April 2013 four focus group discussions were held, two in Southampton, one in Gosport and one in Havant. Focus groups were attended by two researchers, one facilitator who guided the discussions and one observer. At the beginning of the session the facilitator re-introduced the study, and asked if anyone had any questions. The facilitator made sure that everyone was aware and comfortable with the discussions being audiotaped and that all names would be changed when the tapes were transcribed to ensure anonymity, they were also reassured that the recordings would be destroyed following transcription. Consent forms and short demographic questionnaires (Appendix L) were filled out by each participant. Participants and researchers wore name badges and everyone introduced themselves. Before the commencement of the discussions, a set of 'rules' were read out to the groups (Appendix J). To begin discussions, a recent newspaper headline about children's fussy eating (Appendix K) was passed around and participants were asked to discuss what they thought about the headline, this was an ice-breaker to get everyone talking. Discussions were guided by a question route (Appendix M) which was based on themes from the literature review. This covered issues about barriers or enhancers to controlling children's diets, the mealtime environment, key influences on food decisions, and influences as a result of transitions and changes (e.g. going back to work). Ethics approval for this study was provided by University of Southampton Faculty of Medicine ethics committee (approval number 4284).

7.2.3 Participants

Participants were 27 mothers attending Sure Start Children Centre sessions. Nineteen participants took part as part of their attendance on a parenting skills course (9 in focus group 1 and 10 in focus group 2). The other 8 participants were members of the Children's Centre parents forum (5 in focus group 3 and 3 in focus group 4). The characteristics of the participants are displayed in Table 7.1. The average age of the participants was just under 30 years old. All participants were white, most wore UK size 16 clothing or above and most (70%) were educated to GCSE level or below. Most participants also had more than one child (74%), and all had at least one child between the ages of 2–5 years (data not shown).

Characteristic	
Age in years (mean(SD))	29.7 (5.3)
Educational attainment (N(%))	
- ≤GCSE	19 (70)
- >GCSE, <Degree	7 (26)
- ≥Degree	1 (4)
Clothing size* (N(%))	
- <16	10 (38)
- ≥16	16 (62)
Ethnicity (N(%))	
- White	27 (100)
Number of children (N(%))	
- 1	7 (26)
- 2	5 (18)
- 3+	15 (56)

Table 7.1 Characteristics of the 27 participants who took part in the focus group discussions

*One participant refused to provide clothing size information

7.2.4 Analysis

Thematic analysis of the data was undertaken following guidance from an expert in qualitative research and literature on qualitative analysis^(198;199). The audio-recordings of the discussions were transcribed verbatim. Transcripts were read and reread by two researchers (two transcripts each), who discussed the best approach to the data, bearing in mind the purpose of the study, which was to identify what mothers feel influence them when feeding their young children. Sub-sections of all transcripts were double-coded by both researchers to check interrater reliability.

Data were sorted into themes. We began by using the topics in the question route as overarching themes and coded data into sub-themes under these topics. We adopted a constant comparative method such that after two focus groups had been run we began to analyse these and amend the question route for the other groups if necessary. A coding frame (Appendix N) corresponding to the overarching themes was developed to allow for summarising and indexing the opinions expressed in each of the transcripts. Researchers met after each round of coding the transcripts to discuss themes and codes arising from the data. After the initial coding of the four transcripts and discussions among the researchers and with an expert in qualitative research, it became clear that the data fell more clearly under themes according to different levels of impact such as those depicted in ecological models, rather than those from the question route. Data was recoded under the new themes and sub-themes were identified. These themes and sub-themes were depicted in a thematic map⁽¹⁹⁹⁾. The thematic map depicts the way in which the themes and sub-themes identified in the

analysis may work together. It is created as the analysis develops and is a tool to guide the interpretation of the results, is not created *a priori* to guide the analysis. The final thematic map is displayed in Figure 7.1. The majority of data was coded under the 'Maternal' theme. Statements were used to illustrate the sub-themes. Discussions were also held with experts in qualitative research and discrepancies in the coding were discussed until a consensus was met. All researchers agreed with the final coding frame and thematic map.

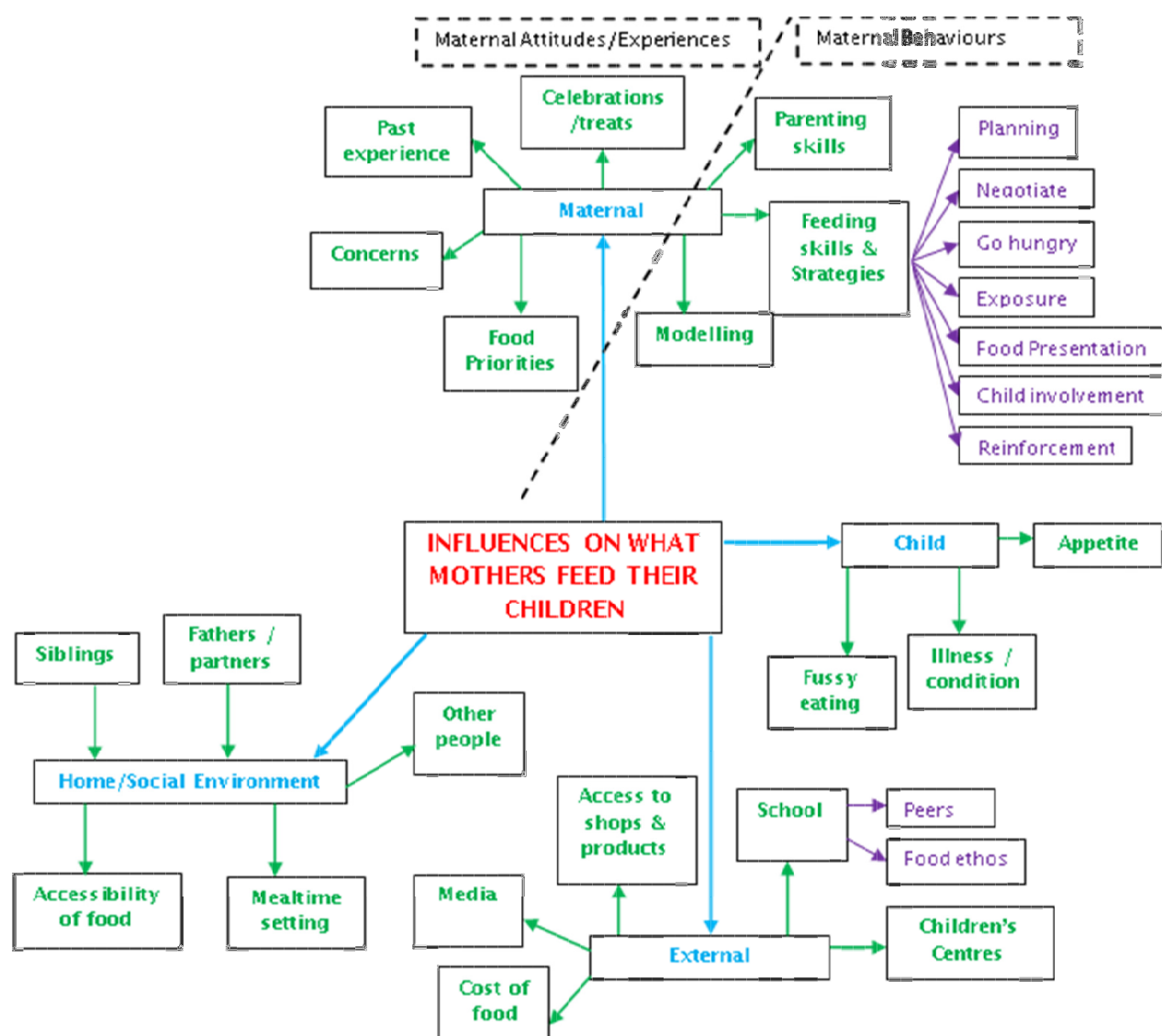


Figure 7.1 Thematic Map showing the themes and sub-themes from the focus group analysis

7.3 Results

From the discussions four main themes emerged: Child level influences, Maternal level influences, Home/social environment level influences, and External Environment level influences. Perhaps unsurprisingly the most prominent theme to emerge was related to mother's themselves which described attitudes and behaviours they had which they felt influenced what they fed their children. The following section will describe and interpret the findings under each main theme and use statements from the discussions to highlight the interpretation.

7.3.1 Child

Factors which were discussed at the child level included fussy eating, illness and child appetite.

In all the groups mothers discussed issues related to their child being a fussy eater. Some women stated that they would feed their children whatever they felt they would eat rather than continuing to expose their child to the rejected foods, suggesting that the children had control over what they were being fed rather than their mother.

“my um youngest stopped eating really and then I just, as long as I could get him to eat cereal and sandwich and that I was happy.” (FG1)

“You see something basic like a shepherds pie. With my lot, I've got two that won't eat mash so they have mince with boiled potatoes, I've got [Luke] who'll only eat pasta so he just has pasta any way. So technically the only person that really eats shepherds pie is me and my partner, so I cook a big thing like that and its just hopeless” (FG2)

“He will not touch it if he don't like it, and I don't think you can force him” (FG4)

Another issue which was discussed was the influence of illness or conditions of the child. Unsurprisingly the mothers who talked about their child's illnesses appeared worried about how it was affecting their child and their family mealtimes.

“my daughters got celiac disease... so she obviously has to have different food and different pans and different stuff” (FG1)

“Believe it or not he's only just turned two last month and he's starting to recognise that he can't eat it because it literally makes him violently ill...so he's

literally right on the edge of the table. I have to do that because if he reaches over and eats their dinner then he's really poorly..."(FG4)

The influence of child illnesses on their diet and the family mealtime environment were discussed but there were only conversations in two groups where there were a few mothers who had children with food related conditions.

Another influence at the child level that mothers discussed was child appetite. This was not discussed at length but discussions did arise in most of the groups. Mothers suggested that they would give their children more food if they appeared to have a 'large appetite'.

"You see [Lucy] would eat all day long if she could. She had two bits of toast this morning and we went to ASDA and she said 'I'm really hungry' cos she saw the restaurant, so we went in there and I got her two sausages and some beans and then we went home and she saying she's still hungry, she would carry on eating so I kinda said 'no that's enough now'" (FG2)

"She wants two dinners, she likes her food she's got a really big appetite, she likes her food but then again I like my food..." (FG1)

There were clearly some characteristics of the child which mothers felt influenced what they fed their children. Issues with picky or fussy eating were discussed at length. These are factors which are likely to be applicable to most children at some point whilst developing eating behaviours and some mothers found these situations challenging. This highlights some of the trials mothers face when feeding their families.

7.3.2 Maternal

Mothers discussed at length factors related to themselves which influenced what and how they fed their children. There were many sub-themes identified in the category of maternal influences and these were divided into two categories: 'attitudes and experiences' or 'behaviours'. Attitudes and experiences reflected mothers' beliefs about food for example, that certain food was a 'treat' and the priority they gave food. Some mothers suggested that they either did not have the time or were often too tired to cook, indicating a lack of priority given to food.

"It's a combination of quick and easy meals. No, I think as parents we haven't got time to stand in the kitchen for two hours preparing a meal, just so your child can say 'no I'm not eating that'" (FG1)

“I work for Burger King and my brother has to bring [Ian] down, my son down, to swap over on the shift, the night lot, and I must admit I am really lazy. I don’t want to go home and cook after working so what do I do? Nightmare. Nightmare” (FG3)

Unsurprisingly mothers also reflected on the experiences they had had as children, and how their parents fed them. For some they felt it was a positive experience, although not all of them felt that they were able to recreate these positive experiences for their own families.

“no cos I always used to have proper meals when we was younger and I don’t do that with my lot, I tried, but um then someone didn’t like this or someone didn’t like that. You can’t just do a one pot meal when you’ve got loads of picky eaters” (FG2)

Others reflected on their previous experiences of food as being negative and therefore indicated that they did not want to repeat the behaviours of their parents.

“Yeah cos food was used as a punishment against me when I was a kid, I’d never, my whole thing with food is different” (FG1)

“Yeah my mum used to make me eat things I hated when I was a kid and it just scared me a little bit” (FG2)

As suggested in psychological theories of behaviour, a person’s past experiences are likely to influence current beliefs and behaviours⁽²⁰⁰⁾.

Mothers also discussed using food as a treat, which their children were allowed on certain days or special occasions.

“Cos you do treat them with food, we’ll go out for something to eat. What else can you do?” (FG1)

“Mine on a Saturday, they can have what they want on a Saturday” (FG4)

The majority of subthemes that were coded in the category of maternal influences were described as ‘behaviours’. Mothers reflected on what strategies they used to encourage their children to eat foods they wanted them to eat and identified a number of food practices. These included overt methods including telling the child they would go

hungry if they did not eat their dinner, negotiating with their children so that they agreed to 'just a few more mouthfuls', or rewarding their child with an undesirable food if they ate certain desirable foods.

"If you don't eat it then you're not getting anything else', and three hours down the line she'll be like 'oh mummy I'm hungry'. Well, 'you should've eaten your dinner, you're not having anything else'" (FG2)

"If he doesn't eat it then he doesn't have anything else to eat" (FG3)

"See pudding is used as a bribery tool in our house. If they don't eat it they don't get pudding, and they will sit and watch the others have pudding if they haven't eaten all of it" (FG1)

Other strategies were more covert in their style, although there were fewer statements regarding these types of control techniques. These included controlling their child's exposure to food, by either increasing exposure to desirable food, by hiding it in the food, or limiting exposure to less desirable foods.

"If I don't want them to have it I just won't buy it" (FG2)

"but I am trying to stay away and not go down to Stoves Café and things like that. He has peas or baked beans from the chippie on his plate rather than Burger King" (FG3)

Mothers also recognised that their own behaviours may influence their children's preferences that children are likely to model the behaviours they observe in others.

"Yeah I think your eating habits do rub off on your children. Like my obsession with sweets is no good, I spend like £25 a week on sweets which makes them obsessed with sweets" (FG1)

"So I have to eat healthily if I want them to eat healthily" (FG4)

Practical food skills were also talked about, such as cooking skills and knowing what a balanced diet entailed. Most conversations suggested that mothers had an understanding of some public health messages, such as the '5-a-day' message, however, some mothers expressed that trying to follow recommendations was stressful and there was some misunderstanding about some foods.

“Because it’s semi-skimmed organic milk, I thought that’s the best one but no, that’s the worst really ...” (FG4)

“They say they should have 5 a day and I make sure mine have 3 everyday, that’s the only thing I do” (FG2)

“...Oh you know, Great Britain it’s like risk of obesity. You’ve got these kids who are obese there, and then adults who are obese there, and it’s like, do you feed your kids right, do you not feed your kids right? It’s like, jeez, you know, it’s just so much stress and strain.” (FG3)

Finally mothers indicated that their own parenting skills may have a part to play. Many spoke about stressful eating situations due to their children’s behaviour and seemed unable to control it.

“the thing is when you’ve got loads of challenging behaviours the food one really becomes the bottom of the chain. As long as they eat you really give up on the whole fighting with the food. You think right, as long as my child is eating, cos I mean in my house I’ve got children that attack each other, um disrespectful, trash the home, so really one more fight about food, I’m not up for it” (FG1)

“Because, well, I find it very hard to, you know, time and time every mealtime if you have a big to do and a big thing that she will push her plate away and she will have a real tantrum that she won’t eat it. And that really, after a while it gets, well it did to me...”(FG3)

A large number of the discussions were focused on maternal factors, in how they shape their children’s diets, indicating a number of maternal attitudes and behaviours around food which seemed important.

7.3.3 Home and Social Environment

The level of influence on children’s diets extended to discussions about the home and social environment of the child. This related to both the physical environment including the mealtime setting and child’s access to food, and the social environment including exposure to other people around them such as fathers, siblings and grandparents.

Mothers spoke about the physical mealtime environment. Many talked about the challenges of sitting together to eat their meals. For some the issue was a lack of space for a table, for others it was due to the temperaments of the children.

“it’s alright if you’ve got the room for a table, I ain’t got the room for a table. I ain’t got room to swing a cat in mine.” (FG1)

“Well for [Poppy], I’ve got a little bit of table where the telly is and she sits on a chair there. She asks for that cos when she goes to her Dads they’ve got a table there so they sit at the table.” (FG2)

“My son’s in a high chair and the telly’s on, because we haven’t got a dining room, it’s a bedroom. So yeah, that’s hard” (FG3)

“Um and they’re kicking and hitting and that, I do try and get them to eat together, but, yeah, its normally just too much stress to even think about it so I try to just get them to sit down and eat” (FG1)

Many of the mothers also spoke about how important the family mealtime was to them. There were some mothers who apparently insisted that their children sat at a table with the family to eat their meals and others, who did not have a table, who wished for one. This indicated that the idea of family mealtimes was considered important and something to aspire to.

“I’d give anything for a table a nice table where we can all sit as a family” (FG1)

“They are all sat at the table and they eat their dinner. But it’s like a rush to see who’s first to finish...But we all sit down. My partner doesn’t finish work until late so it’s generally me with them sitting down. It’s not too bad with us.” (FG3)

“Telly off, up table. A little buffet...you talk about what you’ve done that day” (FG4)

There were a few mothers, however, who stated they used the television as a way of getting their children to sit and eat and seemed to manipulate the mealtime environment in order to reduce the risk of conflict.

“...They want to watch TV so you put something on, or if the TV is on, put on something that none of them watch. None of us like the news, we’d never watch it. So just stick that on so it’s on in the background. We’ll just stick the news on so it’s not distracting Jake from eating...” (FG4)

“We have the telly on but my little ones always at a table...do you know what, it’s the only one time in my day where everything’s calm, it’s the only time in my day where everyone is just being quiet if they’re sat in front of the TV” (FG2)

There was also discussion about managing exposure of children to desirable or undesirable food within the home environment. Some mothers mentioned that the child’s access to food in the house was an issue. They spoke about their children being allowed to ‘help themselves’ to the food in the cupboards and fridge. Whereas others had measures in place to attempt to control their children from helping themselves to foods they didn’t want them to have.

“Yeah [Sam] eats plain bread he just goes and help himself, I saw him the other day he had six slices of plain bread and he’s eaten it all” (FG1)

“I hide it in a top cupboard so when she’s in bed I can eat it” (FG2)

“I’ve got a treat cupboard in my house but I’ve got one of those kid lock things on it so they can’t get in there... the crisps, the biscuits, everything’s in that cupboard and the kids lock is on it” (FG4)

The child’s social environment was also discussed. Some mothers felt that other people such as fathers or siblings had a negative influence on their child’s diet, whereas others suggested that the influence was positive.

“It just drives me nuts, it’s obviously hard to maintain that cos she goes to her dads and then he will fill her up on as much crap as he can” (FG1)

“My mum’s terrible. She’ll give him chocolate biscuits and all that just before I’ve served dinner, chocolate biscuits. And then he won’t have his dinner because he’s full up on biscuits” (FG3)

“I also think if children get together, either cousins or friends, I think they tend to try more as well, eat more.” (FG4)

Children will always be exposed to other people. Other people in the home such as siblings or fathers are likely to influence children’s eating situations.

7.3.4 External Environment

The final theme identified was the external environment. Mothers discussed many factors at this macro-level which they felt influenced their children’s quality of diet.

The roles of childcare settings, including schools and children's centres, were discussed. The influence of peer modelling in both of these settings was spoken about in both a positive and negative light.

"Just in terms of the nursery here, where my daughter goes twice a week, they always tell me how well she's eaten and that she's been eating sweetcorn and allsorts which she won't touch at home. So I guess maybe its sitting at the table with lots of other children is a good thing for her" (FG3)

"I must admit, my daughter, since being in junior school she tends to want to eat what her best friends eating, so she keeps coming home like 'I want crackers for lunch' or 'I don't want sandwiches anymore, I don't like bread' yet at the weekend she'll eat bread so yeah a lot of it is influenced by friends" (FG2)

In terms of the food provided in schools mothers were divided between believing that either the meals were too unfamiliar or thinking that they did not go far enough with providing healthy choices.

"A sausage and three bean casserole was on the school menu today I mean what normal kid is gonna think 'yeah I wanna eat that' they're not are they?" (FG2)

"But the veg at schools, I think they don't do a variety. I know they're on a budget but the children – especially for the children that get that free meal. I know Jamie Oliver's done it but there should be more veg" (FG4)

In contrast to how mothers spoke about schools, the conversations about their experience of Children's Centres in supporting healthy eating was all positive. However, this was unsurprising because of the sampling method used. Mothers also spoke about attending courses run by the Children's Centres, many of these were cooking courses which they felt were useful and provided examples of dishes they'd learned to cook.

"They do like a healthy eating thing to like show you how to cook"

"Yeah we made um spag bol with chilli last week" (FG1)

"I did the cooking for baby and the cooking for toddlers, it was done by a nutritionist so them ones were particularly good for me, because of my son...I got a really good one from the cooking on a budget which was the cheesy courgette bake" (FG4)

Although mothers spoke about how useful the cooking courses had been they suggested that other things they had learned at Children's Centres were not always able to be put into practice at home.

"We use the Centres in the early years, and it's all well and good when you're there learning it, but when you get home, in that situation, like at that moment, I'm not gonna think 'oh I know let me get your wall chart out' cos it's just like you said, its picking another battle" (FG2)

"...She [a nursery nurse] said to me how important it is to be sat at a table, cos I used to be on the sofa, and one would be in one high chair and the other in the other. So I went out and bought a new table and, I don't sit there with them, but the boys will always sit up at the table" (FG1)

Children's Centres provide support for families with young children and although it is not their primary focus, healthy eating seemed to be in the agenda of the Centres. These mothers all suggested that their experience of using the Centres was positive, especially in terms of the courses they attended and the food environments provided for their children. Although there was some suggestion that it was not always easy to incorporate what had been learned during the sessions into situations at home.

Mothers also spoke about the influence of the media and using it to get information on food and health. There was a particularly interesting discussion about receiving mixed messages.

"tell you what have you seen that advert where they're eating pizza and they pour the fat out of the pizza, I haven't, well I had a pizza Sunday, but that's changed my life that has..." (FG1)

"the sugar thing they do a cup of sugar and that put me off"

"But like the sugar free stuff, the sweetener and apparently is supposed to bring on MS symptoms"

"Yeah, which is worse than the sugar"

"why do slimming world and weight watchers advertise the fact that you can have diet coke for free when it makes you ill?"

"Yeah like that woman said to me you're better off giving her real sugar than what you are sweetener"

"its natural product ain't it"

Facilitator “so how do you pick you way through all these different messages then if you’re trying to decide what your children can eat?”

“I end up ignoring them” (FG1)

Messages reported in the media can often be misconstrued or conflicting, which can lead to distrust of the messages and ultimately a disregard for them.

One aspect of the external environment which was discussed at length was the cost of food. This issue was discussed in each group and sparked debate. Some mothers felt it was more expensive to buy healthy than unhealthier foods, whereas some mothers argued that healthier foods weren’t very expensive.

“It is really hard if you’ve got a family of six where things are tight at the moment as well, a lot of it is just, ‘forget the fruit and veg because its dear, let’s go for this instead’” (FG3)

“Healthy food is just expensive” (FG1)

“You can get four Bountys for a quid”

“Come on its like £1 for carrots, a £1 for everything £1, you go in Lidl everythings 39p” (FG2)

The discussions indicated that the issue wasn’t just price related but that they were concerned about wasting fresh foods and the price relative to the energy content of the food.

“for what you pay for 6 apples you get 12 packs of crisps and them crisps are gonna fill the kids up more than them 6 apples” (FG2)

Conversations also addressed the issue of the accessibility of shops and products. Mothers complained that undesirable foods seemed strategically placed so that they appeal to and are noticed by their children.

“All the chocolate bars at the tills, yeah, no matter where you go there’s chocolate or crisps everywhere” (FG3)

“Yeah I can’t get my shopping home you know it’s that as well...” (FG2)

“Yeah right opposite the school because as soon as the kids come out of school they’re screaming for the shop so yeah I think that’s a ridiculous idea” (FG4)

It is accepted by most researchers that the wider environment to which one is exposed have the potential to influence behaviour; however there is still debate about whether it is the individual or the environment which most influences choices.

7.4 Discussion

7.4.1 Summary of findings

The aim of these focus groups was to explore what mothers, primarily from disadvantaged backgrounds, felt most influenced them when making food decisions for their children.

The majority of discussions focused on influences of the mothers themselves. While there were many strategies discussed that mothers used to try to control their children's diets, mothers indicated that mealtimes were particularly stressful and as a result healthy eating was not always as great a priority as reducing conflict and making sure that their children were eating something. Related to this, children's temperament and fussy eating added to the stress of mealtimes and some mothers seemed unable to control these situations, reflected in the conversations about cooking many meals or avoiding certain foods in response to their child's behaviour. The stressful home and mealtime environment also meant that mothers did not always feel able to incorporate skills that they had learned at the Children's Centres, to support healthy eating, into situations at home. Mothers seemed aware of the effects of modelling behaviour to their children, and that their children's food preferences were likely to mirror their own, however that knowledge did not necessarily indicate change in their own behaviour. In addition, in conversations about the mealtime environment mothers spoke about factors which influenced the environment rather than considering how the mealtime environment influenced their child's diet.

Cost of food was also a recurrent theme, although this could reflect a mother's food priorities. There were some mothers who argued that healthier foods could be bought as cheaply as less healthy food. However, it was clear that some mothers considered price in terms of energy content of the food rather than considering direct price comparisons. Mothers also were concerned about wasting food and therefore did not want to buy foods that they did not think their children would eat. This also could indicate mother's lack of feeling in control, where their children's preferences dictate what food is bought.

Food provided and the food environments at school and in Children's Centres were considered to influence children's quality of diet. Some mothers felt that schools weren't doing enough to promote healthy eating. Peer influence in both these settings

was considered as both a positive and negative influence on children's eating behaviours.

There was also some discussion about the media and how mothers had received some public health messages, some had been misconstrued and the feeling of receiving mixed messages led to some mothers disregarding them.

7.4.2 Comparisons with the literature

The results clearly indicated that influences of the child and mothers interact. This also seemed to relate to how mothers manage their child's mealtime environment. Fussy eating was a topic discussed in all the groups and clearly influenced some children's diets. However, as discussed in section 5.4.3 it is suggested that fussy eating, or food neophobia, is innate⁽⁹⁹⁾ and all children are likely to express some fussy eating behaviours during their development of eating habits. The way that mothers respond to their child's neophobic behaviour, however, could be a useful element of future interventions as fussy eating is clearly an important issue which concerns mothers and which most are likely to experience when their children are establishing eating behaviours. Related to this, mealtimes seemed particularly stressful for many mothers. Research suggests that mothers with lower levels of education have lower levels of sense of control over their lives⁽¹²⁴⁾. This was highlighted in many of the mothers who took part in these focus groups. Children's challenging behaviours were discussed at length but it was indicated that feeding situations were changed in response to children's behaviour, such as mothers preparing many different meals.

Many mothers discussed that mealtimes felt particularly stressful. Children's fussy eating tendencies have been reported to be associated with more stressful mealtime situations in other research^(201;202). Whilst children's picky eating has been reported as a barrier to family mealtimes in mothers with higher and lower levels of educational attainment, previous research suggests that mothers of lower socioeconomic status may have less confidence in their ability to facilitate such situations which could add to the stress these mothers feel is created in these situations⁽²⁰³⁾. This suggests that effective targets for intervention may not always be directly food-related and supporting mothers in their parenting skills may make them feel more able to control their child's challenging behaviours which may extend to those around food and mealtimes.

Feeding strategies which reflected overt styles of control were also discussed at length suggesting that mothers were using specific techniques to influence their children's diets. However, research on mealtime conflict has suggested that these control techniques, such as restriction of undesirable foods are associated with more negative interactions at mealtimes. One study described mealtime interactions and maternal

psychological distress in families with overweight and normal weight children. The study found that negative mealtime interactions were more common in families with an overweight child, and also that higher levels of mealtime conflict was associated with higher levels of control at mealtimes and higher levels of maternal distress⁽²⁰⁴⁾.

However, the cross-sectional nature of this study means that causality cannot be determined. Other research has also shown that these types of control techniques, such as restriction of unhealthy foods or rewarding consumption of healthy foods with less healthy foods, can lead to children's higher preoccupation and preference for the less healthy food^(205;206) which is likely to contradict the purpose of using the control strategy.

Research has also shown that conflicts and negative interactions at mealtimes are associated with families avoiding eating meals together⁽²⁰⁷⁾. Mothers in the focus groups discussed that family mealtimes were not always possible due to children's unruly behaviour, however, research has also shown that role modelling of healthy eating behaviours by mothers increases children's healthy food behaviours and less fussy eating tendencies⁽²⁰⁸⁾, which could in turn reduce the perceived stress at mealtimes. The effects of modelling were discussed in the focus groups, with some mothers recognising that their child ate things that they normally rejected when they witnessed other children eating it at the Children Centres or in School. Some mothers did also mention modelling effects within the home. The extent of the influence of modelling on eating habits is not always recognised by individuals and is discussed in research on 'mindless eating'. Mindless eating refers to factors which influences what, or how much, someone eats that they are either unaware of (e.g. the size of the plate one eats from) or that they do not think influences them (advertisements for food products)⁽²⁰⁹⁾. The literature on mindless eating suggests that people may not be aware of the effects that the environments in which food is consumed can have on consumption behaviour⁽²⁰⁹⁾.

In addition, it was suggested in the focus groups that encouraging their children to eat healthy food was not as high a priority for mothers as reducing stress at mealtimes. In our previous work describing analysis of the SIH women's baseline survey (n=1022), lower food involvement (an assessment of the priority one gives to food) was shown to be associated with lower levels of well-being⁽¹⁶⁹⁾. In separate research, higher levels of negative affect (lower well-being) have in turn, been associated with higher perceived levels of stress⁽²¹⁰⁾. Therefore it is possible that a combination of stress and negative affect in these mothers is associated with placing food further down on their list of priorities.

There were some mothers who discussed using feeding strategies which represented covert style control, such as not purchasing undesirable foods or not taking their child to certain food outlets. This style of controlling a child's diet through managing their food environment has consistently been shown to be associated with better quality diets in children^(90;105). However, the discussions in the focus groups about covert control techniques were rare. A previous study which profiled mothers who used different types of control found that those with lower levels of education used less covert control⁽⁹⁰⁾. In addition, Chapter 5 of this thesis described findings which showed that mothers who had lower levels of sense of control, self-efficacy, food priorities and well-being were also less likely to used covert control techniques.

Mothers spoke of the food provision and environments at schools and children's centres as having an influence on their children's eating behaviours. These childcare settings have been raised in other qualitative studies assessing mother's perceptions of influences on children's quality of diet⁽²¹¹⁾. These findings mirror ours in that some mothers felt that peer influence was positive and others that it was negative. A novel finding of the focus groups carried out in our study was mothers perceptions of the usefulness of the skills learned through courses run at the Children's Centres. Mothers spoke positively about their experiences of attending courses run at the Children's Centres. However, some expressed that they were unable to incorporate what they had learned into their lives at home, especially during challenging or stressful situations. This not only suggests that it could be useful for these courses to include encouragement for mothers to reflect how they may be able to use these skills at home. It also points back to the notion that if mothers felt more able to facilitate stressful situations and reduce conflict at home then this may enhance the use of the skills learned in these courses.

Conversations suggested that mothers had an awareness of media influence. However, mothers felt that they sometimes received mixed messages which led to their disregard or misunderstanding of messages. Previous research carried out with disadvantaged mothers of young children also reported that mothers felt that health messages were mixed and therefore confusing⁽²¹²⁾. Influences from television advertising has been considered in the literature on 'mindless eating' which suggests that most people do not believe that they influence their food decisions⁽²⁰⁹⁾. However, television adverts were discussed and some mothers indicated that they were aware that they had the potential to influence their food choices.

Some mothers also recognised that the location of the shops has an influence on their acquisition of food, and therefore what they feed their young children. Some mothers recognised that the locality of shops near schools was an issue in terms of their

children requesting sweets as they left school. Banning outlets which sell undesirable food from being in close proximity of schools has been suggested as a possible intervention by researchers who have explored the food environments around schools⁽²¹³⁾. However, this could also reflect issues related to control. As previously discussed, mothers who feel less in control over their lives in general are less likely to use more covert strategies to control their children's diets which includes avoiding shops which sell unhealthy food.

The conversations about cost of food were not surprising. In other focus groups which have explored food choice, the price of food and its effects on what women bought for their families was identified as a recurrent theme⁽²¹¹⁾. The price of food clearly influences a mother's food choices, and as discussed in section 2.1.3 studies have shown that eating a better quality of diet is associated with spending more money on food^(54;55). However, the issue of the cost of food may actually reflect food priorities of mothers as some mothers from disadvantaged backgrounds do manage to feed their child a good quality diet⁽²¹⁴⁾. Some mothers in the focus groups argued that cost shouldn't be a barrier to healthy eating, suggesting that those who place a higher priority on food are able to budget for it.

7.4.3 Strengths and limitations of focus group discussions

This type of study is not without limitations. Focus groups discussions rely on participants reported beliefs and behaviours which may contrast with their actual experiences. Participants were aware that the focus groups were being moderated by a researcher interested in nutrition and therefore some of the conversations may have reflected what mothers think they should be doing rather than what they do in practice. In addition, focus group data consist of individual's perceptions of their lives which may not always reflect reality. However it has been argued that these explanations and perceptions are key to understanding behaviour⁽¹⁹³⁾. Related to this, as the analysis of focus group data were conducted at a group, rather than individual level, views may sometimes be misrepresented or weighted disproportionately. However, reflecting with the other researcher after each of the groups and double coding some of the data should have minimised any potential misrepresentation of the research findings⁽¹³³⁾.

We only had the capacity to run four focus groups and it is possible that if more focus groups were run then more important themes could have emerged. However, most of the subthemes identified were common in all discussion groups and therefore it was considered that enough focus groups had been run to reach saturation on this topic. In addition, the number of participants in some of the groups was fewer than desired, however, the discussions were lively and all parents were actively engaged. The

moderator ensured that quieter members of the group had the opportunity to contribute; this was more of a challenge in the largest group which contained ten participants. In the larger groups in Southampton many participants already knew each other which was both a strength and a limitation. The strength being that they already felt comfortable with each other and were able to prompt each other to reflect on certain experiences. However, it did lead to some small group conversations and these participants were more vocal than others.

As this study only reflected the views of mothers accessing four Children's Centres in Hampshire it may not be representative of all families with young children. It was anticipated that recruiting from Children's Centres would increase the likelihood of mothers with lower levels of education taking part in the focus groups. Also the recruitment procedures differed between Children's Centres in Southampton and Gosport and thus may have provided a different mix of mothers and opinions. This may have biased the nature of the parents invited to participate in the focus group discussions. However similar experiences and themes were identified across all the focus groups which suggested that there were common issues for parents feeding their children, regardless of their recruitment.

A particular strength of this study was the ability to engage mothers of young children with lower levels of education in focus groups to explore their views and perceptions of what most influences them when making food decisions for their young children. To our knowledge this is the first study to have used focus groups discussions to explore influences on the diets of young children with mothers attending Children's Centres and who predominately had lower levels of educational attainment.

7.5 Conclusion

This study adds to the limited body of literature describing qualitative explorations of influences on the diets of young children. Mothers in this study identified influences from different levels but the majority of discussion described influences from the mothers themselves, and related to this was how they responded to their child's behaviours and how they manage their child's home and mealtime food environments. Influences from the external environment were also discussed, although many of these could be subsumed into how mothers respond to these environmental influences. It is clearly important to consider the influence of the external environment, including cost of food, childcare settings and location of food outlets, when designing future interventions to improve quality of diet in young children. However, it is possible that without supporting mothers to change their attitudes and behaviours around food then manipulating their environment may not be an effective intervention on its own.

Results from this study suggest that intervention to improve the diet quality of young children should be focused in the home and in particular the child's mother, although the levers for intervention may not be directly food-related. These results also suggest that interventions which are focused at the household level and involve other family members may be more effective.

The next chapter will be the final chapter of this thesis and will bring together results from Chapters 5, 6 and 7, to discuss how these results address the original research questions set out at the beginning of this thesis. In addition it will discuss how these results could be used to design a new intervention aimed at improving the diets of young children.

8 Discussion

This chapter aims to bring together the key findings from this work, to discuss them in reference to current literature and consider how these findings address gaps in the evidence. This chapter will also discuss the strengths and limitations of this project.

8.1 Addressing the research questions

This thesis set out to address two research questions in order to develop our knowledge about the influences on UK preschool children's quality of diet. This section will discuss how the results described in the thesis addressed the research questions.

8.1.1 Research question one

Research question one: How do maternal, child and mealtime environmental characteristics interrelate to influence preschool children's quality of diet?

This question was formulated following the literature review which determined that there is a wealth of literature that examines influences of young children's diets but that many of these studies have reported only a few determinants which were often only focused within one domain (e.g. just the child or just the home environment) and do not consider how they may interact.

Chapter 5 showed that maternal, child and home/mealtime environmental factors were often correlated with one another. A principal components analysis was used to determine the most important patterns in the data, in as far as they explained the most variance. The first component, the 'empowered mother' component, demonstrated that a pattern of interrelated maternal psychological and mealtime environment characteristics explained the most variance in the data. The second component, the 'neophobic child' component, described factors which relate to child's fussy eating (neophobia), mealtime conflict and maternal feeding strategies to explain the most variance in the remaining data. These patterns begin to explain how these variables relate to one another, which addresses the first part of the research question.

When the component scores were used to predict children's prudent diet scores we observed that the first pattern was an independent predictor of quality of diet, whereas the second pattern was not associated with children's quality of diet. The next part of the analysis therefore focused on maternal psychological characteristics, as these were key to the first component. A cluster analysis was performed on the maternal psychological characteristics which divided the mothers into two distinct clusters. The first was made up of mothers who tended to feel more in control of their lives, had more self-efficacy for overcoming adversity in general and in particular barriers to

eating a healthy diet, felt food was more important in their lives and generally reported a higher sense of well-being. The opposite was true for those in the second cluster. These clusters were termed 'more resilient' and 'less resilient' respectively. As expected from the principal components analysis, the mothers in these clusters managed their children's mealtime environments differently, with those in the more resilient cluster using more covert feeding strategies, insisting their child sat at a table to eat their meals more often, gave their children take-away food less often and limited the hours their child spent watching television, when compared to mothers in the less resilient cluster. In addition mothers in the more resilient cluster were more likely to report their home as being food secure.

A multiple regression model predicting children's prudent diet scores showed that although maternal cluster membership, covert feeding strategies and mealtime environments relate to one another they are independently related to children's quality of diet. This suggests that targeting just one of these factors in an intervention may not be as effective as recognising that many of them are interrelated. The findings of this thesis suggest that supporting mothers to feel more in control of life, more self-efficacious and raising the priority they give to food will be an important part of future strategies to improve the diets of young children. These changes need to take place alongside encouraging the use of covert style feeding strategies and to sit their children at a table for meals rather than in front of the television. A broader intervention would be expected to have a greater influence on children's quality of diet than focusing on just one of these factors. The findings from Chapter five are depicted in the model in Figure 8.1 which shows the hypothesised directions of influence between cluster membership, covert feeding and children's physical mealtime environment, and between these factors and children's quality of diet.

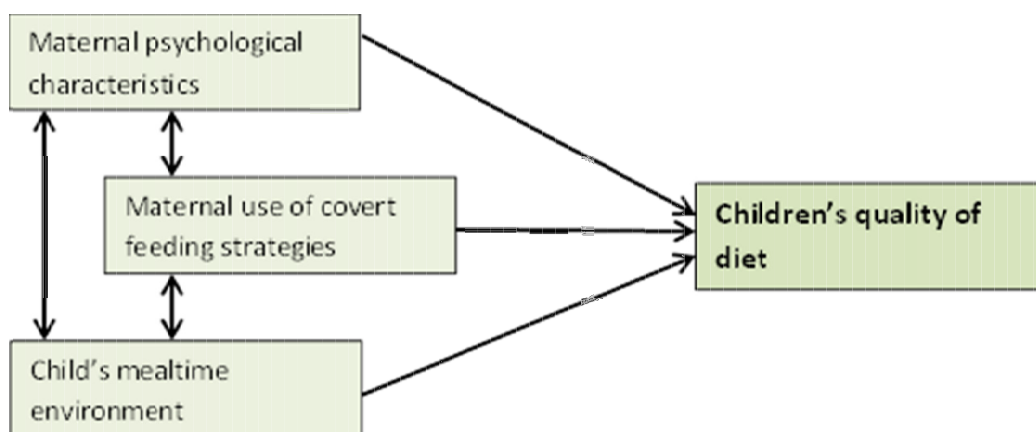


Figure 8.1 Model depicting the key findings from Chapter 5

The results from Chapter 6 expanded on this by showing that maternal cluster membership, covert feeding strategies and children eating while sitting at a table at

baseline were also associated with better quality children's diets at two year follow-up. Although overall children's quality of diet declined over the two year period of follow-up, the model indicated that these characteristics remained protective, with these children maintaining diets of better quality two years later. In addition Chapter 6 showed that, independently of these characteristics the decline in children's quality of diet was more marked in children whose mothers had lower levels of education. Inequalities in health linked to differences in educational attainment are widely recognised. This study provides evidence that they also contribute to sizeable differences in children's quality of diet. This should be considered in terms of mothers at whom future interventions could be targeted. The next phase of the research was conducted to find out more about the complexity of interrelationships between determinants of young children's diet quality, but following on from the findings of Chapter 6, focused on mothers with lower levels of education.

Results from Chapter 7 provide some context that helps explain the way these factors operate on the diets of children of mothers with lower educational attainment. Mothers took part in focus groups to explore their perceptions of what influences them in terms of how and what they feed their young children. Many of the discussions indicated that mealtimes were a particularly challenging and stressful part of family life. These discussions highlighted that child's temperament and fussy eating behaviours, as well as conflict, added to the challenge of mealtimes. Mothers felt they lacked control over situations indicated by the fact that they would cook many meals or change the mealtime environment to reduce conflict, rather than feeling as though they could cope with the situation. In addition they suggested that nutrition was a lower priority than reducing stress at mealtimes. The focus group data help to explain the results in Chapters 5 and 6 because they demonstrate the way in which child characteristics interact with those of the mother and the mealtime environment to influence children's quality of diet. The focus on children's challenging behaviour which came from these discussions was surprising and interesting as the child neophobia component was a less important pattern, in terms of variance explained in the PCA (Chapter 5), than was the component describing maternal characteristics. This could be due to differences in the social backgrounds of the women who took part in the focus groups. However, central to the influences of the physical mealtime environment, child neophobia, feeding strategies, and conflict (the emotional environment at mealtimes) are the mother's psychological characteristics. Figure 8.2 builds on the previous model (Figure 8.1) by also considering the role of child characteristics and the emotional climate at mealtimes. The challenge arises when considering the causal role of these influences, as it is likely that many of the associations are bi-directional and therefore interventions should consider how to target all of these.

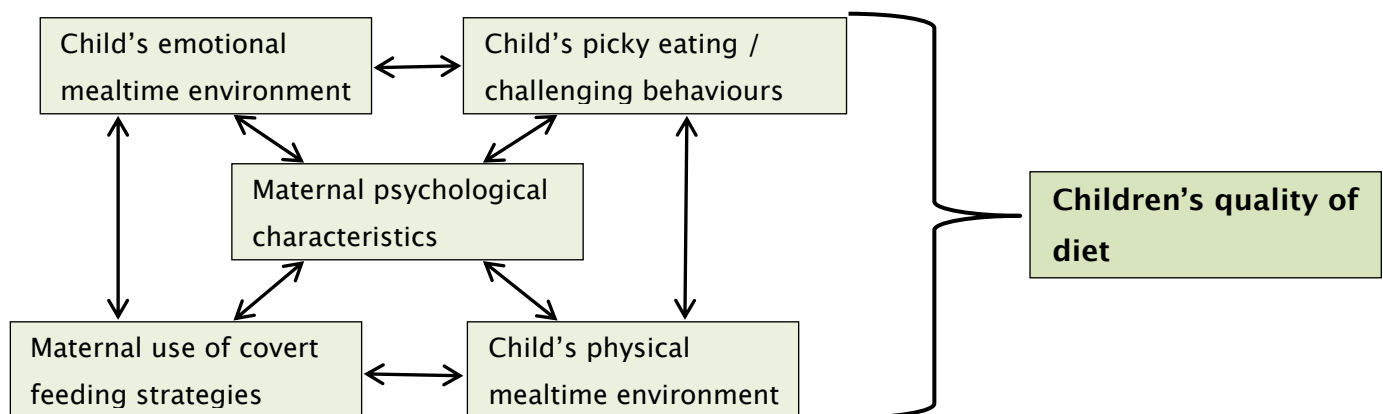


Figure 8.2: Model building on 8.1 which includes the additional factors identified in the focus group discussions

8.1.2 Research question two

Research question two: Does an intervention aimed at improving the diets and lifestyles of women impact on their preschool children's quality of diet?

The literature review in Chapter 2 concluded that of all the influences on children's quality of diet, mother's quality of diet appears to be of particular importance. It was hypothesised, therefore, that an intervention to improve the diets and lifestyles of mothers could lead also to an improvement of their children's quality of diet. Chapter 6 evaluated the influence of the Southampton Initiative for Health (SIH) intervention on levels of maternal sense of control and quality of diet and child quality of diet in a sub-sample of 228 mother-child pairs. The analysis showed that there had been no differential improvements in any of the outcomes in the intervention and control groups. Surprisingly, diet quality fell reduced over the two year intervention period in control and intervention groups; the same was found for changes in maternal diet quality over the same time. The reasons for the lack of significant results are discussed in section 6.4.2. One particular issue with this intervention was that it was relatively diffuse and that exposure of mothers to the intervention could not therefore be guaranteed. The study may also have needed to be larger and have a longer follow-up period.

Research Question 2 was therefore unable to be answered in this project. It is possible that an intervention which improves mothers' diet and lifestyle will impact on the diet of their children, however, the SIH intervention did not improve the diets of the sub-sample of mothers in this project and therefore we were unable to assess whether improvements led to a change in children's diets. The lessons learned from the SIH

intervention study will be considered in conjunction with the results from Chapters 5, 6 and 7, in order to identify possible levers for change, to be part of future interventions.

8.2 Limitations of this project

Using questionnaires to collect data has its limitations. All the data were self-reported which could bias the results. Mothers may be particularly sensitive to feeling judged when reporting their behaviours, particularly concerning their children, and therefore maybe more inclined to answer questions indicating how they want to be perceived rather than how they actually behave. However the questionnaires were administered with a trained researcher, using standard protocols, which would limit the amount of time mother's had to consider any connotations of the questions being asked compared to if it was self-completed. The scales and assessments in the questionnaire were subjective and open to interpretation from the participants. However, in the majority of cases, validated scales were used and other questions were drawn from published studies. Assessing psychological concepts is challenging as the assessments attempt to quantify how someone feels.

The differences in the participants who completed the follow-up survey and those who were lost to follow-up may have introduced bias into the results. Mothers of children who were lost to follow-up tended to have poorer quality diets, be younger and, although not statistically significant, were more likely to have lower levels of educational attainment, be in receipt of benefits, be food insecure and be in the less resilient cluster. In addition, the children were also more likely to have poorer quality diets. Therefore the declines in mothers and children's prudent diet scores observed over the two year follow-up period may be less pronounced than was true for our study population as a whole. Other longitudinal studies have also reported bias in their follow-up populations, in that a greater proportion of those lost to follow-up tend to be from more disadvantaged populations⁽²¹⁵⁾.

The questionnaires were developed following a comprehensive literature review of determinants on preschool children's quality of diet, however, analysing the focus group data in chapter seven provided insights into the context of some of these determinants and as a result, in hindsight, it may have been advantageous to add in some additional assessments to the questionnaire. In particular, better assessments of mealtime climate or stress may have been valuable – a theme which was not evident in published literature. In future I would use focus groups to inform the development of a questionnaire as well as following surveys to provide context to quantitative results.

Carrying out the surveys over the telephone was less resource intensive than interviewing participants in their homes and provides opportunity to collect data from hard-to-reach groups; however, we lost 21% to follow-up due to participants changing their phone numbers over the follow-up period. Related to this, participants were only prompted to provide one number at recruitment instead of being asked for a mobile, home and/or work number which would have increased the ability to reach more of the participants.

Preschool children are unable to complete dietary assessments themselves and therefore we were required to rely on information from their mothers. In addition, the FFQ is a recall method, rather than being completed at the time of consumption, which may increase reporting error. Often FFQ's overestimate intakes, although they have been found to be effective at ranking children according to their dietary patterns⁽¹⁵⁰⁾. The 20-item FFQ was only able to tell us about children's compliance with the prudent diet pattern derived in the Southampton Woman's Survey. However, as described in section 4.4, the short FFQ was tested against the longer version of the FFQ which was used to characterise the diets of a large general population sample of children living in Southampton. The prudent diet score has shown to be correlated with nutrient intakes and in separate analyses, the prudent diet pattern has been shown to be similarly defined at three years when comparing the FFQ with food diaries⁽²¹⁶⁾.

Our sample were drawn from Children's Centres in Southampton, Gosport and Havant, which tend to operate in more disadvantaged areas in the towns and cities they serve. Mothers in our sample did represent a wide range of educational attainment and other demographics and local data suggest that in 2006 around 70% of children under five years were registered with a Sure Start Children's Centre in Southampton⁽¹³²⁾. However our sample size was limited and therefore our sample may not be representative of all mothers with preschool children in these localities. In addition, only 5% of the sample were non-white and therefore the sample were not representative of the wider UK population. These findings may be generalisable to families attending Children's Centres in Southampton, Gosport and Havant. However, larger studies, with more diverse ethnic groups, in different locations in the UK, would need to be replicated before it can be determined whether these results are generalisable to other families in the UK.

8.3 How do mother's psychological characteristics influence children's quality of diet?

The data from Chapter 5 showed that mothers grouped according to their psychological profiles, the characteristics of which were indicative of being more or

less resilient. Mothers clustered according to their levels of perceived control over life, general self-efficacy and specific self-efficacy for healthy eating, food involvement and general well-being. The cluster, in which mothers grouped, in turn was associated with differences in mothers feeding strategies and their management of their children's physical mealtime environment. The results from Chapter 6 built upon these findings by showing that maternal resilience and the associated behaviours at baseline were predictive of children's quality of diet at follow-up.

Mothers who were less resilient were less likely to use covert feeding strategies. This provided a novel insight into associations with covert feeding strategies. Previous research has suggested that the use of different feeding strategies is related to maternal parenting style⁽²¹⁷⁾. Overt style strategies, which often reflect more general behavioural goals (e.g. 'do not eat any more of that' or 'you must finish what's on your plate'), are often commanded in more rigid language and therefore indicative of more authoritarian style parenting which, in turn, has been associated with more negative parent-child interactions. In comparison covert feeding strategies are less commanding (e.g. mother's do not buy the food they do not wish their child to have) and are indicative of a more authoritative style of parenting which in turn has been associated with positive child outcomes. These results may explain findings from the focus groups which suggested that mothers of lower educational attainment used more overt style feeding strategies and that food related interactions with their children were often negative. In terms of mothers psychological resilience and feeding strategies, there is some evidence to suggest that mothers who feel less in control of their lives and have lower levels of well-being use more overt styles of feeding strategies⁽¹⁷⁹⁾ (pressure and restriction to eat). Although we did not observe the same association with the assessment of overt control that we used, the results from Chapters 5 and 6 build on the current literature by indicating that mothers who are more resilient use more covert feeding strategies, which in turn were associated with better quality of diet in children.

The results from the focus group discussions also suggested mothers felt that mealtimes consisted of stressful interactions with their children. This is also likely to be associated with maternal resilience. Children usually prefer the taste of foods high in sugar and fat⁽²¹⁸⁾, however this contradicts what mothers know that their children should consume. Whilst this is likely to cause stress for most mothers, those who are resilient and thus feel able to overcome challenges are likely to feel more able to facilitate these situations. However, for those who feel less in control and less self-efficacious these may be exacerbated by conflict over eating⁽²¹⁹⁾, which makes them feel under stress and in turn is likely to reinforce feelings of lower well-being⁽¹⁷⁷⁾. Those with low psychological resilience have also been shown to have heightened levels of

reactivity during stressful daily events⁽¹⁷⁴⁾. It has also been suggested that more overt feeding strategies are used in times of stress, as a reaction to children's temperaments⁽²¹⁷⁾ which, in turn, is likely to increase the negative emotional climate between mothers and children during mealtimes.

The results from Chapter 7 also indicated mother's frustration with children's picky and fussy eating and refusal of food. Research has shown that children typically need to be exposed to a food around 15 times before it is accepted⁽²²⁰⁾. To pursue this it is likely to require a mother to feel in control of the situation and to feel that food is important enough to continue to present the food in the face of adversity. As highlighted by the findings in Chapter 7, they also need to feel comfortable with the possibility of wasting some food on the 14 occasions that it is likely to be refused. This could explain some of the direct effect of maternal resilience on children's quality of diet. Mothers who give up exposing their children to initially refused foods too soon are more likely to have a child with a limited and poorer quality diet⁽²²¹⁾. Related to this is the concept of role-modelling. Research has consistently shown that role-modelling from others in the shared eating environment is an important influence on child's food preferences and quality of diet^(222;223). In addition it has been shown that positive role-modelling is likely to take place during structured mealtimes at the table⁽²²⁴⁾. However, the results from chapter five showed that mothers in the less resilient cluster were less likely to encourage their child to eat meals whilst sitting at the table. Furthermore, mothers who perceive their children to have non-clinical feeding problems, including fussy eating, neophobia, or low or high appetites, are more likely to report low self-esteem and well-being⁽²²⁵⁾ which is likely to feed back into feeling less resilient.

As well as being associated with feeding practices and mealtime environment factors known to influence diet, maternal psychological factors were also associated independently with children's quality of diet both in the cross-sectional and longitudinal analyses. The psychological factors included in the cluster analysis have, individually, been shown to be associated with food choices women make for themselves and their families^(123;124;169). Mothers with who feel less in control, with lower self-efficacy and with lower levels of food involvement are less likely to make healthy food choices which will influence the food which is available at home, which in turn is associated with children's quality of diet^(91;108). This was also highlighted in Chapter 7 where mothers in the focus groups indicated that for reasons of financial constraint, it was important to buy food that would not be wasted, which meant they often fed their children what they thought they would eat rather than necessarily what they felt was healthy. Allowing children's food preferences to dictate mother's food choices probably indicates that she is feeling less in control.

There are a number of reasons as to why mother's psychological factors are an important predictor of children's quality of diet. Not only do they relate to feeding strategies and some aspects of the mealtime environment but the effect is also independent of these. Importantly it appears that the effect is cyclical. Mothers who are less resilient may adopt less favourable feeding strategies and mealtime environments, which are associated with negative emotional climates and increased feelings of stress, which are likely to feed back into feeling unable to stick to plans when faced with adversity. The exploration of maternal psychological profiles in determining children's quality of diet is novel and the associations discussed in this section suggest that there is no one target for change. An intervention is likely to be more successful if it considers that these influences are all part of a feedback loop and should be addressed in relation to one another. Supporting a mother to feel more resilient may only be effective if it is applied to a specific behaviour or situation (e.g. family mealtimes), and in addition helping mothers to facilitate a more desirable family mealtime may contribute to their feelings of resilience.

8.4 Why is the mealtime environment an important predictor of children's quality of diet?

The results from Chapters 5 and 6 highlighted the important effects of the mealtime environment on children's quality of diet, suggesting that encouraging children to consume meals at the table and not in front of the television is associated with better quality of diet cross-sectionally and longitudinally. Chapter 5 also showed that mothers who were in the less resilient cluster were less likely to insist their child eat while sitting at the table as often as those who were more resilient. The focus groups provided some context to this indicating that mealtime conflict may result in a less structured mealtime setting. The effects of the mealtime environment on children's eating behaviours and quality of diet are multiple. The mealtime environment can largely be considered in two interrelated contexts; the physical environment where the meal takes place and who is present; and the emotional environment, describing the nature of the social interaction between those who are present.

As discussed in previous sections of this thesis, the mealtime environment is important in terms of the effects of role-modelling. Carnell *et al*, conducted a study of twins to determine influences on the development eating behaviours⁽²²⁶⁾. They reported that 60–70% of a child's eating behaviour develops from genes which leave 30–40% to be learned behaviour from their environments. Studies have consistently shown that children mimic the behaviours and eating habits of their parents, siblings and friends. The influence of others eating habits on those of their children was also discussed in the focus groups in Chapter 7. Some of the mothers in the focus groups also discussed

encouraging their children to sit at the table during mealtimes but stated that they did not sit with them. Mothers who follow a 'do as I say and not as I do' style of parenting are unlikely to elicit the desired behaviour in their children⁽²²⁷⁾. The mealtime environment presents an opportunity not only to model the consumption of desired foods to their children but also desired behaviours.

On the other hand eating in front of the television may be more likely to enhance mindless eating. The literature on mindless eating suggests that there are a number of environmental cues which determine food choices in terms of what people eat and in terms of how much one eats⁽²⁰⁹⁾. Crucially, people are often unaware of these cues or that they influence their food choices. Portion size and plate size are both related to overconsumption⁽²²⁸⁾. Preschool children are unlikely to serve themselves so they rely on their mother deciding how much to give them. If this is misjudged, children are often requested to ignore physiological cues of satiety and are encouraged to finish what was given to them. Satiety cues are also more likely to be missed if one is distracted while eating⁽²²⁹⁾. Researchers suggest this is because how much someone eats is related to their 'consumption norms' yet if distracted when eating it is harder to judge how much they have consumed⁽²⁰⁹⁾. While preschool children are developing their eating behaviours they are more sensitive to cues of satiety rather than consumption norms in determining how much to eat. However, if their mother has not monitored how much their child has eaten, as they have not been present or have been distracted during the feeding episode, they may be more likely to encourage them to eat more.

Family mealtimes are often a time for families to interact with one another. Research has shown that when families engage in positive interactions at mealtime's children are less likely to express problematic behaviours. The authors argue that it is unlikely that negative family mealtimes cause problematic behaviours *per se* but that the mealtime environment is an indicator of general family functioning. Family functioning is a term used to describe the wide range of family characteristics and patterns of interaction that provide context for child socialisation⁽²⁰³⁾. A key factor of family functioning is parent-child communication and conflict, and researchers suggest that mealtimes represent a unique part of family life in which to develop these patterns of social interaction⁽²³⁰⁾. Research has shown that more conflict during mealtimes is reported in families whose children are overweight and who exhibit fussy eating behaviours^(204;231). Furthermore mealtime conflicts are associated with avoidance of family mealtimes, with more families opting for meals in front of the television⁽²⁰⁷⁾. This was also suggested in the focus groups in which some mothers spoke about feeling unable to structure mealtimes due to children's unruly behaviours and spoke about using the television to distract or calm their children during mealtimes.

Some families introduce structure and routine into their mealtimes, both of which have been associated with better child eating behaviour and weight status⁽²³²⁾. However, the ability to structure mealtimes also reflect mothers' psychological factors related to resilience. Some researchers have suggested that the development of mealtime structure and rules serve as a way of disciplining a child. This therefore creates a 'power relationship' between the parent and the child. As part of their development all children are likely to attempt to resist their parent's power and authority through arguing, disagreeing and opposing their parents requests⁽²³³⁾. For mothers who feel unable to control difficult situations and have little belief in their ability to carry out a behaviour when faced with resistance, i.e. those who are less resilient, these structured and rule-based mealtimes are more likely to be given up. This could also help to explain the finding in Chapter 5 that mothers in the less resilient cluster were less likely to have meals whilst sitting at the table. This suggests that interventions which only focus on changing mealtime practices may not be effective. Being told by a health professional to 'eat meals together at the table' without any consideration of the family context may not translate into a change in behaviour in families where mothers do not feel as though they can manage the situation when faced with stress and conflict from their child.

There is clearly a complex interplay between mealtime environment (physical and emotional), child eating behaviour, maternal feeding strategies, maternal psychological characteristics and children's quality of diet. In the past, interventions have often targeted specific feeding behaviours or practices to improve children's quality of diet but it is clear that the effect of feeding strategies or mealtime settings on the quality of children's diets is likely to be moderated by the family context such as the emotional climate during mealtimes. A similar conclusion was reached by researchers reviewing pediatric obesity interventions⁽²³⁴⁾. Our project builds on the current literature by including the consideration of maternal psychological factors. It is likely that maternal psychological factors are related to how mothers feel able to manage feeding situations, which relates both to the physical and emotional mealtime environment and their use of feeding practices, which in turn relates to child temperament and ultimately quality of diet. All of which may feedback to how much mothers feels they can cope. The challenge now is to translate this knowledge into an intervention. If all the influences are interrelated where does one target an intervention? It is likely that all of these elements need to be considered and interventions need to be tailored to individual families to take account of their family context. The next, and final, section of this thesis will consider how the findings from this project can be combined with lessons from previous interventions to begin to plan a new intervention.

8.5 The next intervention

From the findings of this project it would seem logical for an intervention aimed at improving the quality of diet of preschool children to be based in the home, focusing on mothers' psychological factors, indicative of lack of resilience, feeding strategies and the family mealtime environment. While the environment beyond the home is likely to also influence the quality of young children's diets, especially through cost and access to food, it would be expected that through raising the mother's sense of food priorities and control, this may also impact on the food choices a mother makes outside of the home.

The SIH aimed to improve mothers' quality of diet through increasing their sense of control over life and level of self-efficacy. Although in Chapter 6 we discovered that the intervention did not have the desired effect in my sub-sample of mother-child pairs, the results from the cluster analysis in Chapter 5 and indicated in Chapter 7, improving mother's psychological factors including sense of control, self-efficacy, food priority and well-being, should be a crucial part of a future intervention to improve children's quality of diet. Using the results from this thesis, reflections on what has been learned from the SIH and other interventions, this thesis will culminate with a logic model as a first step to designing a new intervention.

There have been many interventions aimed at improving diet quality, preventing or treating obesity in children. To our knowledge no interventions to improve the quality of preschool children's diets have, to date, focused on maternal psychological factors, indicative of resilience. However, many have set out to influence maternal feeding practices, mealtime environments and/or parenting styles as a mechanism through which to influence children's quality of diet. Frustratingly, however, many of the interventions which state that they have focused on parenting outcomes have not reported effects of the intervention on these intermediary parenting outcomes, tending only to report outcomes in terms of child diet or weight status. This process evaluation information is important for understanding whether any changes seen in the main outcomes in the children were as a result of changing the intermediary outcomes in the mothers. Intervention studies which have reported these process outcomes have described mixed results.

Interventions which have not been successful in influencing maternal behaviours and outcomes have a few traits in common. Firstly they have reported small sample sizes, with no more than 40 participants in each arm⁽²³⁵⁻²³⁷⁾. It is likely that they were powered to detect changes in diet or weight status, thus it is possible that they were not able to detect any changes in the maternal intermediary outcomes. In addition many reported

that the interventions were solely education based. Horodyski *et al*, reported in their Nutrition Education Aimed at Toddlers study (NEAT)⁽²³⁶⁾, aimed at low-income families in USA, that mothers in the intervention group received 4x90 minute nutrition lessons about toddler nutrition, followed up with 18 reinforcement activities (things to try at home) over 6 months. Although after the six month follow-up mothers in the intervention group reported better nutrition knowledge, there were no significant differences in maternal feeding self-efficacy and child-mother interaction at mealtimes between the intervention and control groups. In addition no dietary outcomes were reported. Similarly Essery and colleagues reported results from an intervention aimed at changing maternal feeding practices (pressure to eat, monitoring, restriction and perceived responsibility)⁽²³⁷⁾. Two intervention groups received booklets on feeding their children, either as one whole booklet or in instalments as weekly newsletters, the control group received nothing. Post-intervention (4months post-baseline) mothers in the newsletter group had reduced their use of pressure to eat (which is considered a negative feeding practice) compared to the control group. There were no other significant changes and no diet information was reported. Another intervention with mothers of overweight preschool children aimed to reduce calorie intake in children⁽²³⁵⁾. Intervention mothers attended four education sessions, the first run by a pediatrician who taught them about understanding obesity, the second run by a dietician focusing on food quality, the glycaemic index, portions and the eating environment, the third by a physiotherapist who focused on physical activity and finally the fourth run by a psychologist who educated them about how to teach a child healthy habits and overcoming behaviour problems. The authors reported no significant differences in maternal discipline styles or parenting self-efficacy following the education sessions. However, they did report a significant reduction in energy intake in the intervention group children (1.3MJ.day). The lack of effect on maternal self-efficacy or feeding practices observed in these studies is not surprising. Literature on behaviour change suggests that self-efficacy is one key element to changing behaviour⁽¹³⁴⁾ and central to building self-efficacy is belief in one's ability to make the changes⁽²⁰⁰⁾. Providing information may not therefore prove effective if its not accompanied by opportunities to see the skills modelled or to have a chance to practice the skills necessary to carry out the behaviour⁽²⁰⁰⁾.

More successful interventions have incorporated information alongside other elements such as peer support, counselling and self-reflection. One such intervention involved using experienced mothers in the community to support first-time mothers during their child's first year, with an emphasis on infant feeding⁽²³⁸⁾. Mothers in the intervention group received their normal visits from a public health nurse and in addition monthly visits from a mother in the community for 12 months. The peer supporters were identified by the public health nurses and trained in the child

development programme. They were encouraged to share ideas and experiences with the other peer supporters and used the public health nurses as mentors. Once a month the peer supporters visited the first time mothers and were asked to provide them with encouragement and support around child development and specifically about feeding. At follow-up mothers in the intervention group had higher well-being (less likely to feel miserable and want to stay indoors) and in addition, their children were consuming more wholegrain, fruit, vegetables and milk, compared to those in the control group. A follow-up of a third of these children was carried out seven years later⁽²³⁹⁾ and although the results didn't reach statistical significance, children in the intervention group were, on average, consuming more foods from the healthier food groups and their mothers were more likely to enforce limits on how much television they were allowed to watch. A significant finding was that mothers in the intervention were more likely to disagree with the statement 'I do not have much in my life to be proud of', indicating better well-being than the control mothers.

In another smaller study of the benefits of peer support in Native American families with obese children mothers received one-to-one peer counselling⁽¹⁸⁸⁾. Both mothers in the intervention and control groups received the peer counselling regarding general parenting skills such as parenting styles, role-modelling, building bonds and problem solving, and those in the intervention group received the same, but with an additional focus on feeding practices, overcoming barriers to health changes, and healthy role-modelling. In the intervention group mothers reduced their use of restrictive feeding practices at follow-up and they had reduced their child's energy intake (-1.32 ± 3.5 MJ.day⁻¹) compared to the control group. However there were no significant changes observed in maternal self-efficacy or behaviour change intention. This could be because the control group also received general parenting counselling which could have increased their self-efficacy as well; the authors did not report the control data however.

With respect to child feeding problems a recent study reported beneficial effects of group support⁽²⁴⁰⁾. Although the participants were mothers whose children had feeding problems severe enough to be referred to a feeding disorder clinic (rather than being mothers of children who are expressing 'normal' fussy eating tendencies) the aim of the study was to provide emotional support addressing low mood, parenting stress and feeding-related concerns. Mothers reported that the groups enabled them to re-evaluate their children's eating problems and they felt less isolated and less need for 'self-blame'. These studies highlight the importance of peer support in interventions. This is a conclusion which previous reviews of interventions have come to⁽²³⁴⁾, and particularly in respect to those working with more disadvantaged communities⁽²⁴¹⁾, but it is an element which is clearly not always incorporated into interventions.

Group support as well as family involvement may prove an effective mechanism for change. One intervention looked at the differential effects of using mothers or other children as the agents for change in the treatment of child overweight⁽²⁴²⁾. The children in this study were school age (6–11 years old). In one group children attended group sessions which addressed behaviour modification, nutrition education, problem solving, and stimulus control. In the other group parents attended groups which addressed similar topics as for the children but also changes for the entire family, role-modelling, and coping with resistance, and for some sessions the entire family were invited to attend. The groups were discussion-led rather than didactic teaching sessions. Although maternal outcomes weren't assessed, the parents as the agents for change group had achieved significantly greater weight loss in the overweight child six months post follow-up compared to the child support group and interestingly the attrition rate in the parent-focused group was nine times lower compared to that of the child group.

A family based approach was also undertaken by the Healthy Home Offerings via the Mealtime Environment (HOME) study⁽²⁴³⁾. This was a pilot study the aim of which was to increase healthy food served at mealtime and increase the frequency of family mealtimes. Families were invited to attend 5x90minute sessions, and all family members were invited to all the sessions, although child minders were arranged for children <8 years old. Sessions involved interactive education, hands-on meal preparation and parent discussion groups. Amongst other things, sessions covered reducing conflict at mealtimes, increasing parental self-efficacy for making healthy changes in the home and overcoming obstacles to family meals. Outcome assessments were parental self-efficacy, frequency and quality of family mealtimes, home food availability, and dietary assessment of the target child. Although not all of the results reached statistical significance, differential effects between the intervention and the control group were in the expected direction for most outcomes. Although the authors do not report acceptability of the intervention delivery, they stated that the intervention was designed with input from members of their target population and the consensus was that meeting with other families in a community location was preferential to home-based sessions.

These suggest that addressing the whole family may be an effective element of an intervention, especially one which is focused on changing family eating occasions. As discussed in the focus groups, the influences on children's quality of diet and mealtime experiences often involved siblings as well; therefore it would be advantageous to include the whole family in parts of the intervention.

Another important element in successful interventions aimed at improving child's quality of diet through working with mothers is the encouragement of reflection throughout the intervention. It was also an element which was key to healthy

conversation skills in the SIH. Each family is different, as discussed previously in this chapter, and it is important to consider the family context when designing interventions which aim to influence feeding practices and the mealtime environment. The person who is most likely to understand their family context and the way certain strategies may work for them is the mother herself. A recent intervention by McGowan *et al*, aimed to change parent and children's healthy habits by encouraging habit formation in the parents in relation to serving their child fruit and vegetables, healthy snacks and healthy drinks⁽²⁴⁴⁾. Of particular interest in this study was the intervention delivery. Parents were recruited from Sure Start Children's Centres but the intervention was delivered in their home. Despite this, the majority of their participants were university educated, which could possibly have been reduced if they had asked the Children's Centre to identify the best sessions to recruit from to try to enable over-sampling of less educated families. This was our recruitment method for the focus groups. The intervention was conducted in four home visits over eight weeks, each that lasted one hour. The researcher took the parent through a work-book about habit formation. Crucially however, parts of the session were parent led, where parents decided which elements they wanted to work on (fruit and veg provision or health snack provision etc.) and after the researcher had given the parents advice they were encouraged to develop their own specific goals to achieving this, as well as identifying some of the potential barriers. The outcomes showed that parents reported more automaticity for serving fruits and vegetables, healthy snacks and drinks compared to parents who had not received any intervention. In addition preschool children of these parents consumed more of the foods served after the eight week intervention period; the authors do not report whether longer term effects were assessed. The intervention did, however, report data from the process evaluation which suggested that parents found the intervention enjoyable and easy. A patient-led approach was central to the SIH and has been shown to empower patients and increase their self-efficacy for managing conditions such as diabetes⁽²⁴⁵⁾. Staff working in the SIH Children's Centres were trained to encourage mothers to identify things they wanted to change, which may not have included the quality of their diet. Therefore the addition of advice or introducing concepts to mothers as part of our new intervention, as well as encouraging them to reflect on barriers and solutions to change, may enhance their empowerment for changing the behaviour of interest, in this case children's quality of diet.

Whilst this is not an exhaustive review of all the interventions undertaken which aim to improve children's quality of diet through the consideration of maternal factors such as feeding practices, self-efficacy or the mealtime environment, it serves to highlight some of the key successful elements of previous intervention work. The main conclusions of this review are that a new intervention should involve peer support,

family involvement, offer some guidance and ideas to mothers but be participant-led and involve reflection.

Ideas for a future intervention based on the findings of this thesis are considered in this final section. It would be advantageous to use focus group methodology with participant's representative of the target population to discuss acceptability and feasibility and to gauge opinion on the intervention concept and design. Sure Start Children's Centres represent a useful way of reaching mothers with lower levels of educational attainment, who this thesis shows are most in need of support and at whom an intervention would therefore be targeted. Sure Start Children's Centres offer an ideal location from which to recruit families. In addition, using the relationship we have already forged with the Children's Centres and given the work they already do to engage disadvantaged families, they may assist with recruitment to the intervention. This would maximise the likelihood of recruiting families from our intended target group. This approach was used to great effect to recruit to the focus groups carried out as part of the research for this thesis. Although we would plan to deliver some of the intervention sessions in the home setting we would also anticipate running group sessions in a community setting, which also could be provided by Sure Start Children's Centres.

Ideally the majority of the intervention would be delivered by peer support workers. Home-based sessions would be run by researchers trained in skills akin to healthy conversation skills, and although the training would be tailored to focus the conversations, the core principles remain important to empowering mothers to make changes. During the home visits, mothers would lead the sessions by identifying changes they would like to make to their child's diet and feeding environment. The researcher would be equipped with ideas and concepts around using covert control strategies, mealtime environments, reducing mealtime conflict, and positive role-modelling; however these concepts would be introduced alongside open questions (e.g. 'how would this work in your family?', 'what things could stop it from happening?'). Small achievable goals would be set by the participant to be reviewed at subsequent sessions. Technology could also be utilised in the form of a virtual parents' forum for the research participants to access to share ideas and experiences. Some sessions would also involve other family members, addressing their feelings around food and mealtimes. Group sessions would follow the initial home-based sessions to give families the opportunity to come together to discuss experiences, and what they would like from future group sessions. This way mothers ultimately tailor-make their own interventions from a range of possible strategies and options offered by the overall intervention package. The hypothetical logic model for this intervention is displayed in Figure 8.3. Mothers will be leading their own interventions reinforced with support from researchers and peers. It is hypothesised that mothers will feel more

resilient and able to control and manage their family's mealtimes and diets. If the plans they put in place prove successful, this will reinforce their feelings of resilience and hopefully enable them to make sustainable changes to improve the health and well-being of their children and themselves.

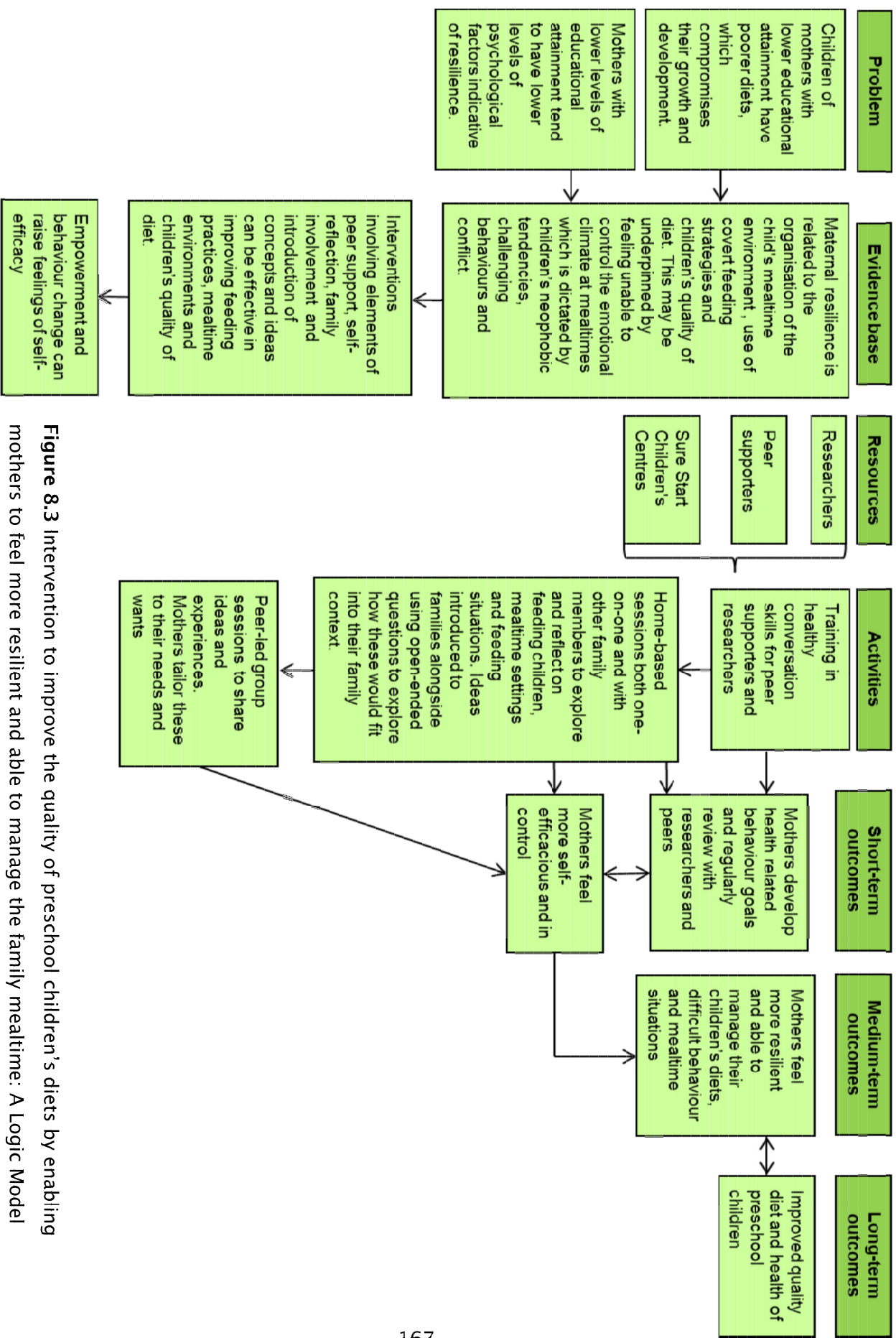


Figure 8.3 Intervention to improve the quality of preschool children's diets by enabling mothers to feel more resilient and able to manage the family mealtime: A Logic Model

8.6 Conclusion

The beginning of this thesis discussed study findings which suggested that there had been little improvement in the quality of young children's diets since the NDNS findings were reported in the SACN review. Results from this thesis shows that there are still disparities in the quality of young children's diets. Policies which have been developed to address these inequalities aim to regulate services that families with children under five years old use. However, as suggested in this thesis, many feeding experiences of preschool children take place in the home. A large amount of research has focused on determinants of children's quality of diet within the home; however, these commonly reported cross-sectional associations of a limited number of influences. This project has begun to explore the role of maternal psychological characteristics, ways that mothers manage children's exposure to food and the location of mealtimes in determining young children's quality of diet. My research has established that the way in which a family functions is a key influence on children's quality of diet. Any interventions put in place to address children's quality of diet have to therefore offer support to improve family functioning especially in more disadvantaged families. This thesis concludes with a consideration of how my findings could be used to plan an intervention. Crucially mothers need to be empowered by being supported to tailor their interventions to suit their own family situations.

Through developing this project it has become increasingly clear that the disciplines of public health nutrition and health psychology offer unique understandings on the interplay between mothers, children and home environments in shaping quality of diet in young children. Public health nutritionists are gaining understanding on the optimal practices which determine children's quality of diet and may be the focus for future health messages and initiatives aimed to help families have healthier diets. However, it is crucial that we appreciate the intricate knowledge offered by psychologists to understand family context and functioning so as to comprehend how these messages may be received and used. I believe that if we continue to work across disciplines we will be able to gain deeper understanding, design more successful interventions, and ultimately develop more effective policies and programmes to enable all families to live healthier lives.

9 Appendices

Appendix A Search strategy protocol: review of influences on young children's quality of diet.

Aim

The aim of this review is to collate and assess evidence regarding influences on the quality of preschool children's diets, influences which range from macro-environmental to individual. This review specifically aims to answer the following questions:

- What factors impact on the quality of pre-school children's diets?
- How do these factors affect their diets?
- What is missing from the current evidence base?

Method

Expert guidance has been sought on how to perform a systematic literature search and the York Centre for Reviews and Dissemination guide to systematic reviews will be referred to if issues arise. The databases Medline, Embase, CAB abstracts and AMED will be used to search for relevant literature. Key words and MeSH terms related to the outcome will be identified and used to perform the literature searches, search terms are detailed below. Searches will be performed on each of the search terms and results will be combined and duplicates removed. Assuming a large number of articles are retrieved screening will initially be performed on the article title. Abstracts will then be screened according to the inclusion/exclusion criteria and ineligible articles will be removed. Any uncertainties about including or excluding an article will be discussed with supervisors. The inclusion/exclusion criteria are detailed in Table 1. The bibliographies of included articles will be screened for additional relevant studies.

Outcome variable search terms:

Child + ...
 ...Diet quality,
 ...Fruit
 ...Vegetable,
 ...high fat, salt or sugar,
 ...Junk food,
 ...Fast food,
 ...Snacking,
 ...Sweetened drinks, beverages

Appendix B Mothers' main SIH baseline survey participant information sheet and questionnaire



MRC
Epidemiology
Resource
Centre

MRC Epidemiology Resource Centre (University of Southampton)
Southampton General Hospital, Southampton SO16 6YD UK



**University of
Southampton**
School of Medicine

NUTRITION, EXERCISE & WELL-BEING QUESTIONNAIRE
Participant information sheet

What is this all about?

We want to make it easier for women to live healthier lives. We have been given the job of finding out more about the things that make this difficult.



What do I have to do?

We are inviting you to complete a short questionnaire about you, how you feel and what you think about eating, cooking and exercise. We will fill it in with you here at the centre today.

Why have I been chosen?

You are a woman living in one of the areas of Hampshire that we have chosen for our research.



Who will see what I have to say?

Only people working on this study will see the questionnaire you fill in. Any information you give us will have your name taken off it before other researchers in our team see it and write reports. Any information you give us will be stored safely.

I don't want to take part in this study!

If you don't want to fill in the questionnaire, or change your mind about it at any time, that is fine. Any information you have given us will be destroyed.

What if I have a question or query about this study?

Please call the freephone number **0800 783 4503** and leave a message for Wendy Lawrence to 'phone you back (24 hour voicemail out of office hours). If you have a complaint about the study, please ask for details of the NHS Complaints



Location:	ID:
	DoB:
	Initials:

Interviewer:	Date:
---------------------	--------------

<u>NUTRITION, EXERCISE & WELL-BEING</u> <u>STUDY</u>
--

We are interested in diet, exercise and well-being of women in Southampton.

This questionnaire is designed to find out about what you eat, when you eat it, how often you exercise and how you're feeling in general. It also asks for some background details about you.

It is **not** a test and we are interested in you as you really are, rather than how you would like to be.

Your answers are strictly **confidential** and your name will not be put on the questionnaire. I will take the questionnaire away when you have finished.

You will generally be asked to indicate the answer that describes you best.

Thank you very much for your help

This questionnaire has been compiled by the Food Choice Group
Medical Research Council Epidemiology Resource Centre
University of Southampton
January 2009

About you

In this section, we want to know a little bit more about you.

- 1(a) How many children (under 18 years) live with you?
- 1(b) How old are they?
- 1(c) Are your children registered with Sure Start?
[Show Sure Start registration form if required]
 Yes ☐ No ☐ Don't know ☐
2. Have you passed any exams or do you have any formal qualifications?
[Enter number in the box to show highest level reached]
1. None
 2. CSE / School cert / GCSE (grade D or lower) / NVQ1 / Foundation GNVQ
 3. O levels / Matric / GCSE (grade A,B,C) / RSA secretarial / NVQ2 / Intermediate GNVQ
 4. A levels / City & Guilds / EN(G) / ONC / NNEB / BTech (day release) / NVQ3 / Advanced GNVQ / OND / HNC
 5. HND / RGN / Teaching Cert / NVQ4
 6. Degree / NVQ5
 7. Other (specify)
3. Are you (or your husband/partner) on any of the following benefits?
 Income support, jobseekers allowance, working families tax credit and/or housing benefit
 Yes ☐ No ☐
- 4(a) Do you own your own home, or are you buying it on a mortgage, or do you rent it in some way?
- | | | |
|---|--------------------------|--|
| Owns outright or buying with mortgage | ☐ | |
| Rent from private landlord | ☐ | |
| Rent from council or housing association | ☐ | |
| Other rented accommodation (hostel, hall of residence, B & B) | ☐ | |
| Lives with parents | ☐ | |
- Other, please specify _____

3

4(b) What type of accommodation do you live in?

- | | |
|-----------------------------------|--------------------------|
| Detached house/bungalow | ☐ |
| Semi-detached house/bungalow | ☐ |
| End terraced house | ☐ |
| Terraced house | ☐ |
| Purpose built flat/maisonette | ☐ |
| Converted flat/maisonette | ☐ |
| Dwelling with business premises | ☐ |
| Bedsitter, in multiple occupation | ☐ |
| Bedsitter, other | ☐ |
| Hostel | ☐ |
| Hall of residence | ☐ |
| Other student accommodation | ☐ |

Other, please specify

5. To which of the following ethnic groups do you feel you belong?

[Show participant ethnic group prompt card]

- | | |
|-------------------|--------------------------|
| White | ☐ |
| Black Caribbean | ☐ |
| Black African | ☐ |
| Black other | ☐ |
| Indian | ☐ |
| Pakistani | ☐ |
| Bangladeshi | ☐ |
| Chinese | ☐ |
| Other Asian group | ☐ |

Other, please specify

Your eating habits

In this section, we want to know more about some of the foods you eat and how often you eat them.

[TICK one box on each line for every item – show response prompt sheet table [i] & refer to FFQ prompt sheet if necessary]

OVER THE PAST MONTH HOW OFTEN HAVE YOU EATEN THESE FOODS?								
	Over the past month	Never	Once a Month	Once every two weeks	1-2 Times per Week	3-6 Times per Week	Once a day	More than once a day
6	Roast Potatoes or chips							
7	Peppers or watercress							
8	Tomatoes							
9	Meat pies							
10	Vegetable dishes							
11	Courgettes, marrow or leeks							
12	Sausages or sausage rolls							
13	Gravy							
14	Green salad							
15	Wholemeal bread							
16	White bread							
17	Onion							
18	Vegetarian food							
19	Pasta							

5

OVER THE PAST MONTH HOW OFTEN HAVE YOU EATEN THESE FOODS?								
	Over the past month	Never	Once a Month	Once every two weeks	1-2 Times per Week	3-6 Times per Week	Once a day	More than once a day
20	Yorkshire pudding or savoury pancakes							
21	Crisps or savoury snacks							
22	Beef							
23	Spinach							
24	Fresh fruit							
25	Approximately how many teaspoons of sugar do you add each day to breakfast cereals, tea and coffee, etc?						teaspoons	
26	How much full-fat milk on average do you use per day in your drinks, added to breakfast cereals, etc?						pints	

[Tick one box on each line for every item – show response prompt sheet [ii] if required]

Now thinking about your family. HOW OFTEN DO MEMBERS OF YOUR FAMILY...						
		Never	Rarely	Sometimes	Often	Very often
27	Approve when you buy fruit, fruit juice or vegetables					
28	Ask you to buy fruit, fruit juice or vegetables					
29	Remind you to buy fruit, fruit juice or vegetables					
30	Buy fruit, fruit juice or vegetables					
31	Talked to you about buying fruit, fruit juice or vegetables					

Food and money

People do different things when they are running out of money for food, to make their food or their food money go further.

[TICK one box for each question]

32. In the last 12 months did you (or other adults in your household) ever reduce the size of your meals or skip meals because there wasn't enough money for food?

No **(go to 34)** ☐ Yes ☐

33. How often did this happen?

In only 1 or 2 months? ☐ Some months, but not every month? ☐ Almost every month? ☐

34. In the last 12 months did you ever eat less than you felt you should because there wasn't enough money to buy food?

No ☐ Yes ☐

35. In the last 12 months were you ever hungry but didn't eat because you couldn't afford enough food?

No ☐ Yes ☐

Here are 2 statements that people have made about their food situation. For these statements, please tell me whether the statement was 'never true', 'sometimes true', or 'often true', for you (or other members of your household) in the last 12 months.

36. 'The food that I / we bought just didn't last and I / we didn't have money to get more'.

Never true ☐ Sometimes true ☐ Often true ☐

37. 'I / we couldn't afford to eat balanced meals'.

Never true ☐ Sometimes true ☐ Often true ☐

- 38(a) At which type of shop do you do your main food shopping?

City centre market stalls	☐
City centre food shop	☐
Corner shop	☐
Greengrocer	☐
Small supermarket	☐
Large supermarket	☐
Internet	☐

- 38(b) Please specify name and location of shopping premises _____

About your feelings

This section is about how you have been feeling. Please say which answer best describes how you have felt over the last 2 weeks.

[TICK one box on each line for every item – show response prompt sheet table [iii]]

	Over the last two weeks ...	At no time	Some of the time	Less than half of the time	More than half of the time	Most of the time	All of the time
39	I have felt cheerful and in good spirits						
40	I have felt calm and relaxed						
41	I have felt active and vigorous						
42	I woke up feeling fresh and rested						
43	My daily life has been filled with things that interest me						

Please say how much you agree or disagree with each of these statements about how you feel.

[TICK one box on each line for every item - show response prompt sheet table [iv]]

		Strongly Disagree	Disagree	Agree	Strongly Agree
44	I feel that what happens in my life is often determined by factors beyond my control				
45	I often have the feeling that I am being treated unfairly				
46	Keeping healthy depends on things that I can do				
47	Over the next 5 – 10 years I expect to have many more good things than bad things happen				
48	There are certain things I can do for myself to reduce the risk of heart disease				
49	In the past 10 years, my life has been full of changes without my knowing what would happen next				
50	There are certain things I can do for myself to reduce the risk of cancer				

8

		Strongly Disagree	Disagree	Agree	Strongly Agree
51	At home I feel I have control over what happens in most situations				
52	I gave up trying to make big improvements or changes in my life a long time ago.				

Please say how much you agree or disagree with each of these statements about healthy food.

[TICK one box on each line for every item - show response prompt sheet table [iv]]

	I know that if I eat healthy foods ...	Strongly Disagree	Disagree	Agree	Strongly Agree
53	I'll feel physically more attractive				
54	I won't have any weight problems				
55	It will be good for my blood pressure				
56	I'll feel happier				
57	It will be good for my cholesterol levels				
58	Other people will admire my willpower				

A question about your clothes size ...

59	What sizes would you normally try on when buying clothes? [Circle which sizes – more than one if necessary]			
	6 – 8	8 – 10	10 – 12	12 – 14
	14 – 16	16 – 18	18 – 20	20 – 22
	22 – 24	24 – 26	26 – 28	Above

60. How would you describe your health in general?

Very bad	☐
Bad	☐
Fair	☐
Good	☐
Very good	☐

9

We want to know how you think about what you're going to cook and eat, and what you feel about preparing food. Please say how much you agree or disagree with each of these statements.

[TICK one box on each line for every item – show response prompt sheet table [VI]]

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
61	I don't think much about food each day					
62	Cooking or barbequing is not much fun					
63	Talking about what I ate or am going to eat is something I like to do					
64	Compared with other daily decisions, my food choices are not very important					
65	When I travel, one of the things I anticipate most is eating the food there					
66	I do most or all of the cleaning up after eating					
67	I enjoy cooking for others & myself					
68	When I eat out, I don't think or talk much about how the food tastes					
69	I do not like to mix or chop food					
70	I do most or all of my own food shopping					
71	I do not wash dishes or clean the table					
72	I care whether or not a table is nicely set					

10

Physical Activity

73. Have you done any paid work over the past 7 days, either as an employee or self-employed?

Yes ☐No ☐ (If No go to 75.)

73(b) Please could you give the location of your place of work

[Ask for street name and/or full postcode]

74. How much physical activity is involved in your work?

[Show response prompt card [vi] – read out examples for each category if required]

Spend most of the time sitting
e.g. in an office

☐

Spend most of the time standing or walking
but it does not require much intense physical effort
e.g. shop assistant, hairdresser.

☐

Work involves definite physical effort including
handling of heavy objects and use of tools
e.g. nurse, gardener, plumber

☐

Work involves vigorous physical activity including
handling of very heavy objects
e.g. refuse collector, construction worker

☐

75. How would you describe your normal walking pace?

Slow pace

☐

Steady average pace

☐

Brisk pace

☐

Fast pace

☐

During the last week how many hours did you spend doing the following activities?

[Tick one box per activity – show response prompt sheet [vii] if required]

		None	Some but less than 1 hour	1 hour but less than 3 hours	More than 3 hours
76	Physical exercise such as swimming, jogging, aerobics, gym				
77	Cycling, including cycling to work and during leisure time				
78	Walking, including walking to work and during leisure time				
79	Housework/childcare				
80	Gardening/DIY				

81. If you use a gym, swimming pool or leisure centre please state its location:

[Please state street name and/or full postcode]

That's all the questions.

Thank you very much for your help

Self-Efficacy

Please could you say how much you agree or disagree with these statements depending on how true they are for you

		Strongly Disagree	Disagree	Agree	Strongly Agree
1	I can manage to solve difficult problems				
2	I can find a way to get what I want				
3	It is easy for me to stick to my aims				
4	I am calm when things are difficult				
5	If I am in trouble I can usually find several solutions				

Again please could say how much you agree or disagree with these statements about healthy eating and exercising depending on how true they are for you

	<i>"I could stick to eating healthy foods even if..."</i>	Strongly Disagree	Disagree	Agree	Strongly Agree
6	I need a long time to build new habits				
7	I have to try a few times before I succeed				
8	I have to rethink my whole diet				
9	I don't receive much support from others when I start out				
10	I have to make a detailed plan				
	<i>"I could stick to an exercise routine even..."</i>	Strongly Disagree	Disagree	Agree	Strongly Agree
11	When I have worries and problems				
12	If I feel depressed				
13	When I feel tense				
14	When I am tired				
15	When I am busy				

That's the end of the questionnaire – many thanks for your help.

School of Medicine
REC No: ISOMSEC025

Appendix C Children's baseline questionnaire

Mother's ID:
Mother's DoB:
Mother's Initials:

Interviewer:	Date:
---------------------	--------------

<u>NUTRITION, EXERCISE & WELL-BEING STUDY</u> <u>Children's Diets - Baseline</u>
--

We previously asked you about what you ate, how you were feeling and what sort of physical activity you did. We are now interested in the diet and well-being of your child (aged between 2-4 years).

This questionnaire is designed to find out about what he or she eats and how well he or she eats. It also asks for some background details.

It is **not** a test and we are interested in you and your child as you really are, rather than how you would like to be.

Your answers are strictly **confidential** and your name will not be put on the questionnaire. I will store the questionnaire securely once it is completed.

You will generally be asked to indicate the answer that describes you best.

Thank you very much for your help

This questionnaire has been compiled by the Food Choice Group
Medical Research Council Epidemiology Resource Centre

2

About your child

In this section, we want to know a little bit more about your child.

1. What is the name of your child?
2. Is *(child's name)* a boy or girl? M ☐ F ☐
3. What is *(child's name)* date of birth?
(Day / Month / Year)
4. Are there any other children that live with you more than 4 days a week?
Yes ☐ No ☐ (go to Q6)
5. What are the ages of all the children that live in the house, more than 4 days a week, in birth order (eldest first)?

	Years	Months
1		
2		
3		
4		
5		
6		

(Place the number that corresponds to the study child in this box)

6. How would you describe *(child's name)* health in general?

Very bad	☐
Bad	☐
Fair	☐
Good	☐
Very good	☐

Child's eating habits

In this section, we want to know more about some of the foods (*child's name*) eats and how often he/she eats them.

[TICK one box on each line for every item – read out response prompt sheet table & refer to FFQ prompt sheet if necessary]

OVER THE PAST 3 MONTHS HOW OFTEN HAS YOUR CHILD EATEN THESE FOODS													
	Food	Never	Less than once per month	1-3 times per month	Number of times per week							More than once per day	No of times per day
					1	2	3	4	5	6	7		
7.	Green Vegetables												
8.	Root Vegetables												
9.	Salad Vegetables (inc tomatoes)												
10.	Other vegetables e.g. sweetcorn, mixed veg												
11.	Vegetable dishes and vegetarian food												
12.	Processed meat e.g. sausages, meat pies, sausage rolls												
13.	Fish or Shellfish												
14.	Chips, potato waffles or croquettes												
14.a	How many portions of chips per serving (MacDonald's size)?												
14.b	How many waffles/croquets per serving?												
15.	Roast potatoes												
15.a	How many egg sized potatoes per serving												
16.	Rice or pasta												

4

	Food	Never	Less than once a month	1-3 times per month	Number of times per week							More than once a day	No of times per day
					1	2	3	4	5	6	7		
17.	Apples or pears												
18.	Bananas												
19.	Other fresh fruit (excluding citrus)												
20.	Dried fruit												
21.	Fruit juice												
22.	Wholemeal bread												
23.	Average number of slices per serving?												
24.	White bread												
25.	Average number of slices per serving?												
26.	Chocolates sweets or lollies												
27.	Crackers												
28.	Cakes or biscuits												
29.	Crisps or savoury snacks												
30.	Water												
31.	Low calorie soft drinks												
32.	Approximately how many teaspoons of sugar does (<i>child's name</i>) have added each day to breakfast cereal, tea and coffee, etc?									Teaspoons			
33.	How much full-fat milk on average does (<i>child's name</i>) have per day in drinks, added to breakfast cereal etc?									Pints			

34. Some children nibble during the day whilst others wait for meals. Which of the following best describes the way that *(child's name)* has eaten in the past month?

Nibbles during the day, rarely eats meals ☐

Nibbles during the day, but also has meals ☐

Nibbles on some days but also has meals ☐

Doesn't nibble much, just has meals ☐

Other (please specify)

AGAIN THINKING ABOUT THE PAST MONTH, HOW OFTEN HAS <i>(child's name)</i>								
	Over the last month	Never	Once a month	Once every two weeks	1-2 times per week	3-6 times per week	Once a day	More than once a day
35.	 eaten breakfast?							
36.	 eaten an evening meal with the family?							
37.	...eaten meals whilst the television was on?							
38.	 eaten take away food including fish and chips?							
39.	...eaten whilst sat at a table?							
40.	...eaten a meal away from home?							

Please could you tell me how much you agree or disagree with the following statements about how *(child's name)* reacts to new food?

		Strongly Disagree	Disagree	Agree	Strongly Agree
41.	<i>(Child's name)</i> doesn't trust new foods				
42.	If <i>(Child's name)</i> doesn't know what's in food he/she won't try it				
43.	<i>(Child's name)</i> will eat almost anything				
44.	<i>(Child's name)</i> is afraid to eat things he/she has never had before				
45.	<i>(Child's name)</i> is very particular about the foods he/she will eat				
46.	<i>(Child's name)</i> is constantly trying new and different foods				

6

47. Over the last month how often have you had battles with *(child's name)* about food?

Never ☐

Rarely ☐

Sometimes ☐

Often ☐

Always ☐

In this section we would like to know a little more about your control over how your child eats

So thinking about your child: HOW OFTEN ...						
		Never	Rarely	Sometimes	Often	Always
48.	Are you firm about WHAT <i>(child's name)</i> should eat?					
49.	Are you firm about WHEN <i>(child's name)</i> should eat?					
50.	Are you firm about WHERE <i>(child's name)</i> should eat?					
51.	Are you firm about HOW MUCH <i>(child's name)</i> should eat?					
52.	Do you encourage <i>(child's name)</i> to eat more if you feel they haven't eaten enough that day or mealtime?					
53.	Do you avoid going to cafés or restaurants with <i>(child's name)</i> that sell unhealthy foods?					
54.	Do you avoid buying sweets and crisps and bringing them into the house?					
55.	Do you not buy foods that you would like to because you don't want <i>(child's name)</i> to have them?					
56.	Do you try not to eat unhealthy foods when <i>(child's name)</i> is around?					
57.	Do you avoid buying biscuits and cakes and bringing them into the house?					

Child's Sedentary Behaviour
--

In this next section we would like to ask you about (*child's name*) television viewing and sleeping pattern.

58. How many hours does (*child's name*) spend sitting watching television/DVD's on average per day?

None	☐
<1 hour a day	☐
1-2 hours a day	☐
2-3 hours a day	☐
3-4 hours a day	☐
4-5 hours a day	☐
>5 hours a day	☐

59. How many hours does (*child's name*) spend sitting playing on a computer or games console on average per day?

None	☐
<1 hour a day	☐
1-2 hours per day	☐
2-3 hours per day	☐
3-4 hours per day	☐
4-5 hours per day	☐
>5 hours per day	☐

60. At what time does (*child's name*) usually go to sleep at night?
(Record time in 24hr format)

----------------------	----------------------	----------------------	----------------------

61. How many times per night does (*child's name*) usually wake up for any reason?

----------------------	----------------------

(If answers 0 go to Q63)

62. When (*child's name*) does wake up, for how long are they generally awake for?

Hrs			Mins		
-----	----------------------	----------------------	------	----------------------	----------------------

63. At what time does *(child's name)* usually wake up in the morning?
(Record time in 24hr format)

--	--	--	--

64. In the last month approximately how many day's in a week has *(child's name)* had a daytime nap?

--

65. On the days that *(child's name)* naps, what is the total time spent napping?

Hrs

--

 Mins

--	--

Maternal Employment

66. Have you been employed since the birth of *(child's name)*?

Yes

--

No

--

 (end of Qr)

67. How old was *(child's name)* when you went back to work?

Years

--	--

Months

--	--

68. Approximately how many hours have you worked in the past week?

Hours

--	--

That's all the questions.

Thank you very much for your help

Appendix D Children's baseline survey information sheet

	MRC Epidemiology Resource Centre (University of Southampton) Southampton General Hospital, Southampton SO16 6YD UK NUTRITION, EXERCISE & WELL-BEING QUESTIONNAIRE CHILDREN'S DIETS EVALUATION Participant information sheet	
What do I have to do? We are inviting you complete a questionnaire about the diet of your 2-4year old child. The questionnaire is completed over the telephone. We will call at a time convenient for you to go through the questions. It will only take around 10minutes.		
	What is this study for? A few months ago you kindly completed a questionnaire for us whilst at your Sure Start Children's Centre. We asked you questions about your diet, exercise and well-being. We are now interested in finding out more about the eating habits of 2-4year old children.	
Why have I been chosen? You are a woman who completed our questionnaire about your own diet, exercise and well-being and you have a 2-4year old child.		
	Who will see what I have to say? Only people working on this study will see the questionnaire you fill in. Any information you give us will have your name taken off it before we pass it on to other researchers in our team see it and write reports. Any information you give us will be stored safely.	
		
I don't want to take part in this part of the study! If you don't want to fill in the questionnaire, or if you change your mind about it at any time, that is fine.		
What if I have a question or query about this study? Please call the Southampton Women's Survey freephone number 0800 783 4503 and leave a message for Wendy Lawrence to 'phone you back (24 hour voicemail out of office hours). If you have a complaint about the study, please contact the University of Southampton Research Governance Office on 023 8059 4456.		

Appendix E Children's surveys protocol

Nutrition, Exercise and Well-Being Study

January 2010

SIH - Children's Diets Evaluation Questionnaire – Protocol

Data collection is conducted over the telephone.

- Choose a participant to phone off the contact sheet. Check when they have stated as the best time to contact and make sure that corresponds with the current time
- When the participant answers the phone introduce yourself and say that you are from the University of Southampton.
- Say that they completed a questionnaire (Qr) with us at their local Sure Start Centre about nutrition, exercise and well-being at the beginning of last year - hopefully they'll remember, if not, give them some more reminders about the questionnaire e.g. "we asked you things like how often you ate foods over the past month and how you'd been feeling over the last few weeks"
- Go on to say that after doing the Qr they very kindly gave us their contact details so that we could get in touch in the future to ask a few more questions.
- Then say that the reason for phoning is that we have now entered the next phase of our research and we are doing a Qr that asks about the diets of 2-4yr old children and that we can see from the previous Qr that they have a child in that age range.

N.B. If their 4yr old is now 5 still conduct the interview, if they had a one yr old at baseline that has now turned 2, base the questionnaire on the 2yr old. Always base the questionnaire on the youngest of their children aged 2-4yrs. If the participant has twins, still base the questionnaire on the youngest of the twins.

- Next explain that the Qr can take around 15minutes and read out the information sheet and ask if they have any questions. If they are happy to commence tell them you can ring them back at any time most convenient with them. Finish by stating that as with any of our Qr's there is no obligation for them to do it at all.

Have the information sheet in front of you.

- **IF THEY REFUSE TO COMPLETE THE QUESTIONNAIRE** – Tell them that it's absolutely fine. Thank them for their participation so far and ask if they would rather not be contacted again.
- **IF THEY ARE HAPPY TO GO AHEAD** – either make a note of the time and day when best to phone them back, or, if they would like to start now then **fill in the identifiers on the front of the Qr first** and read out the following information (also found on the front of the questionnaire)

"We previously asked you about what you ate, how you were feeling and what sort of physical activity you did. We are now interested in the diet of your child (aged between 2-4 years).

This questionnaire is designed to find out about what he or she eats and how well he or she eats. It also asks for some background details.

It is **not** a test and we are interested in you and your child as you really are, rather than how you would like to be.

Your answers are strictly **confidential** and your name will not be put on the questionnaire. I will store the questionnaire securely once it is completed."

Nutrition, Exercise and Well-Being Study

January 2010

- At the end of the questionnaire thank them for their time and mention that we may still want to contact them again in the future and ask if this is still ok.
 - IF NOT OK – place an X next to their name on the contact sheet
 - IF IT IS OK - place a ✓ next to their name on the contact sheet.

Appendix F Children's surveys prompt card

SIH – Children's Qr

January 2010

Prompt Cards to accompany SIH children's diets evaluation questionnaire.

Food Frequency Questionnaire (Q's 7-33)

Food Category:

Green Vegetables *Includes:* peas, green beans, leeks, broccoli, cauliflower, courgettes, marrow, cabbage, spring greens, spinach, kale and brussel sprouts.

*Fresh or frozen NOT tinned.

Root Vegetables *Includes:* carrots, parsnips, swede and turnips NOT potatoes

*Fresh or frozen NOT tinned

Crisps or Savoury Snacks *Includes:* Any type of crisps e.g. potato or corn based. Baked or fried etc

Water

*If answers 'more than once per day' ask how many regular size (200ml) beakers and place that value in the 'no of times per day box'

Salad Vegetables *Includes:* lettuce, cucumber, pepper, celery, watercress and tomatoes

*Tomatoes can be fresh or tinned but NOT tinned tomatoes added to meat casseroles or minced meat dishes.

Other Vegetables *Includes:* Sweetcorn and mixed vegetables

*Fresh or frozen NOT tinned.

Fish or Shellfish *Includes:* fish fingers, fish cakes, fish from the chip shop, grilled, poached and baked, fish in a pie and fish in sauce, white fish, oily fish and shellfish.

*Tinned, frozen or fresh

Chips, Potato Waffles or Croquettes

* 1 waffle, 2 croquettes or 5 regular size oven chips = 1 portion OR 1 regular size McDonalds chips = 2 portions

Roast Potatoes *Includes:* fresh or frozen.

* NOT including sweet potato

Chocolate, Sweets or Lollies *Includes:* any confectionary

Processed Meat *Includes:* beef burgers, lamb burgers, bacon, gammon, sausages, meat pies, sausage rolls, chicken or turkey in batter or breadcrumbs, ham and processed cold meats.

*Fresh, frozen or tinned

SIH – Children's Qr

January 2010

Rice or Pasta *Including:* white or brown rice and pasta, tinned pasta in tomato sauce, pasta or rice in dishes such as lasagne or risotto, and noodles.

*Fresh or dried

Low Calorie Soft Drinks *Including:* Diet fizzy drinks, 'no-added sugar' squash, Ribena light/toothkind, low sugar high juice and flavoured water

Dried Fruit *Including:* dates, raisins, apricots, pineapple, banana etc

Fruit Juice *Including:* pure fruit juices only NOT fruit drinks e.g. Sunny Delight, Five Alive etc

Wholemeal Bread *Including:* any brown bread (granary, multigrain etc) toast, rolls, rye bread, wholemeal pitta, 'best of both' or '50/50' bread

White Bread *Including:* mighty white, toast, rolls, white pitta bread, croissants or bagels

Bananas *Including:* fresh only

Crackers *Including:* crackers (oatcakes, water biscuits etc), cheese biscuits or breadsticks.

Cakes or Biscuits *Including**: sponge cake, cake bars, scones, currant buns, Danish pastries, jam tarts, rice krispie cakes, doughnuts, plain and chocolate digestives, plain and chocolate hobnobs, wrapped chocolate biscuits, chocolate fingers, sandwich biscuits, rich tea or shortcake.

*This is not the entire list; if someone mentions a cake or biscuit that is not listed here it still counts and should be recorded just the same.

Apples or Pears *Including:* fresh only NOT tinned or stewed

Other Fresh Fruit (excluding citrus) *Including:* peaches, nectarines, melon, strawberries, raspberries, mango, kiwi, pineapple, plums, cherries or grapes. NOT oranges, satsumas, clementines and grapefruit.

Vegetable Dishes and Vegetarian Food *Including:* a meal that comprises of no meat or fish e.g. ratatouille, vegetable curry, vegetable lasagne etc, OR vegetarian food e.g. vegeburgers, vegesausages, tofu, quorn etc.

.....

MJ_PhD_2010

SIH – Children's Qr

January 2010

Family Feeding Environment Scale (Q's 35-40)

Q37. "Eaten meals whilst the television was on" – this includes ANY time where the television is on during a meal even if the participant says its on 'in the background'.

Q37-40. For questions where the participant answers 'more than once per day' ask how many times and place the number in the box (don't just tick it!)

Covert/Overt Control Scale (Q's 48-57)

"How often" should come before each question in the scale. So its:

"How often are you firm about what (*child's name*) should eat?

"How often are you firm about when (*child's name*) should eat? Etc.

Time Spent Sedentary (Qs 58 & 59)

If the participant answers with a single value answer e.g. 2hours per day, then ask them whether they feel it's more like 1-2hours or 2-3hours per day and place them in the corresponding category.

Sleep Duration (Q's 60-65)

Q61. Place whatever value the participant gives you in the box provided. If the participant states that her child does not wake up EVERY night then write this information as a note on the questionnaire.

Q62. Record the time given by the participant regardless of the length.

MJ_PhD_2010

Appendix G Children's follow-up survey protocol

Nutrition, Exercise and Well-Being Study

August 2011

SIH - Children's Diets Evaluation Follow-Up Questionnaire – Protocol

Data collection is conducted over the telephone.

- Choose a participant to phone off the contact sheet. Check when they have stated as the best time to contact and make sure that corresponds with the current time
- When the participant answers the phone introduce yourself and say that you are from the University of Southampton.
- Say that they have very kindly completed a few questionnaire's (Qr) with us over the last two years about their own diet and the diet of one of their children (use **child's name**)
- Go on to say that after doing the Qr's they very kindly agreed to be contacted again in the future to be asked a few more questions.
- Then say that the reason for phoning is that we have now entered the next phase of our research and we are repeating the Qr about the diet of (**child's name**) so that we can look at patterns in children's diets.
- Next explain that the Qr is just the same as before and can take around 15minutes. State that if they are happy to go through it you complete it now or you can ring them back at any time most convenient with them. Finish by stating that as with any of our Qr's there is no obligation for them to do it at all.
- BEFORE STARTING THE INTERVIEW – state “can I confirm that you are giving your consent to complete this questionnaire? And ask “have you got any questions before we begin?” Answer any questions and then start the interview
- IF THEY REFUSE TO COMPLETE THE QUESTIONNAIRE – Tell them that it's absolutely fine. Thank them for their participation so far and ask if they would rather not be contacted again.
- IF THEY ARE HAPPY TO GO AHEAD – either make a note of the time and day when best to phone them back, or, if they would like to start now then **fill in the identifiers on the front of the Qr first.**
- BEFORE STARTING THE INTERVIEW – state “can I confirm that you are giving your consent to complete this questionnaire? And ask “have you got any questions before we begin?” Answer any questions and then start the interview
- Now read out the following information (also found on the front of the questionnaire)

“We previously asked you about what you ate, how you were feeling and what sort of physical activity you did. We have also asked you about the diet of (child's name) and we would now like to repeat that questionnaire so that we can look at patterns of children's diets over time.

This questionnaire is designed to find out about what (child's name) eats and how well they eats. It also asks for some background details.

It is not a test and we are interested in you and your child as you really are, rather than how you would like to be.

Your answers are strictly confidential and your name will not be put on the questionnaire. We will store the questionnaire securely once it is completed.”

Appendix H Children's follow-up questionnaire

Mother's ID:
Mother's DoB:
Mother's Initials:

Interviewer:	Date:
---------------------	--------------

<u>NUTRITION, EXERCISE & WELL-BEING STUDY</u>
<u>Children's Diets – Follow-up</u>

We previously asked you about what you ate, how you were feeling and what sort of physical activity you did. We have also asked you about the diet of one of your children and we would now like to repeat that questionnaire so that we can look at patterns of children's diets over time.

This questionnaire is designed to find out about what (*Child's name*) eats and how well he or she eats. It also asks for some background details.

It is **not** a test and we are interested in you and your child as you really are, rather than how you would like to be.

Your answers are strictly **confidential** and your name will not be put on the questionnaire. I will store the questionnaire securely once it is completed.

You will generally be asked to indicate the answer that describes you best.

Thank you very much for your help
--

This questionnaire has been compiled by the Food Choice Group
Medical Research Council Lifecourse Epidemiology Unit
University of Southampton
August 2011

School of Medicine Ethics Committee No: SOMSEC037.09

2

About your child

Look at the contact sheet and note the name of the child – use it throughout the questionnaire wherever you see (child's name) written.

To begin we would like to know a bit more about other children in the house

1. Are there any other children that live with you more than 4 days a week?

Yes ☐ No ☐ (go to Q3)

2. What are the ages of all the children that live in the house, more than 4 days a week, in birth order (eldest first)?

	Years	Months
1		
2		
3		
4		
5		
6		

(Place the number that corresponds to the study child in this box)

Now we would like to know about (child's name)

3. How would you describe (child's name) health in general?

Very bad	☐
Bad	☐
Fair	☐
Good	☐
Very good	☐

Child's eating habits

In this section, we want to know more about some of the foods (*child's name*) eats and how often he/she eats them.

[TICK one box on each line for every item – read out examples from the FFQ prompt sheet for each item]

OVER THE PAST MONTH HOW OFTEN HAS YOUR CHILD EATEN THESE FOODS													
	Food	Never	Less than once per month	1-3 times per month	Number of times per week							More than once per day	No of times per day
					1	2	3	4	5	6	7		
4.	Green Vegetables												
5.	Root Vegetables												
6.	Crisps or savoury snacks												
7.	Water												
8.	Salad Vegetables (inc tomatoes)												
9.	Other Vegetables e.g. sweet corn, mixed veg												
10.	Fish or Shellfish												
11.	Chips, potato waffles or croquettes												
11.a	How many portions of chips per serving (MacDonald's size)?												
11.b	How many waffles/croquets per serving?												
12.	Roast potatoes												
12.a	How many egg sized potatoes per serving												
13.	Chocolates sweets or lollies												

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	Food	Never	Less than once a month	1-3 times per month	Number of times per week							More than once a day	No of times per day
					1	2	3	4	5	6	7		
14.	Processed meat e.g. sausages, meat pies, sausage rolls												
15.	Rice or pasta												
16.	Low calorie soft drinks												
17.	Dried fruit												
18.	Fruit juice												
19.	Wholemeal bread												
20.	Average number of slices of wholemeal bread per serving?												
21.	White bread												
22.	Average number of slices of white bread per serving?												
23.	Bananas												
24.	Crackers												
25.	Cakes or biscuits												
26.	Apples or pears												
27.	Other fresh fruit (excluding citrus)												
28.	Vegetable dishes and vegetarian food												
29.	Approximately how many teaspoons of sugar does (<i>child's name</i>) have added each day to breakfast cereal, tea and coffee, etc?									Teaspoons			
30.	How much full-fat milk on average does (<i>child's name</i>) have per day in drinks, added to breakfast cereal etc?									Pints			

31. How many meals in the last week has *(child's name)* consumed at school/playschool/childminders? [Excluding day care with friends & family members]
If zero go to Q33
32. Does *(child's name)* eat a packed lunch that you provide or meals provided by the school/playschool?
Packed lunch ☐ School meal ☐
33. Some children nibble during the day whilst others wait for meals. Which of the following best describes the way that *(child's name)* has eaten in the past month?
- Nibbles during the day, rarely eats meals ☐
- Nibbles during the day, but also has meals ☐
- Nibbles on some days but also has meals ☐
- Doesn't nibble much, just has meals ☐
- Other *(please specify)* _____

AGAIN THINKING ABOUT THE PAST MONTH, HOW OFTEN HAS <i>(child's name)</i>								
	Over the last month	Never	Once a month	Once every two weeks	1-2 times per week	3-6 times per week	Once a day	More than once a day
34.	 eaten breakfast?	☐	☐	☐	☐	☐	☐	☐
35.	 eaten an evening meal with the family?	☐	☐	☐	☐	☐	☐	☐
36.	...eaten meals whilst the television was on?	☐	☐	☐	☐	☐	☐	☐
37.	 eaten take away food including fish and chips?	☐	☐	☐	☐	☐	☐	☐
38.	...eaten whilst sat at a table?	☐	☐	☐	☐	☐	☐	☐
39.	...eaten a meal away from home?	☐	☐	☐	☐	☐	☐	☐

Please could you tell me how much you agree or disagree with the following statements about how *(child's name)* reacts to new food?

		Strongly Disagree	Disagree	Agree	Strongly Agree
40.	<i>(Child's name)</i> doesn't trust new foods				
41.	If <i>(Child's name)</i> doesn't know what's in food he/she won't try it				
42.	<i>(Child's name)</i> will eat almost anything				
43.	<i>(Child's name)</i> is afraid to eat things he/she has never had before				
44.	<i>(Child's name)</i> is very particular about the foods he/she will eat				
45.	<i>(Child's name)</i> is constantly trying new and different foods				

46. Over the last month how often have you had battles with *(child's name)* about food?

- Never ☐
- Rarely ☐
- Sometimes ☐
- Often ☐
- Always ☐

In this section we would like to know a little more about your control over how your child eats

So thinking about your child: HOW OFTEN...						
		Never	Rarely	Sometimes	Often	Always
47.	Are you firm about WHAT <i>(child's name)</i> should eat?					
48.	Are you firm about WHEN <i>(child's name)</i> should eat?					
49.	Are you firm about WHERE <i>(child's name)</i> should eat?					
50.	Are you firm about HOW MUCH <i>(child's name)</i> should eat?					

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	HOW OFTEN.....	Never	Rarely	Sometimes	Often	Always
51.	Do you encourage <i>(child's name)</i> to eat more if you feel they haven't eaten enough that day or mealtime?					
52.	Do you avoid going to cafés or restaurants with <i>(child's name)</i> that sell unhealthy foods?					
53.	Do you avoid buying sweets and crisps and bringing them into the house?					
54.	Do you not buy foods that you would like to because you don't want <i>(child's name)</i> to have them?					
55.	Do you try not to eat unhealthy foods when <i>(child's name)</i> is around?					
56.	Do you avoid buying biscuits and cakes and bringing them into the house?					

Child's Sedentary Behaviour

In this next section we would like to ask you about *(child's name)* television viewing and sleeping pattern.

57. How many hours does *(child's name)* spend sitting watching television/DVD's on average per day? *[Remind them to consider weekends as well]*

None ☐ <1 hour a day ☐ 1-2 hours a day ☐ 2-3hours a day ☐

3-4 hours a day ☐ 4-5 hours a day ☐ >5 hours a day ☐

58. How many hours does *(child's name)* spend sitting playing on a computer or games console on average per day? *[Remind them to consider weekends as well]*

None ☐ <1 hour a day ☐ 1-2 hours a day ☐ 2-3hours a day ☐

3-4 hours a day ☐ 4-5 hours a day ☐ >5 hours a day ☐

59. Does *(child's name)* have a television in their bedroom?

Yes ☐ No ☐

60. At what time does *(child's name)* usually go to sleep at night?
(Record time in 24hr format)

--	--	--	--

61. How many times per night does *(child's name)* usually wake up for any reason?
(If answers 0 go to Q63)

62. When *(child's name)* does wake up, for how long are they generally awake for?
Hrs Mins

63. At what time does *(child's name)* usually wake up in the morning?
(Record time in 24hr format)

How often do you use these methods to settle(<i>child's name</i>) if they wake up during the night...						
		Never	Rarely	Sometimes	Often	Always
64.	Remove them from their bed and take into another room					
65.	Talk, sing to or pat/stroke (<i>child's name</i>) if their bed					
66.	Put a television on in (<i>child's name</i>) bedroom					
67.	Leave (<i>child's name</i>) to settle themselves					

68. In the last month approximately how many days in a week has *(child's name)* had a daytime nap?

69. On the days that *(child's name)* naps, what is the total time spent napping?
Hours Min

Maternal Employment

70. Have you been employed since the birth of *(child's name)*?
Yes No (end of Qr)

71. How old was *(child's name)* when you went back to work?
Years Months

72. Approximately how many hours have you worked in the past week?
Hours

That's the end of the questionnaire. Thank you for your time

Appendix I Characteristics of those who did and did not attend Sure Start over the study period

Characteristic	Did not attend Sure Start N=55	Did attend Sure Start N=151	P Value
Child age (mean(SD))	3.5 (0.9)	3.3 (0.9)	0.22
Child gender (n(%))			
Male	23 (42)	80 (53)	0.17
Female	32 (58)	72 (47)	
Number of siblings (n(%))			
0	15 (27)	53 (35)	0.62
1	29 (53)	70 (46)	
2	8 (15)	17 (11)	
3+	3 (5)	12 (8)	
Childs prudent diet score (z-score)	0.22 (1)	0.06 (0.9)	0.28
Mothers age (mean(SD))	34.5 (4.9)	32.3 (5.0)	0.006
Mothers educational level (n(%))			
≤GCSE	19 (35)	50 (33)	0.88
>GCSE	20 (36)	61 (40)	
<Degree	19 (29)	41 (27)	
Mothers employment (n(%))			
Yes	34 (38)	87 (57)	0.55
No	21 (62)	65 (43)	
Mothers prudent diet score (z-score)	0.33 (1)	0.08 (0.9)	0.08
Mothers cluster membership (n(%))			
Less resilient	15 (29)	46 (32)	0.68
More resilient	37 (71)	98 (68)	
Food insecurity (n(%))			
Food secure	49 (91)	127 (84)	0.19
Food insecure/hungry	5 (9)	25 (16)	
In receipt of benefits (n(%))			
Yes	22 (40)	60 (39)	0.95
No	33 (60)	92 (61)	

Appendix J Focus group participant information sheet

Document C

MRC Lifecourse Epidemiology Unit (University of Southampton) Southampton General Hospital, Southampton SO16 6YD UK NUTRITION, EXERCISE & WELL-BEING CHILDREN'S DIETS DISCUSSION GROUPS Participant information sheet	
Would you like to take part in a discussion group & join us for refreshments? We are inviting you to take part in a discussion about your child's eating habits with 5 - 8 other parents like you. This will last about an hour and half, and will be held at a time to suit you and the others. We will provide refreshments and crèche facilities.	
	What is this study for and what's in it for me? We have been finding out about the diets and lifestyles of mothers and their children attending Sure Start Children's Centres in Hampshire. We are now interested in talking to mothers about the eating habits of their children because we want to help Sure Start give you the best support possible. We hope you'll enjoy the group. Should anything be said that worries you, we will make someone available to discuss it with you.
Why have I been chosen? You are a mother who has a child aged between two and five years, and who attends Sure Start Children's Centres.	
I don't want to take part in these discussion groups! If you don't want to take part in the discussion group, or if you change your mind about it at any time, that is fine.	
	Who will see what I have to say? The discussions will be audio recorded and then transcribed by the researchers. The recordings will then be destroyed. Only people working on this study will see any information you give us. Any information will have your name taken off it before other researchers in our team see it and write reports. All this information will be stored safely.
What if I have a question or query about this study? Please call the Southampton Women's Survey freephone number 0800 783 4503 and	

Appendix K Focus group protocol



Protocol for a qualitative study to explore mothers' perceptions of the influences on the food choices they make for their preschool children

Researchers

Dr Mary Barker, Miss Megan Jarman, Miss Ilona Cahill

Funder

NIHR Biomedical Research Unit in Nutrition, University of Southampton

Procedure

MJ will attend meetings and parent groups identified by the Children's Centres managers to introduce the study to the women attending and provide them with participant information sheets. MJ and IC will then meet with the group the following week to run the discussion with the women who have agreed to take part. The focus group session will follow the procedure detailed below:

As arriving:

Welcome & Introductions

Badges/labels

Help selves to drinks/snacks

Fill out consent form

Fill out questionnaire

When all arrived:

Briefly explain the project

Ground Rules:-

1" names only

Everyone's contribution is important

Keep conversation in group

Anyone can ask for clarification/explanation of points at any time

Confidentiality & anonymity (names changed, information stored securely etc)

Women introduce themselves briefly.

Tell women we will be discussing all aspects of their young child's diets and what influences the food choices they make for their children – loosely structured around their average day.

Discussions are then facilitated in line with the themes specified in the question route.

Version 01 11/2012

**Data protection and anonymity**

Participants will be assigned an ID number which will appear on the consent form. This ID number will then be transferred onto the background questionnaire. The participants name will only appear on the consent form and these will be stored securely at the MRC Lifecourse Epidemiology unit and separately from their questionnaire. The focus groups will be audio-recorded and anonymised at the time of transcription. Data will be stored at the MRC Lifecourse Epidemiology Unit as laid down in MRC guidelines All paper work and focus group recordings will be kept in locked filing cabinets in the secure MRC Lifecourse Epidemiology Unit building. All personal, identifying data will be kept separate from the questionnaires and discussion recordings. After the recordings have been transcribed (during which they will be anonymised) the recordings will be destroyed. All electronic data is password protected or carried on encrypted laptops. Long-term data storage is governed by MRC guidelines and will be the responsibility of data management staff employed by the MRC.

Appendix L Focus group Ice breaker



Appendix M Focus group demographic questionnaire

Document E

Location:	ID:
	DoB:

Moderator:	Date:
Observer:	

<u>Children's diets focus group discussions</u>
--

We would like to find out a few details about the women who take part in our discussion groups.

You do not have to answer any question that you do not wish to and this will not affect your participation in the discussion group.

Your answers are strictly confidential and your name will not be put on the questionnaire. I will take the questionnaire away when you have finished.

Thank you very much for your help
--

Medical Research Council Lifecourse Epidemiology Unit
University of Southampton

Version number: 02_12/2012
Ethics committee approval number: 4284

2

About you

- 1(a) How many children (under 18 years) live with you?
- 1(b) How old are they?
[Specify months or year]
2. Have you passed any exams or do you have any formal qualifications?
[Enter number in the box to show highest level reached]
- None
 - CSE / School cert / GCSE (grade D or lower) / NVQ1 / Foundation GNVQ
 - O levels / Matric / GCSE (grade A,B,C) / RSA secretarial / NVQ2 / Intermediate GNVQ
 - A levels / City & Guilds / EN(G) / ONC / NNEB / BTech (day release) / NVQ3 / Advanced GNVQ / OND / HNC
 - HND / RGN / Teaching Cert / NVQ4
 - Degree / NVQ5
 - Other (specify)
3. To which of the following ethnic groups do you feel you belong?
[Show participant ethnic group prompt card]
- | | | | |
|-----------------|--------------------------|-------------------|--------------------------|
| White | ☐ | Bangladeshi | ☐ |
| Black Caribbean | ☐ | Chinese | ☐ |
| Black African | ☐ | Other Asian group | ☐ |
| Black other | ☐ | Mixed | ☐ |
| Indian | ☐ | Arabic | ☐ |
| Pakistani | ☐ | Other American | ☐ |
- Other, please specify: _____

5.	What sizes would you normally try on when buying clothes?			
	6 – 8	8 - 10	10 - 12	12 - 14
	14 - 16	16 - 18	18 - 20	20 -22
	22 - 24	24 - 26	26 - 28	Above

Appendix N Focus group question route

Document E

Children's diets focus group discussions

Discussion route

We are interested in finding out about your child's eating habits and mealtimes in your home.

- **Control over children's diets**
 - "What things do you all do to try to get your children to eat foods you would like them to eat?"
 - "What things do you do to limit your child eating foods you don't want them to have?"
 - "What things make it difficult to control your child's eating habits?"
- **Mealtime environment**
 - "What do mealtimes in your households look like?"
 - Prompt if needed – "do you tend to all eat together, at a table?"
 - "What makes you choose to ... (e.g. eat separately, eat with the TV on)?"
- **Influences of Sure Start**
 - "How does coming to Children's Centres affect your child's diet?"
 - Prompt if needed – "has your child started eating new things since coming here?"
 - "What support does your children's centre offer on healthy eating?"
 - "How has this changed how your child eats at home?"
 - "What things would you like children's centres to start doing or do more of in regards to children's diet and health?"
- **Mothers considerations of the most important influences on food choices**
 - "What things influence you when you are choosing food for your child?"
 - Prompt "when you're shopping and cooking at home and eating out"
- **Transitions and changes**
 - "Have any of you returned to work after having your child?"
 - "How do you think your child's diet changed when you returned to work?"
 - "Have any of you got older children who are attending school?"
 - "Has going to school changed their diet at all?"
 - e.g. do they have school dinners, do they ask for foods that their friends have?

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Appendix O Focus group analysis coding frame

Group discussions: What factors influence mothers when feeding their young children **FG No: 1, 2, 3 and 4** **Date: 15-08-2013** **Coder: MJ & LS**

Themes (& sub-themes)	Descriptors	Line nos	Example quote
Child influence			
Child preferences	Giving the child what they want	FG1: 16, 113, 206, 327-328, 365, 370-371, 627, 974-978, 1035-1038, 1040, 1045-1046, 1087-1088 FG2: 22, 23, 24, 172, 173, 264-265, 469, 524, 541, 553-554, 558, 562-563, 576-587, 590-591, 857, 860 FG3: 495-496, 498-499, 527-528, 529-534, 722-723, 728-729, FG4: 4, 6, 8-9, 10, 11, 12, 15-16, 18, 35, 37, 45, 329, FG1: 173-176, 178, 180-181, 212-215, 218-219, 621-622, 642, 643, 644, 1158 FG2: 176-179, 191-192, 199, 204-205, 207, 221, 301-303, 771-773 FG3: 55-56, 205, 208-209, 273, 531, 544-547, 548, 549, 550, 554, 571-572	"You're like oh what do you want to eat, I'll cook whatever you want"
Appetite	Perception of the child's appetite	FG1: 173-176, 178, 180-181, 212-215, 218-219, 621-622, 642, 643, 644, 1158 FG2: 176-179, 191-192, 199, 204-205, 207, 221, 301-303, 771-773 FG3: 55-56, 205, 208-209, 273, 531, 544-547, 548, 549, 550, 554, 571-572	"or she'll eat her dinner and then be like 'oh I'm still really hungry I ain't had no dinner tonight"
Fussy eating	Children being fussy or picky with what they'll eat	FG1: 32-33, 39, 42-43, 68-69, 71-72, 74-76, 78-81, 83-85, 97-99, 103-105, 165-167, 227-230, 370-374, 551-553, 554, 998-1004, 1189 FG2: 11, 17, 18, 19-20, 45, 66, 67-68, 70, 75, 84, 106, 138, 140, 141-143, 145, 148, 295-297, 298-302, 469-472, 473, 480-481, 483-539-541, 542, 546, 549, 551-552, 559, 568, 585-586, 588, 647, 728, 734-735, 740, 741, 742, 783, 828, 845, 849, 867, 913, 915, 942, 943, 944, 945, FG3: 12-14, 53-56, 135-138, 239-244, 246-250, 529-534, 623-628, 646-650, 708-709 FG4: 66, 71-72, 78, 129-130, 133-134, 135, 139-140, 141, 142, 143, 144, 145, 146-147, 238, 244-245, 248-250, 251, 252, 253, 255, 256, 293, 1070, 1075, 1076, 1078, 1080, 1082, 1083-1084, FG5: 66, 282-296, 317-320, 541-543, 583-584, 922-931, 932-939, 940-945, 948-952, 275-277, 278 156-157, 175-176, 182, 363, 380, 382-387, 398-401, 494-497, 499, 501-504, 507-508, 653-654, 679-681, 743-745, 747-753, 757-758, 764-766, 770-771, 773-775, 782-785, 788-794, 796, 836-837, 365-367, 854, 858-859, 950-954, 1056, 1091, 1100, 1102-1104, 1106-1107, 1109-1111, 1181, 1286-1287, 1295, 1323-1327, 1329-1330	"[Ethan's] like that though he sticks to what he eats and he won't really try anything new"
Illness/Conditions	A diagnosed illness or condition of the child	FG5: 66, 282-296, 317-320, 541-543, 583-584, 922-931, 932-939, 940-945, 948-952, 275-277, 278 156-157, 175-176, 182, 363, 380, 382-387, 398-401, 494-497, 499, 501-504, 507-508, 653-654, 679-681, 743-745, 747-753, 757-758, 764-766, 770-771, 773-775, 782-785, 788-794, 796, 836-837, 365-367, 854, 858-859, 950-954, 1056, 1091, 1100, 1102-1104, 1106-1107, 1109-1111, 1181, 1286-1287, 1295, 1323-1327, 1329-1330	"But not so much now, because my daughters just been diagnosed with autism, and they said that one of the factors into why shes so fussy"
Maternal influence			
Modelling	Food behaviours of the mothers	FG1: 25, 39, 48-50, 89-90, 169-170, 180-181, 183-184, 188, 251-252, 255, 476-477, 508-519, 580-582, 593, 654-655, 799, 800-802, 804, 806-814, 816-821, 822, 847-848, 870-873, 982-984, 986 FG2: 26-27, 29, 30, 31-32, 48-50, 725-727, 730-731, 732-733, 838, 855, 862, 882, FG3: 81-83, 89, 91-92, 102-103, 669-671, 672-674, 682-683 FG4: 160-163, 442-443, 1021-1024, 1043-1045, 1047-1048, 1051-1052, 1057, 1059, 1092-1095 FG1: 78-79, 97-99, 110-111, 114-116, 118-120, 618-619, 620, 1097 FG2: 14, 275-276, 301-303, 853, 856, 859-861, 884, 887, 889-890, 912 FG3: 695-699 FG4: 45-46,	"I have friends whose kids are fussy but so are they, so because they won't eat it the children won't eat it"
Concerns/anxiety	Concerns with what or how much their child eats	FG1: 78-79, 97-99, 110-111, 114-116, 118-120, 618-619, 620, 1097 FG2: 14, 275-276, 301-303, 853, 856, 859-861, 884, 887, 889-890, 912 FG3: 695-699 FG4: 45-46,	"Yeah cos if your kid doesn't eat it upsets you doesn't it cos you're worried like that they're not eating so you fuss over them"

Parenting skills	Difficulties with children's challenging behaviour	FG1: 341-342, 346-347, 349-352, 368-369, 444, 445, 478-481, 556-559, 824-825, 1141, 1160-1164, 1163-1164, 1167-1177, 1179-1180 FG2: 23-24, 72-73, 106-107, 281-289, 327-334, 472, 485, 545, 553 FG3: 112-119, 252-253, 273-274, 284-289, 468-469, 706, 731-732 FG4: 38-39, 59, 192, 320, 1220, 1278-1280	"Em practically every night it's just yeah it is i hate dinner times dinner times and bed times they're just i dunno like an Indiana Jones film"
Celebration/treats	Special occasions changing normal food provision or using food as a treat	FG1: 404, 472-474, 755, 991, 1183-1184 FG2: 214, 222, 272 FG3: 556-557 FG4: 163, 165-166, 169, 170, 171-172, 429-431, 445, 450-451, 454, 456, 464-467, 525-527, 557-558, 565-567, 568-570, 767	"Mine on a Saturday, they have what they want on a Saturday"
Past experience	Mothers' past experiences with food	FG1: 271-272, 427-429, 431, 436-443, 601-603, 604-606, 692-693, 694-695, 878, 881-884, 886-887, 1013, 1015, 1017, 1018, 1019-1022, 1092-1096, 1098-1101, 1104-1105, 1117-1118, 1119-1123, 1125, 1135, 1136-1139 FG2: 169, 274, 295, 555, 576-579 FG3: 91-92, 383-389, 415-416, 417, 418, 420, 423-425, 560-562, 565-566, 567-569, 572, 575, 582, 584-585, 589-591, 594 FG4: 609-611, 614-615, 817-820, 1028-1029	"When you think it stems from your childhood and how you were treated as a kid with food, it's how you're going to treat your children and then your children's children"
Food priorities	The level of priority mothers give to food	FG1: 34, 310-313, 463, 466-467, 469-470, 560-563, 608-612, 732-734, 739-741, 742, 743-748, 970-973, 992-996, 1126-1128 FG2: 33, 34, 47, 52, 522, 523, 525, 530, 553, 616, 617, 631, 650, 652, 653, 656, 750-755, 921, 922, 924-925, 928, 929 FG3: 165-167, 425-426, 428-434, 474-476, 479, 481-483, 505 FG4: 112, 751, 1096-1101	"...you get in and you're shattered and the last thing you wanna do is prepare a big meal"
Feeding skills and strategies	Skills or knowledge about food and ways to try and control their child's diet	FG1: 314-315, 396-399, 618-619, 632-634, 667-668, 671-674, 824-825, 748-749, 979-980, 1016, 1023-1026, 1159, 1160-1161, 1163, 1164, 1167-1177, 1179-1180 FG2: 200, 209-210, 476-478, 481, 564-566, 746, 748-749, 757-762, 767-769, 869, 893-894, 897, 898-902 FG3: 85-87, 365-367, 398-401, 641-642, 690-694, 703-705 FG4: 40-44, 47-48, 50-52, 61, 62-63, 65, 83-84, 122-123, 192, 224, 227, 413, 470-472, 554-556, 617-618, 624-626, 636-638, 641-642, 644-651, 658, 662-663, 671-673, 674-678, 693-695, 1028-1031, 1120, 1243-1244, 1250-1255, 1257-1259, 1266-1267, 1269-1270 FG1: 834-836, 838, 844-846 FG2: 594, 595, 596, 597, 598, 599-600, 601, 603, 604, 605-606, 607-608, 610 FG3: 536-541, 543-544, 547-549 FG4: 90, 94-97, 98, 99, 228-229, 230-231, 232, 439, 483, 961-963	"like fish fingers chicken dippers, which I think are quite healthy if you buy like real chicken ones"
Child involvement	Encouraging the child to participate in food preparation	FG1: 56, 60-61, 74-76 FG2: 57, 61, 62-63, 64-66 FG3: 93-96, 100-101, 341-342, 653-656 FG4: 74, 78-80, 82-83, 85, 87, 90-95, 100-101, 127-128, 202-203, 211, 212-213, 215, 216-219, 227, 236-238, 473, 478-481, 726	"They learn at pre-school as well don't they, they do things like buttering and they put on icing sprinkles don they and buttering jam bread and"
Food presentation	Trying to make the food appealing to the child or hiding foods within a meal	FG1: 17, 18, 19, 23-24, 41, 305-306, 598-600, 896, 898, 900-902, 903-904, 905-912 FG2: 31-32, 55, 98, 100, 132-135, 139, 180, 183-186, 220, 538, 542-543 FG3: 16, 19-20, 24-25, 26-37, 46-48, 122-127, 170-174,	"The meat. I used to cut it with dinosaur cutters"
Reinforcement	Providing something the child wants in response to them eating desired food	FG1: 17, 18, 19, 23-24, 41, 305-306, 598-600, 896, 898, 900-902, 903-904, 905-912 FG2: 31-32, 55, 98, 100, 132-135, 139, 180, 183-186, 220, 538, 542-543 FG3: 16, 19-20, 24-25, 26-37, 46-48, 122-127, 170-174,	"see pudding is used as bribery cool in my house if they don't eat it they don't get pudding and they can sit and watch the others have pudding if they haven't eaten all of it"

		FG1: 28-29, 31, 190-191, 193-195,	
Exposure	Limiting or increasing exposure to desirable or undesirable food	FG1: 224, 225, 232, 238-239, 259, 264-265 FG2: 81-82, 153, 154, 156, 174, 175, 182, 183-186, 546, 736 FG3: 105-109, 125-128, 130-132, 154-157, 167-169, 179-182, 701-703, FG4: 66-68, 132, 153-154, 168, 196-200, 202-203, 206-207, 426, 427-428, 434-435, 437, 440, 463, 1241-1242	"And I'll always put it on her plate. I know she's not going to eat it. But over time, one day, eventually, one day she will eat it"
Go hungry	Not allowing the child any more food if they have refused meals	FG1: 55, 165-167, 1143-1145 FG2: 76-80, 110-111, 116, 533, 535-537, 544 FG3: 644-648, 649, 711-717, 722 FG4: 36	"And he doesn't eat it. So he goes hungry. Because I don't give him anything else. I won't give him anything else. I'm strict on that one."
Negotiate	Compromising with their child about how much they have to eat	FG1: 891, 913-917, FG2: 102, 104-105, 109	"What I also do as well is like ok so you eat this half and you can leave that half"
Planning	Planning ahead about what food to buy or meals to make	FG1: 314-315, 710-713, 759-761, 762-770, FG2: 406, 449, 526-528, 530-533, 616-624, 625-632, 653-655, FG3: 477-478, 486-487, 500-511, 735-740, 746-748 FG4: 124, 729-737, 738-739	"You can't sit down and think right what are we going to eat for the next 7 days"
Home/Social environment			
Siblings	Siblings having positive or negative influence on children's diets	FG1: 288-292, 301-303, 445-449, 615-617, FG3: 120-124, FG4: 788-794	"It's hard to get them all to be sat and behaving at the same time when the older ones are annoying the younger ones and I get pea flicking"
Partners/fathers	Positive of negative influence from partners or fathers.	FG1: 48-50, 236, 247-249, 954-955, 960 FG2: 22, 142, 687, 690-691, 692-693, 697, 698, 699, 700, 717, 718-720 FG3: 212-213, 216-219,	"I think we try and sing from the same hymn sheet really, you got to as parents, I think or you've got to try at least"
Accessibility of food	Child being able to help themselves to food	FG1: 94-95, 188-191, 866 FG2: 156, 159-167, 175, 217-219 FG4: 27, 106-107	"Yeah, [Sam] eats plain bread he just goes and helps himself I saw him the other day he had six slices of plain bread and he's eaten it all"
Mealtime setting	The location of mealtimes	FG1: 325, 327-328, 333, 341-342, 344, 357-361, 412-414, 415-416, 417, 418-419, 420-422, 425, 452-454, 459-460, 463, 465, 608-612 FG2: 86-87, 311-314, 317-326, 336-346, 360-366, 937-940, 946-955 FG3: 102, 257-258, 260-261, 263-267, 269, 276-279, 280-282, FG4: 699-703, 704-708, 712-715, 719-720, 721-725, 761, 761-764	"It's alright if you've got the room for a table - I ain't got the room for a table I ain't got room for to swing a cat in mine never mind"
External environment			
Media	Influence (positive or negative) from the media	FG1: 772, 776-777, 778, 782, 783, 1007-1010, 1050-1057, 1063, 1064-1065, 1067, 1072-1073, 1074-1086 FG2: 815, 941-945 FG3: 221-223, 232-235, 236-237, 326-327, 393-396, 398-410, 411-413, 434-438 FG4: 298, 510-512, 667-670, 882-883	"Yeah chocolate, there's always chocolate on TV"
Cost of food	How much money food costs	FG1: 379, 381-383, 384, 385, 387, 388, 389-390, 391, 392, 394-395, 402, 656-658, 661-664, 665-666, 680-688, 689-691, 697-699, 700, 710-722, 753-754, 765,	"20 chicken nuggets is like a pound to feed your kids which you can just chuck in the oven"

		FC2: 235-237, 400-405, 406-409, 413-424, 427-429-433, 447-448, 455-460, 488-489, 493-505, 508-509, 517, 638, 702-715, 864, 881-884, 886, 905 FC3: 226, 227, 503-504, 507-508 FC4: 102-110, 113-114, 116, 117-120, 313, 398-408, 409-412, 652, 972-986, 987-988, 1001-1003, 1004-1015, 1053-1054, 1058, 1060-1062, 1125-1127, 1151-1157, 1163-1166, 1167-1179, 1191-1193, 1196-1200, 1201-1202, 1205-1208, 1282, 1300-1305, 1328	
Access to shops and products	Location of the shops or of products within the shops	FC2: 436-445, 460, 490, 491 FC3: 57-60, 61-64, 164-165, 225-226, 228-229, 512-516, 518-521 FC4: 534-535, 537-538, 539-540, 542-543, 990-991, 1201-1206, 1210-1215	"Shops in general. As soon as you walk in, they've got their offers right in the doorway as soon as you walk in"
School			
	Peers	FC1: 122-126, 128, 130-132, 136-138, 140, 142, 148-149, 160-161, 163, 209-211 FC2: 35-37, 41-44	"She might see the fact other children are having the fruit and might not feel secluded to have a bit as well but when she's at home she's like 'I'm not having no fruit'"
	Food ethos	FC1: 148-149, 156-157, 196-197 FC2: 39-40, 224-224, 226-228, 229-230, 238-242, 247-248, 264, 765, 774-780, 798, 805, 807-808, 812-814, 820-824, 826-827, 828-830, 909-910, 912 FC3: 608-610, 613-619, 629-630, 632-635 FC4: 274-278, 280-281, 286-287, 289, 291-300, 303-308, 313-316, 317-319, 321, 330-332, 342-346, 348-352, 353-354, 356, 359-361, 392-393, 1128-1129, 1137-1140, 1144-1145, 1188-1189, 1226-1233, 1245-1246	"They moan though like if I were to send her to school with like crisps they wouldn't let her eat yet shes got a healthy lunch and kids are picking on her and she won't eat anything"
Children's Centres	Food related influences from or experiences of attending Sure Start Children's Centres	FC1: 375-378, 408-414, 492-493, 501-507, 524-525, 526-528, 531-532, 572-573, 574-577, 624-625, 628, 629-631, 677-678, 708-710, 839-843, 850-851, 854-855, 858-862, 864, 867-868, 1188, 1190-1191 FC2: 355-358, 355, 362, 368-376, 378-384, 385-389, 390-393, 394-399, 851-852, 895-897 FC3: 294-297, 298-299, 302-309, 312-318, 319-320, 323-325, 331-333, 334-339, 345-353, 354, 357-362, 365-369, 373-380, 437-439, 440-442, 444-448, 449-453, 456-461, 463-464, 465-468, 482-485, 492-493, 660-668 FC4: 115, 215, 267-272, 588-601, 630-632, 709-711, 716, 746, 755, 822, 824-829, 830-834, 835, 838-844, 847-848, 850, 872-875, 876-877, 904-906, 907-913, 915-922, 930-932, 938-939, 941-944, 948-950, 1056-1057, 1223-1225, 1245, 1260-1262, 1263-1264, 1265-1266	"Ben comes down there as well. He comes home with a little card. They've written it all day saying that he's eaten sweet corn at lunchtime. Give it to him at home. No"

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