
Longitudinal data on food-related issues: a scoping review

Volume one: main report



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**Longitudinal data on food-related issues:
a scoping review**

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Content

Acknowledgements	1
Notes to tables	2
Executive summary	4
1 Introduction	12
1.1 Background and policy context	12
1.2 Longitudinal survey data: an overview	13
1.2.1 Advantages of longitudinal data over cross-sectional data	13
1.2.2 Types of longitudinal surveys	14
<i>Panel surveys</i>	14
<i>Cohort surveys</i>	14
<i>Cohort panels</i>	15
1.2.3 The challenges of longitudinal data	15
1.2.4 Impact of longitudinal surveys on health and social policy.....	17
1.3 Project aims	19
1.4 Project outputs	19
1.5 Scope and reporting style	20
1.6 References	20
2 Methodological summary	24
2.1 Previous scoping work in this area	24
2.2 Data search strategy	25
2.3 Assessing and selecting the datasets	25
2.4 Datasets included in the project	27
2.5 Datasets excluded from further analysis in this report	28
2.5.1 Boyd Orr.....	28
2.5.2 Growing up in Scotland.....	29
2.5.3 Effective Pre-school, Primary and Secondary Education Project	29
2.5.4 Gateshead Millennium Study.....	30
2.5.5 The impact of change in school food policy on nutrient intake study	31
2.5.6 Evaluation of Free School Meals pilot - School caterers survey	32
2.5.7 Born in Bradford.....	32
2.5.8 National Child Development Survey.....	33
2.5.9 British Cohort Study.....	33
2.5.10 Millennium Cohort Study.....	34
2.6 A note on Understanding Society	34
2.7 Ethical approval	35
2.8 References	35
3 The surveys covered in this report	36
3.1 Avon Longitudinal Study of Parents and Children	36
3.2 British Household Panel Survey Youth Cohort	37
3.3 Family and Children’s Survey	38

3.4	English Longitudinal Survey of Aging	38
3.5	National Survey of Health and Development (NSHD)	39
3.6	Whitehall II.....	40
4	Eating and cooking practices.....	42
4.1	Summary	42
4.2	Survey questions and analysis approach.....	45
4.2.1	BHPS youth cohort	45
4.2.2	Whitehall II	47
4.2.3	ALSPAC.....	48
4.3	Results.....	53
4.3.1	Eating fast food and takeaways – BHPS.....	53
4.3.2	Eating crisps, fizzy drinks and sweets – BHPS	54
4.3.3	Sharing an evening meal with family - BHPS	55
4.3.4	Associations with eating fruit and vegetables - BHPS.....	56
4.3.5	Adding salt to food while cooking – Whitehall II	57
4.3.6	Eating food that is fried – Whitehall II	58
4.3.7	Eating the visible fat on meat – Whitehall II.....	58
4.3.8	Using fat for frying, roasting, grilling – Whitehall II	59
4.3.9	Using fat for baking – Whitehall II	60
4.3.10	Co-occurring behaviours – Whitehall II.....	60
4.3.11	Associations with eating fruit & vegetables – Whitehall II	61
4.3.12	Salt used in food or in preparing food – ALSPAC	62
4.3.13	Fat used for frying or on bread or vegetables – ALSPAC	63
4.3.14	Eating the fat on meat – ALSPAC	64
4.3.15	Eating food that is fried – ALSPAC.....	65
4.3.16	Co-occurring behaviours – ALSPAC	66
4.4	References	67
5	Choice and access to food.....	69
5.1	Summary	69
5.2	Survey questions and analysis approach.....	70
5.3	Results.....	71
5.3.1	Item trends over time.....	71
6	Nutrients	77
6.1	Summary	77
6.2	Survey questions and analysis approach.....	78
6.2.1	NSHD.....	78
6.2.2	ALSPAC.....	82
6.2.3	Whitehall II	86
6.3	Results.....	86
6.3.1	NSHD.....	86
6.3.2	Whitehall II	88
6.4	References	89
7	Fruit and vegetable consumption	93
7.1	Summary	93
7.2	Survey questions and analysis	95

7.2.1	ELSA.....	95
7.2.2	BHPS youth cohort.....	96
7.2.3	Whitehall II.....	96
7.2.4	NSHD.....	97
7.2.5	ALSPAC.....	98
7.3	Results.....	99
7.3.1	ELSA.....	99
7.3.2	BHPS youth cohort.....	101
7.3.3	Whitehall II.....	103
7.3.4	NSHD.....	104
7.4	References.....	107
8	Food safety.....	108
8.1	Summary.....	108
8.2	Survey questions and analysis.....	109
8.3	Results.....	109
8.3.1	Associations with other eating and cooking practices.....	111
8.4	References.....	111
9	Discussion.....	112

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Notes to tables

- 1 The data used in this report have been weighted using the survey specific appropriate weighting variables that were archived with each dataset. Both unweighted and weighted sample sizes are shown at the foot of each table. The weighted numbers reflect the relative size of each group in the population, not numbers of interviews conducted, which are shown by the unweighted bases.
- 2 The following conventions have been used in the tables, which are presented in volume 2 of this report:
 - no observations (zero value)
 - 0 non-zero values of less than 0.5% and thus rounded to zero
 - .. data not available (e.g. the food-related behaviour was not assessed that survey year)
 - [] used to warn of small sample bases, usually where the unweighted base is less than 40.
- 3 Because of rounding, row or column percentages may not add exactly to 100%.
- 4 A percentage may be quoted in the text for a single category that aggregates two or more of the percentages shown in a table. The percentage for the single category may, because of rounding, differ from the sum of the percentages in the table.
- 5 In this report percentages are rounded to the nearest whole number.
- 6 'Missing values' occur for several reasons, including refusal or inability to answer a particular question; refusal to co-operate in an entire section of the survey (such as the self-completion questionnaire); cases where the question is not applicable to the respondent; and of particular relevance

here – where there has been attrition at subsequent waves. In general, missing values have been omitted.

- 7 The group to whom each table refers is stated at the upper left corner of the table.

- 8 The term ‘significant’ refers to statistical significance (at the 95% level) and is not intended to imply substantive importance. Unless otherwise stated, differences mentioned in the text have been found to be statistically significant at the 95% confidence level. Standard errors that reflect the complex sampling design and weighting procedures used in the survey have been calculated and used in tests of statistical significance.

Executive summary

Introduction

NatCen was commissioned by the Food Standards Agency (FSA) to undertake this scoping and analysis project. Project oversight subsequently moved to the Department of Health, as a result of changes in departmental responsibilities.

This work builds on a study undertaken by the Policy Studies Institute (PSI, 2009). While the previous work reviewed a range of types of survey data on food-related issues, this report focuses specifically on longitudinal sources. The main aims of this report are to:

- Identify and describe available sources of longitudinal food-related data
- Review what available longitudinal data sources can tell us about:
 - a. changes in eating and cooking practices
 - b. changes in choice of and access to food
 - c. changes in the intake of key nutrients and foods
 - d. changes in food safety practices.

A longitudinal approach allows us to track change at the individual level, to describe patterns and predictors of change, and is particularly useful for examining attitudes or behaviours that may change over the lifespan (Ruspini, 2000), such as those related to diet or food. Findings from longitudinal research have had major impacts on health and social policy in recent decades.

Methods

A search strategy was developed in liaison with the DH to identify relevant surveys. To be screened in as eligible for this review, surveys had to have:

- At least one data point occurring since 1999
- Fieldwork in Britain
- At least three time points with comparable food-related measures.

Surveys that met these initial inclusion criteria were given a comprehensive evaluation. This involved being rated in five domains; longitudinal design, sample and response, topic coverage, possible measurement error, and data usability. The process yielded six key surveys. Understanding Society (a new longitudinal household panel survey) was identified as a key data source that will become relevant in future years.

Basic analysis of the identified data available was undertaken. The purpose of this was not to conduct advanced analysis fully utilising the longitudinal nature of the data, but rather to profile the samples and the data available in descriptive tables.

- The main findings of this scoping review and descriptive analysis are described here, in volume 1 of this report. Volume 2 contains the appendices, including all the tables.
- A companion report - *Food choices and behaviours: trends and the impact of life events* (Hall *et al.*, 2011) includes more complex statistical analysis, focusing on the longitudinal impact of life events on food-related outcomes.
- The final output from this project is a question design toolkit; *Designing survey questions on food-related issues* (d'Ardenne *et al.*, 2011).

Surveys covered in this report

- **Avon Longitudinal Survey of Parent and Children (ALSPAC)**

ALSPAC, also known as the 'Children of the 90s', recruited 14,541 pregnant women in 1991 and 1992. These women, their partners and the children arising from the pregnancy have been followed up and data collected throughout their childhood. ALSPAC has collected considerable amounts of food-related data including food diaries for children and feeding/food frequency questionnaires for

the children, the mothers and their partners. The ALSPAC nutrition team have already published widely on this data.

- **British Household Panel Survey (BHPS) - Youth Cohort**

Wave one of the BHPS consisted of 10,300 adults, with the same individuals re-interviewed each wave. Adult respondents have not been asked food-related questions. However, since 1994 children aged 11 to 15 have also completed a short interview. Five consecutive waves of the youth cohort questionnaire (2004 to 2009) included three questions about diet and one on sharing an evening meal with the family.

- **Family and Children Surveys (FACS)**

FACS was a panel survey, with the same families with children re-interviewed on a yearly basis. From 2002 to 2005 an expenditure module was included with questions about choice and access to food. This covered whether or not the family could afford fresh fruit and vegetables and a cooked main meal every day.

- **English Longitudinal Survey of Aging (ELSA)**

The initial ELSA sample consisted of 12,000 respondents aged 50 and over, drawn from three Health Survey for England Surveys (HSE). One of the baseline HSE surveys (2001) included questions about diet. Since then, two ELSA waves (2006 and 2008) have also collected data about fruit and vegetable consumption.

- **National Survey of Health and Development (NSHD)**

The initial Medical Research Council (MRC) NSHD sample consisted of 4695 single, legitimate births that took place in one week in 1946, With 23 data collection points to date, the sample is now aged 65. Detailed five-day food diaries were used for three waves of the survey in 1982, 1989 and 1999.

- **Whitehall II.**

Whitehall II is a cohort study of around 10,300 men and women who were working as civil servants in London in 1985. Respondents were aged 35 to 55 at

recruitment to the study, and were 58 to 78 at the most recent data collection. In waves three, five and seven Whitehall II included a food frequency questionnaire and questions about salt consumption and the use of fat in cooking.

Key findings

Eating and cooking practices

A wide range of behaviours related to eating convenience or takeaway foods was considered, as well as different ways of preparing and eating food. The analyses covered sixteen topics drawing on three datasets (BHPS YC, Whitehall II and ALSPAC). Findings included that:

- One child in six persistently (that is, across every wave analysed) ate crisps, fizzy drinks or sweets everyday, with boys more likely than girls to report this. (BHPS)
- One child in three persistently did not share a weekly evening meal with their family. (BHPS)
- People of non-white ethnicity were twice as likely as white respondents to persistently add salt to food when cooking (57% and 28% respectively). (Whitehall II)
- A fifth of mothers persistently added salt to their child's food. Mothers with lower educational qualifications, whose children were entitled to free school meals, and who were of non-white ethnicity were the most likely to persistently add salt to their child's food. (ALSPAC)
- About half of the meat eaters in Whitehall II consistently ate as little fat as possible on the meat that they consumed, while about a quarter persistently ate all or some. Smokers were more likely to persistently eat visible fat than non-smokers. (Whitehall)
- There was evidence that healthy eating and cooking practices do co-occur, and likewise that unhealthy eating and cooking practices co-occur. (BHPS, Whitehall, ALSPAC)

Choice and access to food

The ability to afford quality and variety in food was looked at, using data from four waves of FACS.

- Nearly all families could consistently afford to have a cooked meal everyday and a roast (or something similar) every week. However, 3-4% persistently could not afford fish or meat every other day.
- Lone parent households were more likely than two-parent households to experience this. However this difference was more pronounced in 2002 than in 2005: there was some evidence of a trend towards greater access to food and less inequality in access.

Nutrients

Nutritional intake was examined, in particular consumption of fat. The analyses used data obtained from the NSHD food diary and the Whitehall II food frequency questionnaire.

- Half of the NSHD adult cohort persistently ate more than the recommended daily total fat intake (33% of total calorie intake).
- Most of the factors examined (sex, marital status, presence of children in the household, employment status and socio-economic position) were not associated with persistently eating more than the recommended amount. Educational qualification was a significant predictor: people with vocational or secondary school qualifications were the least likely to persistently eat more than the recommended intake of total fat. (NSHD)
- However, in Whitehall II data several variables were associated with the longitudinal pattern of saturated fat consumption. Women and people of non-white ethnicity were less likely to persistently exceed recommended fat intake levels (53% of women compared with 64% of men; 28% of those of non-white ethnicity compared with 63% of those with white ethnicity).
- Younger people and those in administrative or professional and executive employment grades were the most likely to persistently exceed recommended limits (65% of those aged 39-44 and 62% of those in either administrative or professional and executive grades). (Whitehall)

Fruit and vegetable consumption

Longitudinal patterns in fruit and vegetable consumption were explored. Data were collected on this in most of the surveys covered in this report, including ALSPAC, ELSA, BHPS youth cohort, Whitehall II, and NSHD.

- About half of Whitehall II respondents consistently ate fresh fruit and vegetables daily. (Whitehall II)
- However, looking at the more demanding recommended threshold of five portions a day, 61% of the NSHD cohort did not manage this at any of the waves analysed. (NSHD)
- There was evidence for the co-existence of multiple risk factors. Drinking above the recommended limit and being a regular smoker were both associated with persistent low fruit and vegetable consumption among older adults. (ELSA)
- Young people's attitude to health responsibility was strongly associated with their longitudinal pattern of fruit and vegetable consumption. Those who felt that young people did not need to worry about their health were less likely to consistently eat fresh fruit and vegetables every day (27% compared to 50% and 51% of those who strongly disagreed/disagreed or neither agreed nor disagreed with this statement). (BHPS)

Food safety

Only one variable, in one survey, was found with longitudinal data relating to food hygiene and safety. This was a question on ALSPAC about cleaning children's hands before meals.

- One mother in five consistently reported that their child always or usually had washed hands before meals.
- Mothers with higher educational qualifications and those in more skilled occupations were less likely to have children whose hands were washed before meals (21% of mothers with degrees persistently did not wash their child's hands before meals compared with 9-14% of mothers with lower levels of qualifications; and 15% of mothers employed in skilled, professional, managerial or technical occupations persistently did not

wash their child's hands compared with 10% of mothers in partly skilled or unskilled occupations).

- The longitudinal pattern in children's hand washing was associated with salt use. Mothers with children who persistently did not have washed hands before eating were also more likely to persistently add salt to their child's food.

Discussion

- This review found that there are few longitudinal data sources on food safety and hygiene practices.
- Further examination of the socio-economic profile found in hand washing practices is warranted given that it could have implications for the targeting of health promotion.
- Future planning of food-related data needs should factor in the coverage of future waves of Understanding Society (a new longitudinal household panel survey) to avoid duplication.
- A number of surveys were not featured in this report as they currently have too few relevant data points. Some of these, for example the Millenium Cohort Survey (MCS), will emerge as key data sources for the future.
- The MCS could also potentially fill a gap which could be emerging in the coming decade in available data on children.
- Data linkage to administrative and other records has the potential to add another longitudinal element to surveys. Permission for this should always be asked as part of survey data collection even if there are not plans at the outset to link the data.
- The collection of anthropometric and biomarker information (such as height, weight, waist and hip, blood pressure and blood, urine and saliva samples) is of relevance in this topic area, and inclusion of food-related questions should be a priority on surveys that collect this information. There is also scope to introduce the collection of more directly nutrient-related biomarker information, such as the assessment of salt intake using

- a 24-hour urine sample, like that done on the National Diet and Nutrition Survey (NDNS) and the Diet and Health Study 2011.
- Healthy Aging across the Life Course (HALCYon) is currently bringing together a number of life course cohorts. The project includes developing methods for combining food-related data collected in different ways, and this methodology could be useful in further analysis of existing datasets.

See volume 2 of this report for:

- A Additional information about the datasets reviewed
- B A discussion of issues relating to the weighting of longitudinal survey data
- C A list of the screening criteria applied in the selection of surveys to review
- D The tables that accompany the chapters in this report.

1 Introduction

1.1 Background and policy context

The major health problems of obesity, diabetes, cardiovascular disease (CVD) and cancer have all been related to diet (WHO, 1990; Block *et al.*, 1992; Department of Health, 1998; Hooper *et al.* 2001). In response to this, key public health campaigns have included encouraging people to increase their daily consumption of fruit and vegetables, reduce their intake of salt and saturated fats, and eat more complex carbohydrates. Research based on cross-sectional and longitudinal data sources demonstrate population level increases in consumption of fruits and vegetables, dietary fibre and poultry, and a decline in consumption of whole milk, butter and red meat (Prynne, Wagemakers, Stephen and Wadsworth, 2009; The Information Centre for Health and Social Care, 2009; Prynne, Paul, Mishra, Greenberg and Wadsworth, 2005) and decreases in consumption of saturated fat, trans fatty acids and added sugar (Bates, Lennox and Swan, 2010).

NatCen was initially commissioned by the Food Standards Agency (FSA) to undertake this scoping and analysis project, although project oversight moved to the Department of Health as a result of changes in departmental responsibilities. The project was commissioned to identify the food-related data available from longitudinal sources in order to inform future research and policy priorities. This work builds on a study already undertaken by the Policy Studies Institute (PSI, 2009) for the FSA. While the previous work covered a range of data sources, the focus of this project is on longitudinal data. Longitudinal data are needed to examine changes over time and the factors associated with change. This includes analysis by key socio-demographic variables and other risk factors (such as smoking status and alcohol intake).

Food hygiene is a key risk factor for the transmission of food borne disease. The Department of Health and the Food Standards Agency have highlighted the apparent lack of data on this topic. This scoping review has also sought to identify what longitudinal data sources exist on this topic.

1.2 Longitudinal survey data: an overview

1.2.1 Advantages of longitudinal data over cross-sectional data

Longitudinal survey research involves studying the same group of people over an extended period of time. Data are collected at the outset of the study (the baseline), and then repeatedly throughout the length of the study. Longitudinal approaches allow us to track change at the individual level, to describe patterns of change, provide insights into processes involving social change and are particularly useful for examining attitudes or behaviours that may change over the lifespan (Ruspini, 2000), such as those related to diet or food. This life course approach means that it is often possible to look at how change occurs in relation to life events such as illness, marriage and having children. In addition, with the use of advanced statistical techniques such data can be used to locate the proximal and distal predictors of outcomes, and disentangle cause and effect. This is key when identifying which risk factors to target in health promotion.

Change can also be studied using repeated cross-sectional studies, involving different samples of the population at different points in time. These reveal how the population as a whole has changed, but they do not provide insight into the complex pattern at the individual level which leads to these changes.

Longitudinal data can address questions and enable statistical methods that are not possible with cross-sectional approaches. Research areas where longitudinal designs are particularly valuable include:

- When the focus is directly on change and the phenomena are themselves inherently longitudinal (e.g. changing social attitudes)

- When investigating causal processes (e.g. the effects of diet in childhood on health in later life)
- When controlling for the effects of unmeasured fixed differences between subjects
- When studying social change and needing to separate out age, period and cohort effects
- When establishing the effect of a ‘treatment’ by following an experimental or quasi-experimental design or comparing periods before and after the introduction of a public policy.

1.2.2 Types of longitudinal surveys

The three main types of longitudinal surveys, which are all in this report, are panel studies, cohort studies and cohort panels (Ruspini, 2000).

Panel surveys

Panel surveys involve sampling a representative cross-section of people who are then repeatedly surveyed at fixed, often regular, discrete points in time. The main advantage is that they make it possible to establish the nature and predictors of individual change. For this reason, they are well suited to the statistical analysis of both social change and dynamic behaviour. Some surveys will supplement the original sample with new members over time to ensure the sample remains representative (for example, to address non-response from those from poorer backgrounds).

Cohort surveys

Cohort surveys involve selecting a group of people based on a specific characteristic, often date or week of birth, geographic location or having experienced the same significant life event within a given period of time. Researchers select a group, and then administer measures to a sample or to the whole group. This allows, one or more ‘generations’ to be followed over their life course. As with panel surveys, the interest is usually in the study of long-term change but additionally such designs permit the examination of individual

development processes more fully. The main drawback of this approach is generation replacement as each generation ages.

Cohort panels

Cohort panels can be considered a specific form of survey that overcomes the problem of generation replacement by supplementing the sample with a new representative sample.

It should be noted that all these types of longitudinal surveys often include aspects of retrospective study, such as the collection of historical information on employment or health.

1.2.3 The challenges of longitudinal data

As has been highlighted elsewhere (Ruspini, 2000; Barnes, Butt and Tomaszewski, 2011) longitudinal data raise a number of methodological problems. Here we outline these and how they are addressed in the current project.

Firstly, longitudinal survey samples are often small, due to the cost of repeatedly interviewing the same respondents. This can lead to problems with power. The studies presented here include all the available large-scale studies, and where our analysis involves smaller sub-groups we are cautious in interpreting the findings and do not present data where subgroup bases are fewer than 30 cases.

Secondly, with any panel or cohort study there is the problem of attrition. In particular problems occur if the respondents that drop out of the sample differ systematically from those that remain, thereby introducing bias into the sample. To help address this, we considered sample attrition when selecting which surveys to include and use the appropriate weights where available to correct for any systematic differences in non-response (for more information on weighting longitudinal surveys see Appendix B). Where possible we also examine the

characteristics of the analysis sample, compared with the sample from which they were drawn, before undertaking any analysis.

Thirdly, measuring change requires that variables of interest be measured in a consistent way over the time period. Where possible we have only included those studies with consistent or comparable measures, and highlight any major differences.

Finally, when we consider the longitudinal pattern or dynamics, and move beyond simple dichotomous indicators, the question is how best to categorise respondents (for example, according to their different food histories). Any classification will necessarily be imperfect given the data available only cover a discrete period of time and because we do not know what happened before or after data collection. In this report we will clearly outline our approach to exploring longitudinal patterns or change, and the limitations inherent.

1.2.4 Impact of longitudinal surveys on health and social policy

In a recent review of the British Household Panel Survey (BHPS) and the birth cohort surveys of 1958, 1970 and 2000, the Chief Executive of the Economic and Social Research Council (ESRC), Ian Diamond, stated that these “studies have transformed our understanding of the complex trends affecting UK society, and have informed long-term policy making in many areas of government.”(Berthoud and Burton (eds.), 2008).

In the review, Professor Mel Bartley highlights how the availability of annual information from the birth cohort studies has impacted on understanding of ill health and health risk behaviours. Without such data sources, he argues, it is not possible to observe changes in material circumstances, living arrangements and lifestyles at such frequent intervals, and relate these changes to changes in health status. Longitudinal data have made it possible to disentangle sources of confounding. For example, instead of looking at the mental health of people who happen to be unemployed or divorced, it became possible to see whether a spell

of unemployment or a relationship breakdown in someone who started with good mental health increased their risk of poorer health after the event (Pevalin and Goldberg, 2003). As well as relating the deprivation of a town to the health of its members, it also became possible to see whether healthier people were more likely to move away from more deprived towards more prosperous areas (Brimblecombe, Dorling and Shaw, 2000). Bartley went on to explore how data from the BHPS has enabled health research to establish that income levels are more significant than income change; persistent poverty is more harmful for health than occasional episodes; and income reductions appear to have a greater effect on health than income increases (Benzeval and Judge, 2001).

In the same review Dr David Halpern wrote that a key early finding from BHPS - that a large proportion of people on low incomes in one year were *not* the same as those in the next - appeared to debunk the claim that there was an 'underclass' in Britain or that some people were inevitably trapped in poverty. He has argued that the view that 'work is the best route out of poverty', and the welfare-to-work programmes that followed, can be traced directly to the dynamic perspective on low incomes that longitudinal data provided.

Halpern points out that longitudinal data have been used widely in informing government policy on social exclusion, child poverty, welfare reform, pensions, personal accounts, family policy, teenage pregnancy, smoking, youth policy, student loans, social housing, savings and debt, low pay, the skills agenda, social mobility, informal care, road pricing, and immigration. He also gives the specific example of longitudinal findings on the cognitive ability of bright children from poor backgrounds being overtaken by that of less able children from affluent backgrounds before entering school as a key factor in the decision to focus on expansion of pre-school provision in Britain.

The ALSPAC progress report (2006-2010) gives three examples of how ALSPAC findings have impacted on public health policy (Smith *et al.*, 2011). One example concerned the finding that fish consumption in pregnancy is associated with

better cognitive performance in offspring. This influenced guidelines on maternal fish consumption.

The brochure sent to NSHD participants to celebrate 65 years of the study (http://www.nshd.mrc.ac.uk/nshd_65/65th_birthday_brochure.aspx) highlighted examples of the impact it has had. An early policy impact came about through a finding from the maternity study (a questionnaire for the mothers of those born in 1946) that just 20% of women in the survey had received any kind of pain relief during childbirth. This influenced the introduction of the Analgesia in Childbirth bill to the House of Commons in 1949 and led to increased training for midwives to offer gas and air analgesia to all mothers in labour. Another example is the Platt Report of 1959. This used evidence from the NSHD to recommend greater flexibility in visiting hours in hospitals and better facilities for parents to stay near their sick children. Findings on the influence of home and school have had an impact of educational reforms in primary, secondary and higher education. The NSHD was also one of the first studies to link childhood phenomena with adult symptoms, for example the link between low birth weight and higher blood pressure in later life. A comparison of children's diet in 1950 with that in the 1990s (Prynne *et al* ., 1999) had an indirect impact on policy because of its evidence for a decline in the quality and nutrient value of infant and childhood over that period.

1.3 Project aims

In summary, the aims of this project are to:

- Identify and describe available sources of longitudinal food-related data.
- Review what the available longitudinal data sources tell us about;
 - a. changes in eating and cooking practices
 - b. changes in choice and access to food
 - c. changes in the intake of key nutrients and foods
 - d. changes in food safety practices
- Identify key gaps in the available data.

Basic analysis of the identified data available was undertaken and is presented in this report. The purpose of this was not to conduct advanced analysis fully utilising the longitudinal nature of the data, but rather to simply profile the samples and the data available in descriptive tables.

1.4 Project outputs

- The main findings of the scoping review and initial descriptive analyses are presented here, in volume one of this report. See volume 2 of this report for the appendices, which outline:
 - A Additional information about the datasets reviewed
 - B A discussion of issues relating to the weighting of longitudinal survey data
 - C A list of the screening criteria applied in the selection of surveys to review
 - D The tables that accompany the chapters in this report.
- A companion report to this, ***Food choices and behaviours: trends and the impact of life events*** (Hall *et al.*, 2011), includes more complex statistical analyses, focusing on the longitudinal impact of life events on food-related outcomes.
- A further output from this project is a question design toolkit, ***Designing survey questions on food-related issues*** (d'Ardenne *et al.*, 2011).

1.5 Scope and reporting style

This report is intended for a general readership and so where possible avoids presenting detailed statistical analyses in the main text. In the text, unless otherwise stated, results are expressed as percentages of the entire sample and only statistically significant associations are mentioned. We use 95% probability as our minimum level for statistical significance ($p < 0.05$). Different surveys use different terminologies to describe the various data collection points that make up their longitudinal measurements (such as 'year', 'phase' and 'wave'), for ease of

presentation we refer to all of these as survey ‘waves’ throughout this report. For ease of reading the text and findings, the tables with data are kept together in Appendix D, towards the end of this report.

1.6 References

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2 Methodological summary

2.1 Previous scoping work in this area

In 2009, the Food Standards Agency (FSA) commissioned a scoping study to examine the topic coverage of current survey sources on attitudes and behaviours around healthy eating and food safety. (PSI, 2009) Since 2000, the main source of data for the FSA had been the Consumer Attitude Survey (CAS), but upon review it was decided to replace CAS with a new annual food survey. Thus the scoping study aimed to inform the development of this new survey.

The Policy Studies Institute carried out the scoping study with the objective of mapping the existing UK survey data resources that capture attitudes and behaviours towards healthy eating and food safety, and to assess the scope of the UK-based research literature that examines healthy eating and food safety.

They produced four outputs:

- A discussion paper
- A data catalogue recording food-related attitudinal and behavioural questions asked in major publicly-funded surveys
- An Endnote database containing social scientific studies which address factors relating to health eating and food safety, based on UK data, over the period 2000-2009
- An Endnote database containing literature on methodological research.

The data catalogue contains both cross-sectional and longitudinal survey data resources, and includes several of the surveys analysed here, although not all. The study noted that there are not many examples of questions which attempt to capture attitudes and behaviours around food safety and perceptions of food poisoning.

The PSI discussion paper can be accessed here:

<http://www.food.gov.uk/multimedia/pdfs/foodandyousscoping.pdf>

2.2 Data search strategy

The data search strategy was fundamental to ensuring the success of the overall project. It was developed in liaison with the Department of Health. Our approach involved the following steps (for ease of presentation these are shown as a list, but it should be noted this was an iterative, rather than sequential, process);

- Survey screening criteria were developed (see 2.3)
- Survey evaluation criteria were developed (see 2.3)
- We reviewed the data catalogue and survey questions produced by PSI
- Searched the UK Data Archive (ESDS, ISER), Centre for Longitudinal Studies, Halcyon, on-line bibliographic databases and internet search engines to identify any other longitudinal surveys missed by the data catalogue
- Used bibliographic databases to check analysis already undertaken, reading relevant literature in order to identify gaps and avoid replication
- ‘Snowballing’ from reading research papers (and ascertaining relevant references) and talking to researchers involved in managing projects, and asking experts if they were aware of any relevant projects.
- This enabled us to identify possible longitudinal datasets to review which were then screened and where appropriate evaluated for inclusion.
- From this work an analysis plan was developed with DH.

2.3 Assessing and selecting the datasets

Once we had identified possible surveys for inclusion we had a two-stage approach to assessing and selecting the datasets for inclusion. The first stage involved completing a screening questionnaire to establish data sources with:

- At least one data point occurring since 1999, and
- Fieldwork in the UK, and
- At least three time points with the same (or similar) food-related measure/item (to ensure the longitudinal component).

This allowed us to document which surveys warranted a more comprehensive evaluation. The full evaluation covered the following five areas; longitudinal design, sample and response, topic coverage, possible measurement error, data usability and any other issues specific to the survey were also noted (see Box 2.1 for details of their components). Each component was given a rating out of 7 (1= not appropriate/ poor, 7= exceptional), and combined to produce an overall rating (maximum score 35). See Appendix C for full details of the evaluation criteria.

Box 2.1 Summary of longitudinal survey data evaluation criteria

Longitudinal design

Number and intervals between data collection points, and overall study period.

Sample and response

Sample size, sample attrition rate, item non-response, sampling method, study population and any inclusion of sub-groups of interest.

Topic coverage

Food behaviours (food intake, healthy shopping & food purchases, and eating & cooking practices),

Food knowledge, food attitudes & beliefs,

Micronutrients and physiological markers (e.g. blood cholesterol and pressure)

Social & cultural contextual information about food,

Food safety,

Food choice (accessibility & affordability of food, and sustainable & ethical issues)

Data about outcomes of interest (e.g. BMI, physical activity, health status or illness),

Possible break variables (socio-demographic data, smoking, alcohol use).

Measurement error

Content validity (does the question wording appear to measure what it intends to),

Internal reliability (is the question wording, response options and routing consistent across data points).

Data usability

Quality of documentation, access to the data and first impressions on how the data is set up: levels of information/ consistent variable names.

2.4 Datasets included in the project

This process yielded six longitudinal surveys of interest for this project:

- Avon Longitudinal Survey of Parent and Children (ALSPAC),
- British Household Panel Survey (BHPS) - Youth Cohort,
- English Longitudinal Survey of Aging (ELSA),
- Family and Children Surveys (FACS),
- National Survey of Health and Development (NSHD), and
- Whitehall II.

Three of the above could be accessed via public data archives (BHPS, ELSA and FACS), and three required data access applications to be made directly to the survey teams who manage them, which were then assessed by their data release panels. This process included negotiation with the survey teams about what data could be made available and finally data sharing agreements were set up. Arrangements for data delivery included secure on-line pick up systems and going to collect a password protected CD with the data from the institution that runs the survey.

As would be expected with a project involving the analysis of data across so many different and large data sources, the data management task for this project was enormous. The datasets varied considerably in their set up and conventions. Because this project required longitudinal data, merging data from waves of the same survey was a large task and the issues that arose varied. For example, for the ELSA, variables in each survey wave had exactly the same name (surveys often have a convention of labelling each wave a question is asked with different prefix or suffix to indicate the wave of the survey), so this required the renaming of all the variables of interest before being able to merge the datasets. In addition, for other datasets the values of the variable were not labelled, so this had to be done before the data could be analysed.

All syntax for the data management process has been saved and clearly labelled so that this process can be replicated and checked.

2.5 Datasets excluded from further analysis in this report

Some excellent and potentially relevant longitudinal surveys were identified by this project but were not included in the secondary analysis because they did not meet the inclusion criteria. Reasons for exclusion included things like: the survey data had access restrictions, it did not cover topics of interest extensively enough, or the studies did not (yet) include three data collection points related to food. Here we provide a brief overview of some of the surveys that were identified as relevant but are not included in the project analysis.

2.5.1 Boyd Orr

The Boyd Orr is a cohort study carried out by the University Of Bristol Department of Social Medicine. Its aim is to investigate the long-term impact of children's diet, growth, living conditions and health on adult cardiovascular disease. Boyd Orr is based on the 65-year follow-up of 4,999 children who were surveyed in the Carnegie Survey of Diet and Health (1937-9). Uniquely for a survey established in the first half of the 20th century, families were required to keep food diaries. With funding from the British Heart Foundation, the cohort was established in 1988 by Professors George Davey Smith and Stephen Frankel who retrieved the original research records of the pre-war survey from the Rowett Research Institute. Subsequent work on the cohort has been funded by grants from the Medical Research Council (UK), the World Cancer Research Fund, Research into Ageing, UK Survivors, the Economic and Social Research Council, the Wellcome Trust and the British Heart Foundation.

Findings from the cohort to date have investigated a range of disease endpoints, particularly coronary heart disease and cancer, in relation to infant and childhood diet, and markers of childhood nutritional status (body mass index, leg length and height). Since 1937-9, the cohort has been surveyed twice, in 1997-8 and 2002-3. Both these waves included food frequency questionnaire data. There are no plans currently to follow up this sample with further surveys or clinical data collection, but they are all tracked via vital status registration.

<http://www.epi.bris.ac.uk/boydorr/index.htm>

Reason for exclusion: the same items were not included for three survey waves, plus there would be likely issues related to data access.

2.5.2 Growing up in Scotland

Growing up in Scotland (GUS) is a nationally representative cohort study of children in Scotland. The sample includes two cohorts: a birth cohort of 5,000 children born between 1st June 2004 and 31st May 2005 (aged 10.5 months at first interview) and a toddler cohort of 3,000 children born between 1st June 2002 and 31st May 2003 (aged 34.5 months at first interview).

The survey is carried out by the Scottish Centre for Social Research (part of NatCen) and funded by the Scottish Government. The survey provides a nationally representative sample and also permits analysis by some sub-groups (urban/rural, deprived/non-deprived areas). A new birth cohort will be recruited in 2011, making the survey a cohort panel. Food-related data has been included in the survey for two survey waves (food frequency type questions).

<http://www.cls.ioe.ac.uk/text.asp?section=00010001000500090003>

Reason for exclusion: too few relevant data collection points (but likely to be a good source in the future).

2.5.3 Effective Pre-school, Primary and Secondary Education Project

Funded by the Department of Health and carried out by the Institute of Education, the Effective Provision of Pre-School Education (EPPE) Project is the first major study in the UK to focus specifically on the effectiveness of early year's education. The EPPE project is a large scale, longitudinal study of the progress and development of 3,000 children in various types of pre-school education. The study aims to explore the characteristics of different kinds of early

years provision and examines children's development in pre-school education, influences on their later adjustment and progress in infant/ primary school up to the National Assessment at age seven (end of Key Stage1). The study aims to identify the aspects of pre-school provision that have a positive impact on children's attainment, progress and development, and so provide guidance on good practice. Data collection points include: KS1 (age 7), KS2 (age 11), KS3 (14), and the 16+ extension follow the original intake (1996-2003) through their final year of compulsory education.

To date, two survey waves included the following questions about sharing meals:

- Age 3/5 from parent report: How many days in a typical week has your EPPE child sat down and eaten a meal with the whole family together?
- Age 14 from parent report: How often in the last week have you and your EPPSE child had an evening meal together?
- Age 14 from pupil report: How many days last week did you eat an evening meal together with your family?

<http://eppe.ioe.ac.uk/index.htm>

Reason for exclusion: too few relevant data collection points and minimal topic coverage.

2.5.4 Gateshead Millennium Study

The Gateshead Millennium Study (GMS) is a cohort study of 1029 babies born to mothers resident in Gateshead in a 34-week period in 1999/2000. It is run by the University of Glasgow, Newcastle University and other collaborators. The study was initially funded by the Henry Smith Charity, Sport Aiding Research in Kids (SPARKS) and Child Growth Foundation. Further phases have been supported by Gateshead Health Trust Levy Funding, and the Northern and Yorkshire NHS R&D, Northumberland Tyne and Wear NHS Trust.

The study was originally set up to investigate infant feeding and growth but more recently, with funding from the National Preventative Research Initiative and

Chief Scientist Office, the focus of the study has been on overweight and obesity in childhood. To date, there are 12 waves in total: six parental surveys, four health professional surveys and one health check, plus school entry height and weight from NHS data registry.

The data relevant to this project include eating behaviour, food intake and attitudes towards and knowledge about food in both the children and their mothers. Also collected are data on the children's diet and physical activity environment. They plan to publish their findings on all these areas in the future.

The children are currently aged ten and eleven years and are making the transition to secondary school. Therefore, the research team hope (funding permitting) to visit the children once they are at secondary school to collect further data on this group. They envisage that this would also include measures of dietary intake and other food/diet related issues.

The research team's recent publications include analyses relating to feeding in infancy, objectively measured physical activity, changes in physical activity and body composition. They have also explored parental perceptions of childhood overweight and obesity using both quantitative and qualitative techniques.

<http://www.cls.ioe.ac.uk/text.asp?section=00010001000500090012>

Reason for exclusion: research team planning work on topics relevant to this report in the near future. There data access issues would also be likely.

2.5.5 The impact of change in school food policy on nutrient intake study

Much of the same research team undertaking the GMS, led by Professor Ashley Adamson, are also carrying out a separate study involving data collection in schools to look at the effect of change in school food policy on food and nutrient intake among children. Although the study uses a repeated cross-sectional design, the sample are drawn from the same schools each year and so

essentially follow the same cohort of children. This work is being funded by the Department of Health through the Public Health Research Consortium.

<http://www.ncl.ac.uk/hnrc/research/project/3016>

Reason for exclusion: the data is not yet publicly available, and the team are planning relevant publications.

2.5.6 Evaluation of Free School Meals pilot - School caterers survey

Funded by the Department of Health and Department for Education and carried out by NatCen and the Institute of Fiscal Studies (IFS), this survey includes a longitudinal follow-up of school caterers (three waves) and children and parents (two waves). Topics for caterers include the provision of different types of food, where food is prepared, and strategies to promote healthy options. The final waves are underway and the report is due to be published in December 2012.

<http://www.natcen.ac.uk/free-school-meals/>

Reason for exclusion: study currently underway and due to publish in 2012.

2.5.7 Born in Bradford

Born in Bradford is a birth cohort study. All pregnant mothers and their partners attending Bradford Royal Infirmary, from Spring 2007 onwards, have been invited to join the study. By November 2010 12,231 have been recruited. It is run by Bradford Royal Infirmary with University Collaborators, funded by European Union, UK Higher Education Funding Council, DH, Bradford teaching hospitals, NHS foundation trust and charitable donations. A unique feature of the sample is that half of babies born in city each year are of South Asian origin. The survey has included feeding/food questionnaires at age 6 months, 12 months, and 18 months, plus allergy and infection data at age 12 months and 24 months.

<http://www.cls.ioe.ac.uk/text.asp?section=00010001000500090013>

www.borninbradford.nhs.uk

Reason for exclusion: too few relevant data collection points (although likely to be sufficient in the future). Also, the research team are planning to undertake work on relevant topics in the near future.

2.5.8 National Child Development Survey

The National Child Development Survey (sometime called the 1958 Birth Cohort), is a cohort study drawing on a sample of all the people born in one week in England, Scotland and Wales in March 1958. It is now overseen by the Centre for Longitudinal Studies at the Institute of Education. It's original aim was to study perinatal mortality and is part of the series of surveys which also include the 1946 (NHDS), 1970 (British Cohort) and 2000/1 (MC). At birth, data were collected for almost 17,500 infants. Since birth there have been eight data collection points to monitor medical, social, physical, educational and economic development. Two data collection points included data about food (food frequency questionnaires) in 1991 and 2000 (waves five and six respectively). However, the question wording changed between these waves, making comparisons problematic.

<http://www.cls.ioe.ac.uk/studies.asp?section=000100020003>

Reason for exclusion: too few relevant data collection points.

2.5.9 British Cohort Study

The British Cohort Study (1970), also part of the perinatal mortality series now run by the Centre for Longitudinal Survey at the Institute of Education, sampled all those living in England, Scotland and Wales, who were born in one week in April 1970. Initially, data were collected from the parents of 17,200 infants. There have been six data collection points since 1970 which have covered medical, physical, social and educational development, and in later years economic and other risk factors. One wave (2000) has included data about food (food frequency questionnaire).

<http://www.cls.ioe.ac.uk/studies.asp?section=000100020002>

Reason for exclusion: too few relevant data collection points.

2.5.10 Millennium Cohort Study

The Millennium Cohort (MC) Study is funded by the ESRC and carried out by the Centre for Longitudinal Studies at the Institute of Education and NatCen, with the aim of increasing understanding the social conditions surrounding birth and early childhood and how they relate to the life course. The sample includes around 19,000 children born in 2000/1. The sample has been followed up at 9 months, three, five and seven years. Surveys at age five and seven have included food-related data and the survey team inform us that the next wave in 2012 (age 11) is also expected to include some aspects of food-related data.

<http://www.cls.ioe.ac.uk/studies.asp?section=000100020001>

Reason for exclusion: too few relevant data collection points (but likely to be a good source in the future).

2.6 A note on Understanding Society

Understanding Society is a new representative longitudinal household panel survey that has incorporated the BHPS sample. It is designed to track the lives of 100,000 individuals in 40,000 households every year as they respond to regional, national and international change. It was commissioned by the ESRC to provide social scientists, medical researchers and Government with a far greater understanding of peoples' lives and diversity of experience. The aim is to enhance our insight into the pathways that influence people's longer-term occupational trajectories, their health and wellbeing, their financial circumstances and personal relationships. The study will also capture biomedical data on 20,000 participants and place this alongside social histories, helping to weigh the extent to which peoples' environment influences their health.

The study team inform us that there are plans to collect nutrition data in waves two, five and eight. The nutrition questions asked at wave two (currently in the field) included the main type of milk usually consumed, the type of bread eaten

most frequently, and questions on fruit and vegetable consumption. In addition to the nutrition module, the other food-related questions include:

- How much people in the household have spent in the last 4 weeks on food and groceries.
- Whether able to access all services such as healthcare, food shops or learning facilities when you need to.
- If there is a new baby in the household, the extent to which they refuse to eat/show no appetite.
- The youth self-completion questionnaire contains questions on how many days a week eaten an evening meal together with family; portions of fruit or vegetables eaten in a usual day; frequency of eating fast food, crisps, sweets or fizzy drinks; alcohol usage.
- The ethnic identity module asks how often people eat food typical of the country where they or their parents/grandparents were born (if different).

Before the content of each wave is finalised, ISER consult the relevant Government Departments on the questionnaire content, although by wave four it is hoped that all core modules (including the nutrition module) will be established. It is therefore likely that waves five and eight will include the same questions in the nutrition module as in wave two.

Wave one Year one data were published on the UK data archive in December 2010, and currently wave two year two and wave three year one are in the field.

<http://www.understandingsociety.org.uk/>

2.7 Ethical approval

The NatCen Research Ethics Committee granted ethical approval for this project.

2.8 References

PSI (2009) Attitudes and Behaviours towards to healthy eating and food hygiene: a scoping study. FSA: London.

<http://www.food.gov.uk/multimedia/pdfs/foodandyousscoping.pdf>

3 The surveys covered in this report

3.1 Avon Longitudinal Study of Parents and Children

The Avon Longitudinal Study of Parents and Children (ALSPAC), also known as the 'Children of the 90s', recruited 14,541 pregnant women with an estimated delivery between April 1991 and December 1992. These women, their partners and the children arising from the pregnancy have been followed up and data collected throughout childhood. When the children were about seven years old, there was an attempt to boost the sample with cases that failed to join the original sample, giving 548 extra cases. In addition, 10% of the sample, known as the Children in Focus (CiF) group attended clinics at the University of Bristol at various time points between four and 61 months of age.

The ALSPAC sample is representative of those families living in the Avon area. However, mothers of infants in Avon are slightly more likely to live in owner-occupied accommodation, to have a car available to the household and be less likely to have one or more persons per room and to be non-white compared with mothers in the UK as a whole (using 1991 census data).

ALSPAC has included considerable amounts of food-related data including food diaries for children (eight waves), and feeding/food frequency questionnaires for the children (nine waves), the mothers (four waves) and their partners (three waves).

The ALSPAC nutrition team have published widely and have future plans that overlap with this report's remit. Therefore to avoid duplication we present a summary of ALSPAC's published findings and will undertake analysis relating to specific topics agreed with the ALSPAC team and DH, to include adding salt to food, types of fat used in cooking, and washing of hands before meals. Washing hands before meals was one of the few examples identified of longitudinal data related to food hygiene.

3.2 British Household Panel Survey Youth Cohort

The British Household Panel Survey (BHPS) is carried out by Institute for Social and Economic Research (ISER) at the University of Essex, which aims to further understanding of social and economic change and was an annual survey. Wave one consists of 5,500 households and 10,300 individuals drawn from 250 areas in Britain. The sample is a stratified clustered design drawn from the Postcode Address File and all residents present at those addresses at the first wave of the survey were designated as panel members. These same individuals are re-interviewed each successive year and, if they split-off from original households to form new households, they are followed and all adult members of these households are also interviewed. Similarly, new members joining sample households become eligible for interview and children are interviewed as they reach the age of 16. From 1994, children aged 11 to 15 also complete a short interview, these are known as the youth cohort. The sample follows the same representative panel of individuals and is designed to allow meaningful analysis of certain groups, including the youth cohort.

Data collected include those on household organisation, employment, accommodation, tenancy, housing, health and demographics. To date there have been 18 waves, none of the adults' waves have included food-related questions but several of the youth cohort waves have included four food-related questions collected via self-completion (paper questionnaire). These were asked across five consecutive waves between 2004 and 2008/9 (waves 14 to 18), with consistent wording throughout and were;

- How often do you eat fast foods or takeaways?
- How often do you eat fresh fruit or vegetables?
- How often do you eat crisps, fizzy drinks or sweets?
(With answer options of, 'everyday or nearly everyday', 'about once a week', 'every now and then' and 'never or hardly ever')
- In the past week, how many times have you shared an evening meal with your family?

(With answer options of, 'none', '1-2', '3-5', and '6-7')

Overall, 186 respondents provided answers for all five waves and these are the focus for our longitudinal analysis.

3.3 Family and Children's Survey

The Families and Children Study (FACS), formerly known as Survey of Low Income Families, was commissioned by the Department of Work and Pensions with fieldwork carried out by NatCen, and ran from 1999-2010. It originally provided a baseline survey of low-income and lone parent families, and from 2001 it was extended to include higher-income families as well. One of its main objectives was to provide information on general family welfare issues, including the government's long-term target to eradicate child poverty.

FACS is a panel study, in which the same families with children were interviewed on a yearly basis with samples being from the child benefit records. From 2002 to 2005, FACS included a series of questions, within the expenditure module, about choice and access to food. These were usually asked of the mother. They covered topics such as whether the family could afford to have fresh fruit and vegetables everyday and whether they could afford to have a cooked main meal everyday (see Box 5.1).

3.4 English Longitudinal Survey of Aging

The English Longitudinal Survey of Aging (ELSA) is drawn from respondents to the Health Survey for England (HSE), and is jointly conducted by NatCen and the Department of Epidemiology and Public Health, UCL. Around 12,000 respondents from three HSE survey years were recruited to provide a representative sample of the English population aged 50 and over. A key advantage is the baseline data on respondents' health (details of morbidity, lifestyle and blood samples) and, importantly for this project, one of the baseline years (2001) also included data about diet and fruit and vegetable intake. To date, two more survey waves have included data about fruit and vegetable

consumption (2006 and 2008), and therefore it is possible to combine fruit and vegetable data from the sub-sample of respondents from 2001, 2006 and 2008 to track patterns of consumption over time, providing data from over 1,000 longitudinal respondents. Details of the measures of fruit and vegetable consumption are provided in Section 7.

3.5 National Survey of Health and Development (NSHD)

The MRC National Survey of Health and Development is the oldest of the birth cohort studies based on a national representative sample (all 5362 single, legitimate births that took place in one week in March 1946, achieving contact with 4695 at baseline). With 23 data collection points to date, response rates remain high (83% in the 1999 wave), and the sample is now aged 65.

Five-day food diaries were used for three waves of the survey in 1982, 1989 and 1999. Food diaries provide good estimates of energy and most nutrients and foods at both the individual and population level. However, they impose considerable burden on participants, who may alter their diet to ease recording. In the NSHD, all food and drink consumed both at home and away was recorded in the diaries over consecutive days using household measures and estimating portion sizes according to detailed guidance notes and photographs provided at the beginning of the diary. The diaries were coded using the in-house program 'diet in data out' (DIDO) (Price *et al.*, 1995). Foods and nutrient intakes for all three assessments were calculated using the in-house suite of programs based on McCance and Widdowson's 'The Composition of Foods' (Paul & Southgate, 1978), its supplements (Holland *et al.*, 1988, 1989) and the sixth edition (Food Standards Agency, 2002). These databases are the standard reference works for the UK. For further details on the dietary assessment procedures refer to Prynne *et al.* (2005).

It should be noted that NSHD (like Whitehall II and ALSPAC) does not include longitudinal weights and, therefore, sample biases may arise from only using

people who had completed the diet diaries at all three time points. The diaries had a lower response rate than the NSHD questionnaires.

The NSHD have provided a dataset that includes socio-demographic data, BMI and the following derived dietary data;

- Energy (kcal)
- Energy (kj)
- Fat (g)
- Saturated fatty acids (g) (1999 wave only)
- Protein (g)
- Total carbohydrates (g)
- Non-starch polysaccharides (g)
- Sugar (g)
- Total weight from fruit (g)
- Total weight from vegetables (excluding potatoes) (g)
- Calcium (mg)
- Vitamin C (mg)
- Iron (mg)
- Folate (ug)

Appendix A provides an overview of the socio-demographic data in this dataset.

3.6 Whitehall II

Whitehall II is a cohort study of around 10,308 working men and women who were working as civil servants in London in 1985. It was originally set up by Professor Sir Michael Marmot at UCL to investigate the importance of social class for health. The Medical Research Council, the British Heart Foundation, the National Heart and Blood Institute and the National Institute on Aging currently fund the study.

The Whitehall II study is a cohort of non-industrial civil servants, and as such reflects the demographic composition of this cohort at the study baseline in the

mid-1980s. Women make up one-third of the cohort and half of them were in the clerical and office support grade, making examination of social grade in women difficult. There is also a lack of individuals from ethnic minority backgrounds in the higher grades. An additional limitation of the study is the absence of manual workers in the cohort. However, the trend towards non-manual labour in the labour market means that this study covers an increasingly dominant section of the working population (Marmot and Brunner, 2004).

The 11 waves of the study have consisted of clinical screening/questionnaire and questionnaire only. The sample was aged 35-55 on enrolment into the study, and at the most recent clinical collection were aged 58-78. Response rates remain high with around 70% of those still alive continuing to take part.

In wave three (1991-1994), wave five (1997-1999) and wave seven (2002-2004) Whitehall II included a food frequency questionnaire and questions about use of fat in cooking and the use of salt (average consumption in the last 12 months). Food frequency questionnaires have been used widely in epidemiological studies investigating links between diet and disease. They can rank intake of individuals relative to others in the population but do not produce reliable estimates of absolute intake at the individual level. Over-estimation is common, particularly for foods eaten less often or for foods perceived as 'healthy' such as fruit and vegetables. Reporting bias can also change over the course of a longitudinal study as participants become more aware of health guidelines. The Whitehall II team have provided a dataset that includes extensive food frequency data (see Appendix A), socio demographic data plus data on health problems (including the Rose Angina questionnaire), alcohol units, smoking and exercise. They have also provided us with the percentage of total energy from saturated and unsaturated fat.

4 Eating and cooking practices

4.1 Summary

This chapter examines items that, rather than measuring nutritional intake or diet, focus on eating and cooking practices and behaviours. This includes such things as eating convenience ‘fast food’ and different ways of eating or preparing food. The analyses covered sixteen topic areas using data from the BHPS youth cohort, Whitehall II, and ALSPAC.

Some key findings in this chapter include:

- One child in six persistently (that is, across every wave analysed) ate crisps, fizzy drinks or sweets everyday, with boys more likely than girls to report this (BHPS, 4.3.2).
- One child in three persistently did not share an evening meal with their family (BHPS, 4.3.3).
- 57% of people with non-white ethnicity compared to 28% of people with white ethnicity persistently added salt to food while cooking (Whitehall, 4,3,5).
- A fifth of mothers from ALSPAC persistently added salt to their child’s food. Mothers with lower educational qualifications, whose children were entitled to free school meals, and who were of non-white ethnicity were more likely to persistently add salt to their child’s food (ALSPAC, 4.3.12).
- About half of the meat eaters in Whitehall II consistently ate as little fat as possible on the meat they consumed, while about a quarter persistently ate all or some. Smokers were more likely to persistently eat the visible fat on meat than non-smokers (Whitehall II, 4.3.7).
- There is evidence that unhealthy eating and cooking practices co-occur (BHPS, 4.3.4, Whitehall II, 4.3.10, ALSPAC, 4.3.16).

Box 4.1 Summary of questions on eating and cooking practices

BHPS youth cohort

1. How often do you eat fast food or takeaways?
 - Everyday or nearly everyday
 - About once a week
 - Every now and then
 - Never or hardly ever

2. How often do you eat crisps, fizzy drinks or sweets?
 - Everyday or nearly everyday
 - About once a week
 - Every now and then
 - Never or hardly ever

3. In the past week, how many times have you shared an evening meal with your family?
 - None
 - Once or twice
 - Three to five times
 - Six or seven times

4.2 Survey questions and analysis approach

4.2.1 BHPS youth cohort

Waves 14 to 18 of the BHPS youth cohort included three questions relevant to eating and cooking practices (these are summarised in Box 4.1).

For our analysis we firstly derived a binary variable for each survey wave to indicate the following categories:

- Eats fast food or takeaways at least once a week vs. eats fast food takeaways less than once a week

- Eats crisps, fizzy drinks or sweets everyday vs. eats crisps, fizzy drinks or sweets less than everyday
- Shares an evening meal at least once in last week vs. has not shared an evening meal in the last week

These variables were then used to classify respondents' longitudinal pattern of responses over the four survey waves, as follows:

- Fast food and takeaways at least once a week
 - Never eats fast food or takeaway (includes those who say now and then, and never or hardly ever for all waves)
 - Eats fast food takeaways for one or two waves
 - Eats fast food or takeaways for three or four waves
 - Persistently eats fast food or takeaways (for all waves)
- Crisps, fizzy drinks and sweets everyday
 - Consistently does not eat crisps, fizzy drinks or sweets everyday (includes all those who say once a week or less often for all waves)
 - Eat crisps, fizzy drinks or sweets everyday for one or two waves
 - Eat crisps, fizzy drinks or sweets everyday for three or four waves
 - Persistently eats eat crisps, fizzy drinks or sweets everyday (for all waves)
- Shares an evening meal with family at least once in last week
 - Consistently share an evening meal (include those who say they do once a week or more for all survey waves)
 - Shares an evening meal for three or four waves
 - Shares an evening meal for one or two waves
 - Persistently never shares an evening meal (for all waves)

4.2.2 Whitehall II

Waves three, five and seven of the Whitehall II study included questions related to eating and cooking practices. Those that analysed in this chapter are summarised in Box 4.1.

For our analysis we firstly derived binary variables for each survey wave to indicate the following categories:

- Adds salt to food while cooking usually or always vs never, rarely or sometimes adds salt
- Eats food that is fried at least once a week vs less than once a week
- For meat eaters only: eats some or most of the visible fat on meat vs eats as little as possible
- Uses saturated fat vs uses no fat or unsaturated fat for cooking such as frying, roasting and grilling
- Uses saturated fat vs uses no fat or unsaturated fat for baking

These variables were then used to classify respondents' longitudinal pattern of responses over the three survey waves as follows:

Adds salt to food while cooking usually or always

- Never adds salt to food while cooking (includes those who do rarely or sometimes)
- Adds salt to food while cooking usually or always for one wave
- Adds salt to food while cooking usually or always for two waves
- Persistently adds salt to food while cooking usually or always (for all waves)

Eats food that is fried at least once a week

- Consistently only eats food that is fried less than once a week (for all waves)
- Eats food that is fried at least once a week for one wave
- Eats food that is fried at least once a week for two waves
- Persistently eats food that is fried at least once a week (for all waves)

Eats some or most of the visible fat on meat

- Consistently eats as little fat as possible on meat (for all waves)
- Eats some or most of the visible fat on meat for one wave

- Eats some or most of the visible fat on meat for two waves
- Persistently eats some or most of the visible fat on meat (for all waves)

Uses any fat for frying, roasting, grilling etc

- Consistently does not use any fat for frying, roasting, grilling etc (for all waves)
- Consistently does not use any fat or only uses unsaturated fat for frying, roasting, grilling etc
- Uses any saturated fat for frying, roasting, grilling etc for one wave
- Uses any saturated fat for frying, roasting, grilling etc for two waves
- Persistently uses saturated fat for frying, roasting, grilling etc (for all waves)

Uses any fat for baking

- Consistently does not use any fat for baking (for all waves)
- Consistently does not use any fat or only uses unsaturated fat for baking
- Uses saturated fat for baking for one wave
- Uses saturated fat for baking for two waves
- Persistently uses saturated fat for baking (for all waves)

4.2.3 ALSPAC

The ALSPAC team have not published widely on cooking practices. They have, however, looked at eating practices by using Principal Components Analysis (PCA). PCA is a way of summarizing complex information about the various foods consumed into a more manageable data set that is capable of giving insight into how people eat (Emmett, 2009). Several analyses have been performed on the ALSPAC data based on the food frequency questionnaire, and we briefly discuss these here.

PCA analysis has been undertaken on the dietary data of the children of ALSPAC at ages three, four and seven (North and Emmett, 2000; Northstone and Emmett 2005). At the age of three, four distinct dietary components were obtained. The first represented a diet based on convenience foods and was associated with younger, less educated mothers and the presence of older siblings. The second was characterized by a high consumption of foods currently considered to be healthy and was particularly related to vegetarian mothers and higher education levels. The third described the established British 'meat and two vegetables' diet and was associated with girls and children with no older siblings. The fourth had high loadings on snack and finger foods and was related to socially advantaged conditions and the presence of older siblings. Thus it was concluded that social, demographic and lifestyle factors relating to the mother have an influence on the early eating patterns of children.

This result was further confirmed by the subsequent analyses at four and seven years of age. At these two time points however, only three distinct dietary patterns were identified: a 'junk food' component high in fat and sugar content, processed and convenience foods, a 'traditional' British diet based on meat, potatoes and vegetables, and a 'health-conscious' pattern associated with vegetarian style foods, rice, pasta, salad and fruit. At both time points, the 'junk food' diet was more likely in white children, where maternal education level was low and where the child had older siblings. The 'traditional' pattern was more likely in girls, where the mother had a partner and in non-vegetarians. The 'health-conscious' pattern was more likely with increasing levels of education and increasing maternal age.

Northstone and Emmett (2008) undertook PCA analysis again at the age of 9 years and found another slight change in dietary patterns. While the three components identified at the ages of four and seven remained, a slight modification was seen to the 'health conscious' component, with loadings on meat products becoming negative.

These dietary patterns have been found to be related to a number of outcomes. For example, Northstone *et al.* (2011) found that the 'processed' pattern of diet at three years of age was negatively associated with IQ assessed at eight years. They also found that the 'health conscious' pattern at eight years was positively associated with IQ. Feinstein *et al.* (2008) also found that the 'junk food' dietary pattern at the age of three had a negative association with the level of school attainment (tested at ages 10-11 with the Key Stage 2 National tests). In addition, this association remained after controlling for other dietary patterns at the age of three and dietary patterns at ages four and seven, suggesting that early eating patterns have implications for attainment that appear to persist over time, regardless of subsequent changes in diet. Wiles *et al.* (2009) found that children eating a diet high in 'junk food' at four years of age were more likely to be in the top 33% on the Strength and Difficulties Questionnaire (SDQ) hyperactivity sub-scale at the age of seven. They found little evidence however to support an association between 'junk food' intake and overall behavioural difficulties or other sub-scales of the SDQ. Peacock *et al.* (2011) also found no evidence to support an association between a 'junk food' diet at 81 months of age and behavioural problems at 97 months.

Similar analysis has also been carried out on the mothers of ALSPAC children. Northstone *et al.* (2008) established five distinct dietary patterns to describe the types of diets being consumed in pregnancy: the 'health conscious' (a diet based on salad, fruit, rice, pasta, breakfast cereals, fish, eggs, pulses, fruit juices, white meat and non-white bread), 'traditional' diet (loading highly on all types of vegetables, red meat and poultry), 'processed' diet (associated with high-fat processed foods), 'confectionary' pattern (characterised by snack foods with high sugar content), and 'vegetarian' diet (loading highly on meat substitutes, pulses, nuts and herbal tea, with negative high loadings on red meat and poultry). They found strong associations between all of these five dietary patterns and socio-demographic variables. In particular, a 'health conscious' diet was positively associated with increasing education and age and non-white women. Negative associations were seen between this dietary pattern and single, non-working women, those who smoked, and those who were overweight pre-pregnancy.

Opposite associations were seen with the ‘processed’ component. Northstone *et al.* (2008b) also examined the association of these dietary patterns with nutrient intakes, and concluded that their results suggest the dietary patterns adequately characterise dietary intake, validating their potential use in assessing relationships between diet and health outcomes. Shaheen *et al.* (2009) have used these dietary patterns in pregnancy to look at the possible impact on respiratory and atopic outcomes in childhood. They found that dietary patterns did not predict asthma and related outcomes (eczema, total IgE, wheezing, hay fever, and atopy) in the offspring after controlling for confounders.

Northstone and Emmett (2010) have also carried out PCA on the father’s in ALSPAC. Four dietary patterns were established in the father’s: ‘health conscious’, ‘traditional’, ‘processed/confectionary’, and ‘semi-vegetarian’. These patterns are similar to but not identical to the patterns found for women. One of the biggest differences between men and women was that men did not have separate ‘processed’ and ‘confectionary’ patterns as the women did. Also, for the ‘semi-vegetarian’ pattern, there were no negative loadings for meats and the loadings for fish were positive, unlike the ‘vegetarian’ pattern in women. Strong associations were evident between several socio-demographic variables and the dietary patterns, similar to those reported for women.

The questions included in ALSPAC that are examined in this chapter are:

- Fats used for frying food
- Fats used for bread and vegetables
- Whether all fat eaten on meat
- Salt added to children’s food or during cooking
- Frequency of eating food that is fried.

Five waves of ALSPAC (at 38 months, 54 months, 81 months, 103 months and 157 months) asked mothers, on the child-based questionnaire, about what fat they used for frying or on bread or vegetables given to the children (see Box 4.1). For our analysis we have summarised these into binary variables of:

- Used any high saturated fat for frying or on bread or vegetables (butter, ghee, dripping, lard, solid cooking fat) vs
- Used low saturated fats and other fats, or no fat (margarine, polyunsaturated margarine, low fat spread, sunflower oil, corn oil, soya oil, olive oil, hazelnut oil, rapeseed oil, other vegetable oil, other, or none).

To examine the longitudinal pattern of using fat for frying or on bread or vegetables, we created the following variable:

- Consistently did not use any high saturated fat (for all five waves)
- Used high saturated fat for one or two waves
- Used high saturated fat for three or four waves
- Persistently used high saturated fat (for all five waves).

The same five waves of ALSPAC also asked the mothers (on the child-based questionnaire) whether the child ate the fat on meat, and how often the child ate food that was fried. For our analysis purposes we have summarised these into two binary variables as follows:

- For meat eaters only: the child ate some or all of the fat on meat versus ate none of the fat on meat;
- The child ate food that was fried one or more times a week versus never or rarely ate food that was fried.

To examine the longitudinal pattern of these variables we summarised them as follows:

- Consistently did not eat any of the fat on meat
- Ate some or all of the fat on meat for one or two waves
- Ate some or all of the fat on meat for three or four waves
- Persistently ate some or all of the fat on meat (for all five waves)
- Consistently never or rarely ate food that was fried (for all five waves)
- Ate food that was fried one or more times a week for one or two waves

- Ate food that was fried one or more times a week for three or four waves
- Persistently ate food that was fried one or more times a week (for all five waves).

Three waves of ALSPAC (15 months, 24 months and aged seven years) also asked the mothers (on the child-based questionnaire) whether they added salt to the child's food or in preparing the child's food. For our purposes we created a binary variable of whether the Mother added any salt to the child's food or in preparing the child's food versus added no salt. To study the longitudinal pattern of this variable we created the following variable:

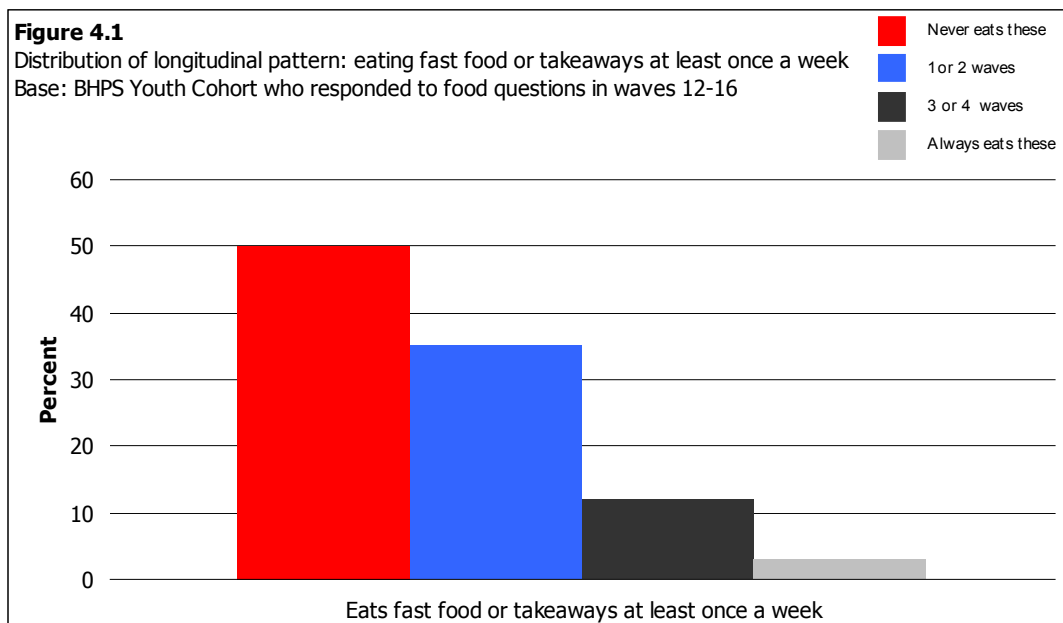
- Consistently used no salt in the child's food or in preparing their food (for all three waves)
- Used salt for one wave
- Used salt for two waves
- Persistently used salt (for all three waves).

4.3 Results

4.3.1 Eating fast food and takeaways – BHPS

Very few children between the ages of 11 and 15 persistently ate fast food or takeaways at least once a week. Overall, half (50%) of respondents were in the healthiest longitudinal group, having never eaten fast food or takeaways once a week or more (in all waves), 35% reported eating such food once a week in one or two waves, 12% in three or four waves, and just 3% were in the unhealthiest group (having persistently eaten fast food or takeaways at least once a week for all waves). Longitudinal patterns for eating fast food or takeaways did not significantly vary by any of the covariates.

Tables 4.1 to 4.7, Figure 4.1



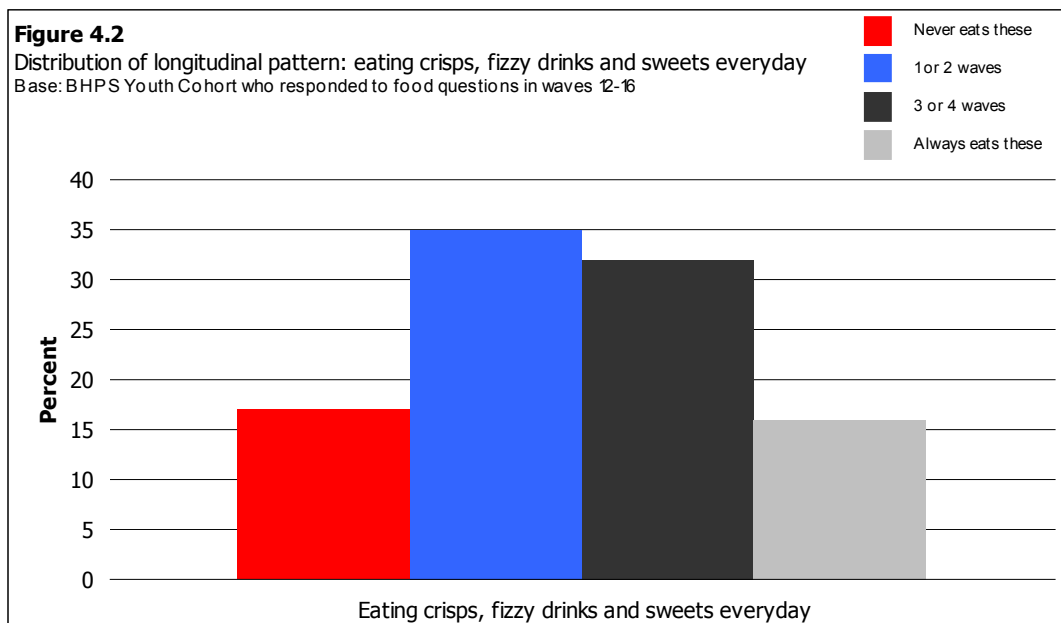
4.3.2 Eating crisps, fizzy drinks and sweets – BHPS

Equal proportions of children were in the healthiest and unhealthiest groups in terms of their longitudinal pattern of eating crisps, fizzy drinks and sweets.

Seventeen percent of children said they did not eat these everyday across all survey waves, however, 16% of children persistently ate these everyday between the ages of 11 and 15.

There was an association with sex, with 25% of boys persistently eating crisps, fizzy drinks or sweets daily, compared to just 7% of girls.

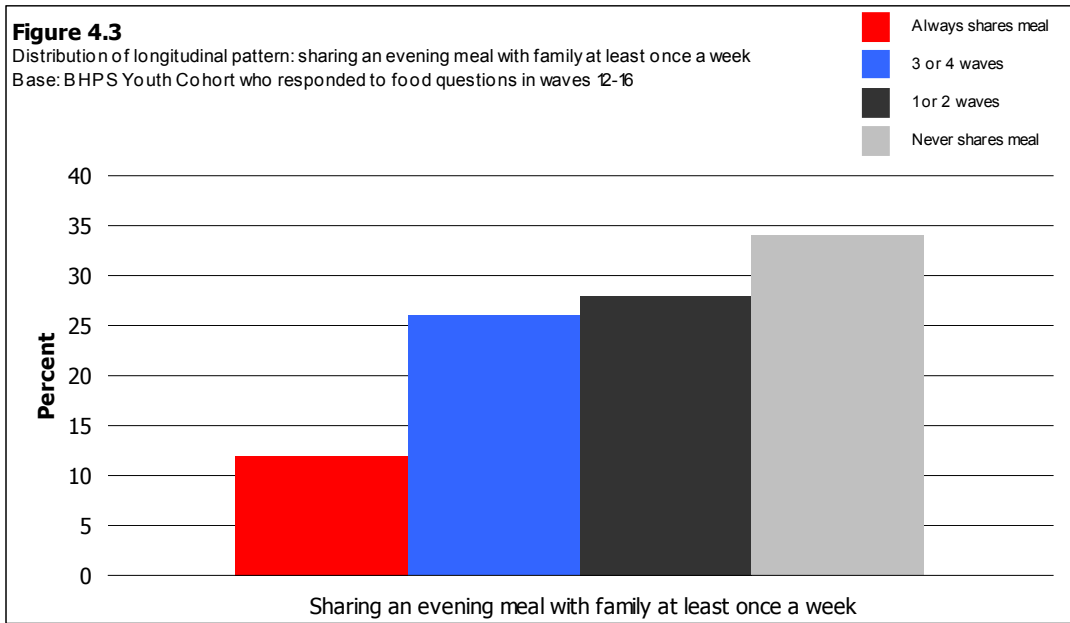
Tables 4.8 to 4.14, Figure 4.2



4.3.3 Sharing an evening meal with family - BHPS

Only a minority of children between the ages of 11 and 15 consistently shared an evening meal with their family at least once a week. Twelve percent of children had shared an evening meal with their family at least once in the last week, across all survey waves, whereas a third (34%) persistently did not share a weekly evening meal with their family. A quarter had shared a meal in the last week for three or four waves (26%), and almost a third (28%) shared an evening meal with family for one or two waves. The only significant association found was a higher prevalence of dieting in the past year (29%) for those who always shared an evening meal with their family once a week (only 9% of those who had never dieted always shared an evening meal). However, caution is required in interpreting these findings due to small sub-group sizes.

Tables 4.15 to 4.21, Figure 4.3



4.3.4 Associations with eating fruit and vegetables - BHPS

Due to the small sample size, it was not viable to look at how behaviours such as eating fast food/takeaway, sharing an evening meal, and consumption of crisps, fizzy drinks and sweets co-occurred. There were not enough cases in some of the sub-groups for comparisons to be meaningful. However, it was possible to compare all these behaviours with the longitudinal pattern for eating fresh fruit and vegetables.

There was some evidence that healthy behaviours co-occurred. For those children who consistently never ate crisps, fizzy drinks or sweets everyday, 31% also ate fresh fruit and vegetables everyday, whereas just 6% of this group never/rarely ate fresh fruit and vegetables daily. In addition, although just missing significance ($p=0.06$), for those who persistently ate crisps, fizzy drinks and sweets everyday, only 9% also ate fresh fruit and vegetables daily, whereas 46% mostly (three to four waves) and 17% never/rarely ate fruit and vegetables daily.

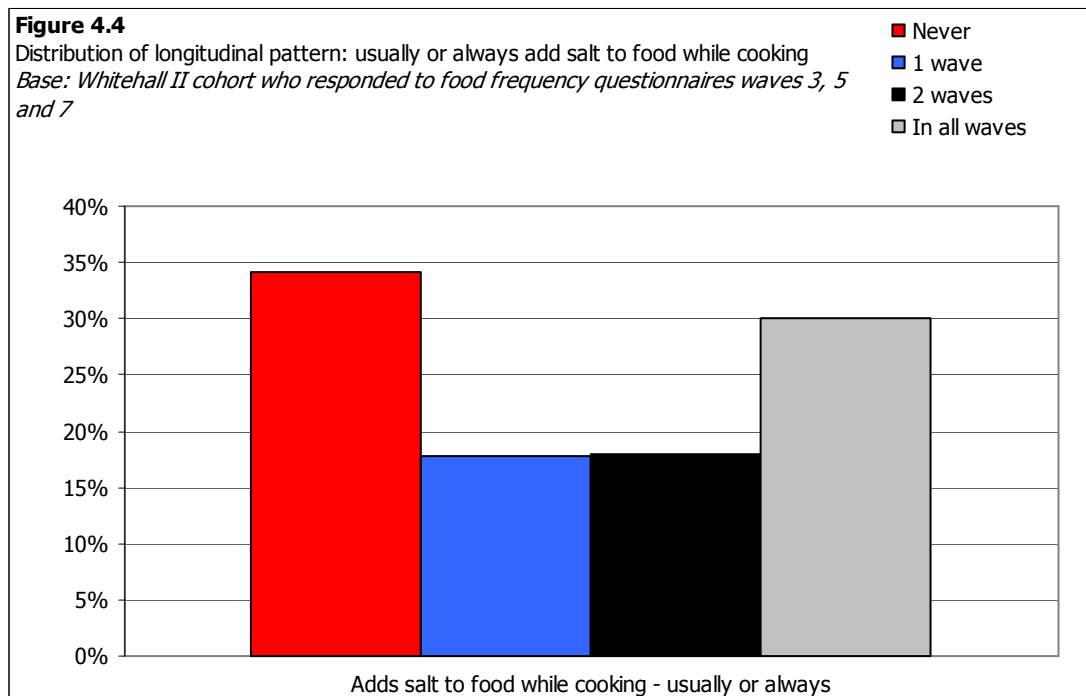
Tables 4.22 to 4.24

4.3.5 Adding salt to food while cooking – Whitehall II

The highest proportion of respondents to the Whitehall II study consistently never (or rarely or sometimes) added salt to their food while cooking (34%). However, 30% always or usually added salt to food while cooking for all three waves.

A higher proportion of females than males (37% compared to 28%, $p < 0.001$) persistently added salt to food while cooking (this may have reflected differences in the amount of cooking done). People of non-white ethnicity were twice as likely as those of white ethnicity to persistently add salt to food while cooking (57% and 28% respectively, $p < 0.001$). Older people were also more likely to persistently add salt to food while cooking ($p < 0.001$), as were those who currently smoke ($p = 0.003$), those in clerical/support positions ($p < 0.001$), and those with no children in the household ($p < 0.001$). Seventy three percent of the clerical/support grade were female, so the finding that this grade was more likely to persistently add salt to food while cooking could simply be due to the fact that women are more likely to do this.

Tables 4.25 to 4.30, Figure 4.4

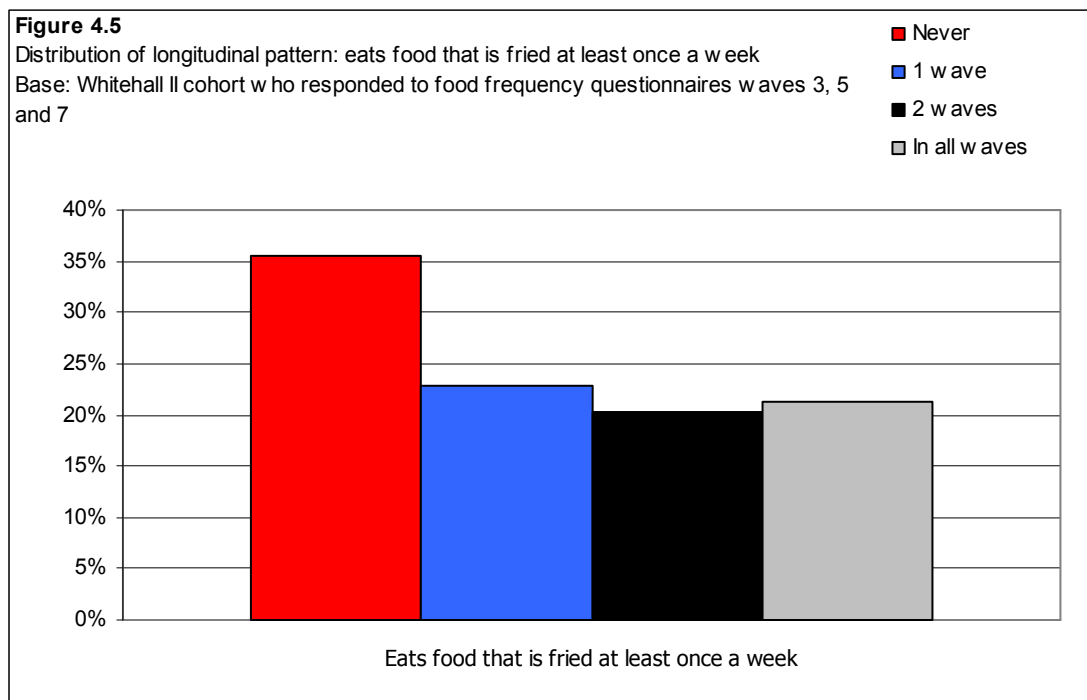


4.3.6 Eating food that is fried – Whitehall II

Similarly to adding salt to food while cooking, the highest proportion of the Whitehall II cohort were those who never ate fried food one or more times in a week, for all three waves (36%). Twenty one percent of respondents persistently ate food that was fried one or more times a week (in all three waves).

A higher proportion of males than females persistently ate fried food one or more times a week (for all three waves) (24% compared to 15%, $p < 0.001$). Those of non-white ethnicity, with one or more children in the household, and who currently smoke were more likely to eat fried food one or more times a week for all three waves. Age and employment grade were not significantly associated with longitudinal pattern of eating fried food.

Tables 4.31 to 4.36, Figure 4.5

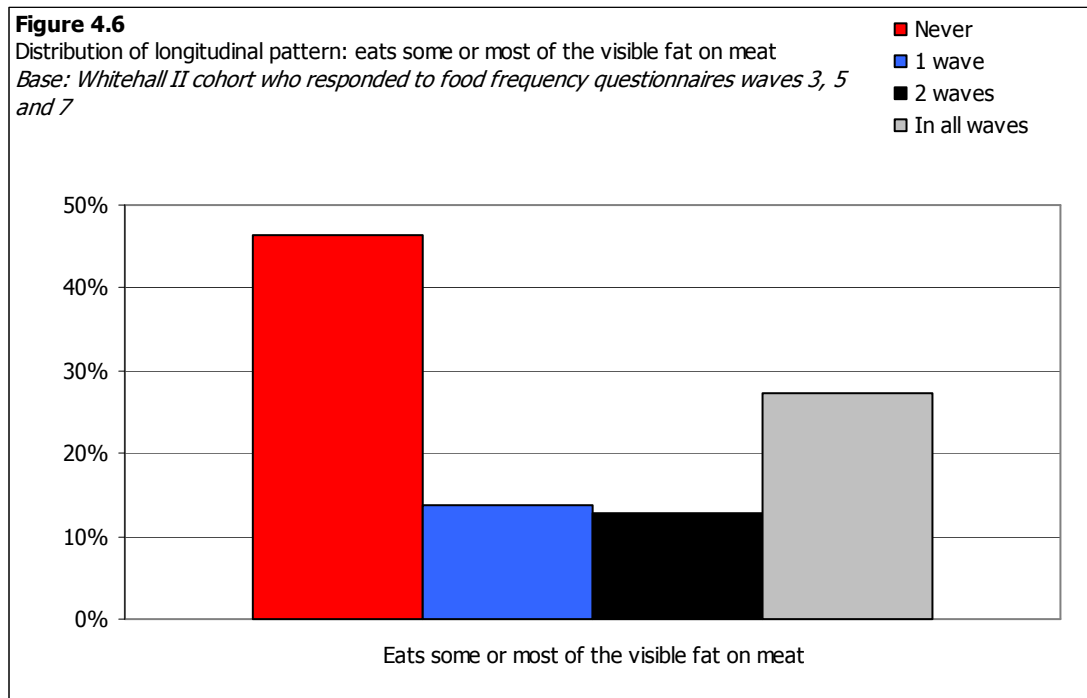


4.3.7 Eating the visible fat on meat – Whitehall II

Forty six percent of Whitehall II meat-eaters consistently ate as little fat as possible on the meat they consumed. On the other hand, 27% persistently ate some or most of the visible fat (for all three waves).

Thirty percent of males persistently (for all three waves) ate some or most of the visible fat on their meat compared to only 18% of females ($p < 0.001$). Those of white ethnicity were also much more likely to persistently eat some or most of the visible fat on meat than those of non-white ethnicity (28% and 6% respectively, $p < 0.001$). The younger age groups (39–49) and current smokers were also more likely to persistently eat some or most of the visible fat on meat. Those in clerical/support positions were less likely to persistently eat some or most of the visible fat on meat, but again this could be due to the gender make-up of this employment grade.

Tables 4.37 to 4.42, Figure 4.6



4.3.8 Using fat for frying, roasting, grilling – Whitehall II

The majority of Whitehall II respondents did not use any fat or used unsaturated fat for frying, grilling or roasting (87%). Only 1% used saturated fat for all three waves, and 10% used saturated fat in one or two waves.

More females than males persistently used saturated fat for frying etc (2% compared to 1%, $p = 0.014$). Those in clerical/support positions were also more

likely to use saturated fat for all three waves (3% compared to 1% for the other two employment grades), but again this could be due to the gender profile of this employment grade. Ethnicity, age, smoking status and whether there were any children in the household were all not significantly associated with using fat for frying etc for all three waves.

Tables 4.43 to 4.48

4.3.9 Using fat for baking – Whitehall II

Respondents were more likely to use saturated fat persistently (for all three waves) for baking than for frying, grilling or roasting (4% compared to 1%).

Gender and whether there were any children in the household were both associated with the persistent use of saturated fat for baking – women were more likely to persistently use saturated fat and more households with no children persistently used saturated fat. Neither ethnicity, age, nor smoking status were associated with the persistent use of saturated fat in baking, although employment grade was (at the 10% level, $p=0.075$).

Tables 4.49 to 4.54

4.3.10 Co-occurring behaviours – Whitehall II

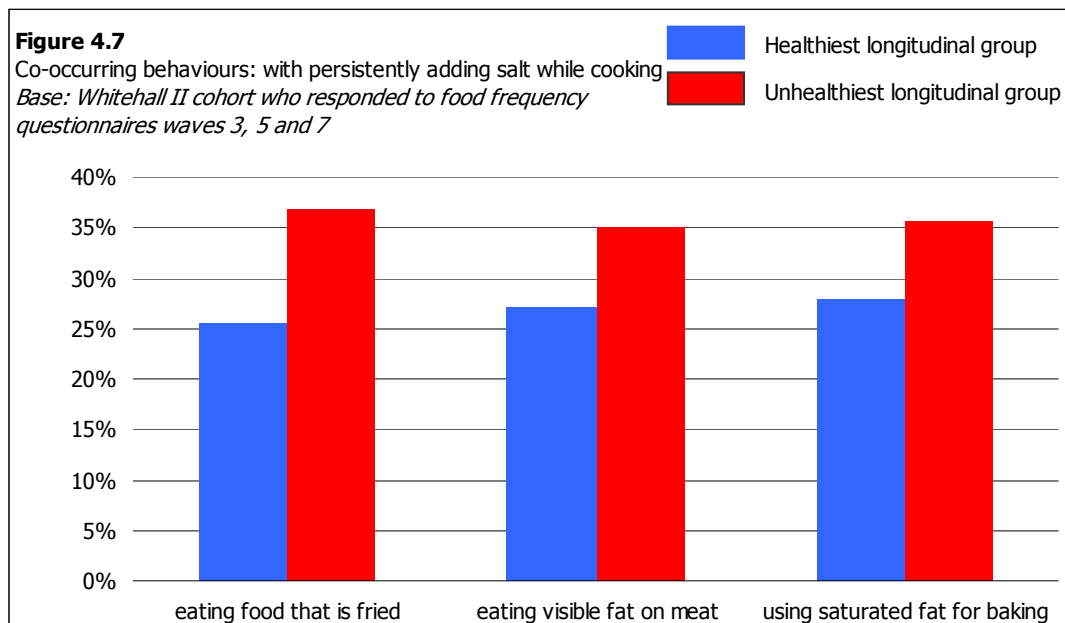
There is some evidence from the Whitehall II cohort that bad cooking practices co-occur. For example, those who persistently ate fried food one or more times a week were more likely to persistently add salt to food while cooking usually or always. This was also the case for those who persistently ate some or most of the visible fat on meat, and also for those who persistently used saturated fat for baking (Figure 4.7).

Similarly, while only 17% of those who consistently ate as little fat as possible on their meat also ate fried food one or more times a week for all three waves, 30% of those who persistently ate some or all of the fat on their meat also persistently ate fried food regularly.

27% of those who consistently did not use any fat for baking persistently ate some or most of the visible fat on their meat, while 36% of those who persistently used saturated fat for baking also persistently ate some or most of the visible fat on their meat.

Interestingly, there was no significant association between persistently eating fried food one or more times a week and the longitudinal pattern of using fat for baking. Using saturated fat for frying, grilling, roasting etc was not included in this analysis due to the small sizes of some sub-groups.

Tables 4.55 to 4.60, Figure 4.7



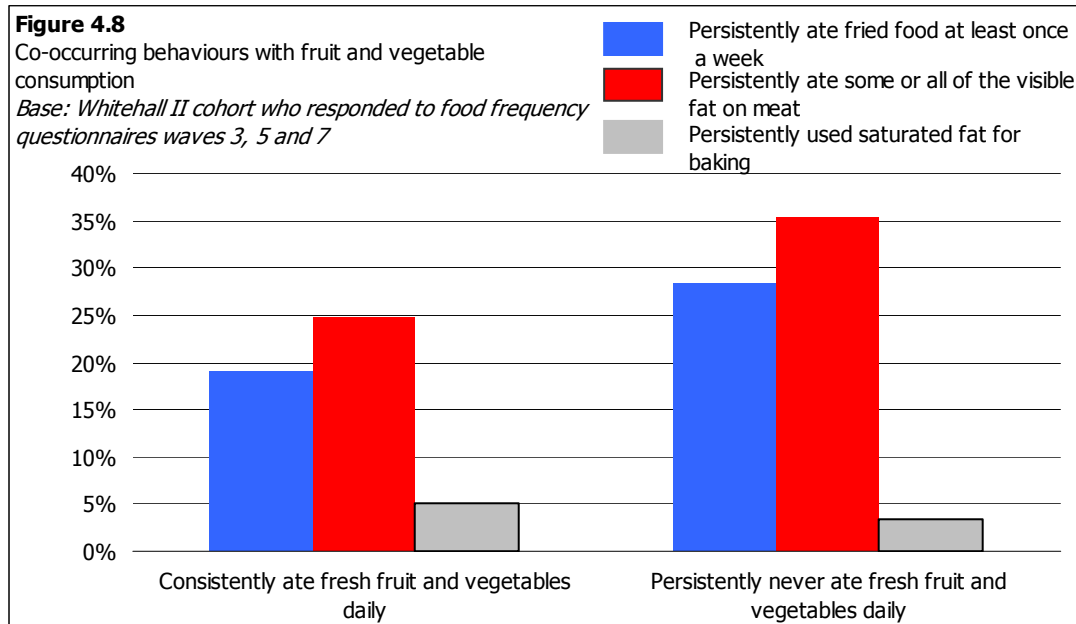
4.3.11 Associations with eating fruit & vegetables – Whitehall II

As with the BHPS, there was some evidence from the Whitehall II cohort that healthy fruit and vegetable behaviours co-occurred with other healthy eating patterns.

The proportion who usually or always added salt to food while cooking did not vary significantly between the longitudinal groups for fruit and vegetable consumption. However, those who persistently never ate fresh fruit and vegetables daily were more likely to persistently eat fried food one or more times

a week, and also to eat some or most of the visible fat on meat for all waves. On the other hand, these people were actually *less* likely to use saturated fat for baking for all waves, compared to those who consistently ate fresh fruit and vegetables daily.

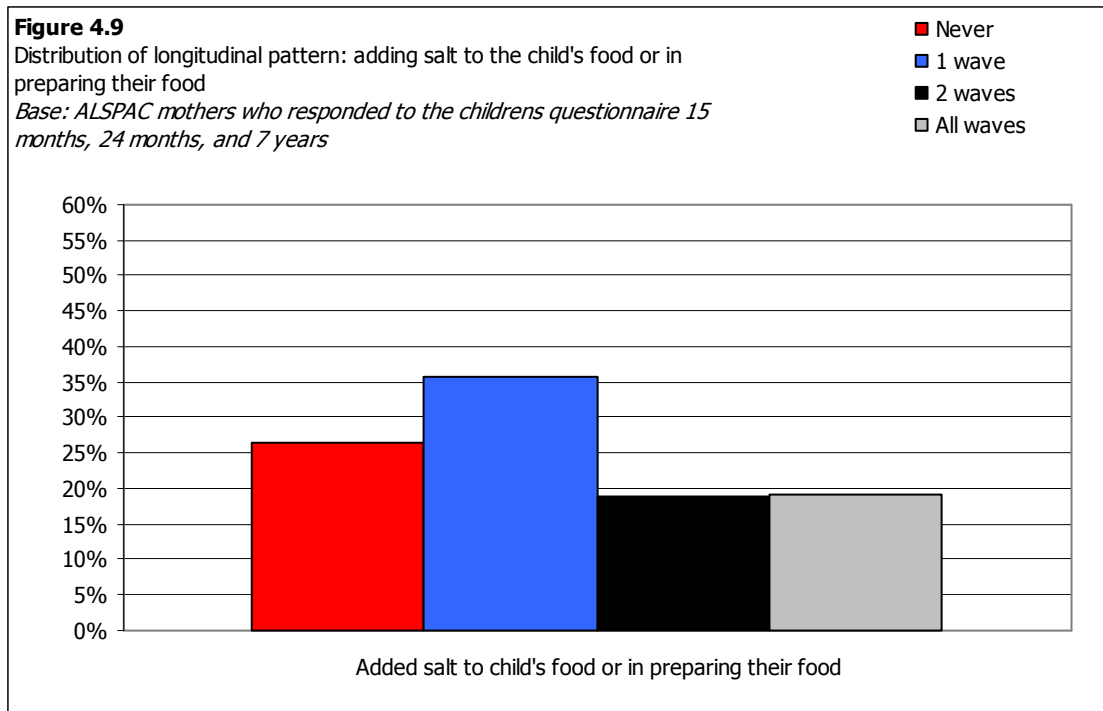
Tables 4.61 to 4.65, Figure 4.8



4.3.12 Salt used in food or in preparing food – ALSPAC

Nineteen percent of mothers in ALSPAC persistently added salt to their child’s food or in preparing their food (for all three waves this was measured), while 26% never added any salt to the child’s food.

Educational qualifications, whether the child was eligible for free school meals, ethnicity and social grade were all associated with the use of salt while marital status was not. Mothers with only Certificate of Secondary Education (CSE) or vocational qualifications were more likely to persistently add salt to the child’s food ($p < 0.001$) as were those mothers whose children were eligible for free school meals ($p = 0.012$) and those mothers who were in the lowest social grades (partly skilled or unskilled, $p < 0.001$). Children of non-white ethnicity were more likely to persistently have salt added to their food by their mothers ($p < 0.001$).



4.3.13 Fat used for frying or on bread or vegetables – ALSPAC

Thirty seven percent of mothers did not use any high saturated fats for frying or on bread or vegetables prepared for their children for the five waves this was measured. On the other hand, 14% of mothers persistently used high saturated fats for frying or on bread or vegetables (for all five waves).

The use of high saturated fats increased with the mothers education level – 24% of mothers with degrees persistently used high saturated fats compared to 8% of those with CSE qualifications only ($p < 0.001$). Mothers of children not eligible for free school meals were more likely to persistently use high saturated fats (14% compared to 6%, $p = 0.013$). Consistent with the education level finding, mothers with higher social grades were more likely to persistently use high saturated fats ($p < 0.001$). The longitudinal pattern of using high saturated fats varied by marital status (with those mothers who had had two or more marriages the most likely to

persistently use high saturated fats, $p=0.051$) but did not vary significantly by ethnicity.

Tables 4.71 to 4.75, Figure 4.10

4.3.14 Eating the fat on meat – ALSPAC

Eight percent of mothers who responded to the five waves for which this question was asked reported that their child persistently ate the fat on meat (all or some of it). Forty two percent reported that their child never ate the fat on meat for all five waves.

The longitudinal pattern of eating the fat on meat did not vary significantly by any of the covariates examined (although the association with marital status was significant at the 10% level, with more mothers who were never married or were separated, divorced or widowed more likely to report their child persistently ate the fat on meat, $p=0.064$).

Tables 4.76 to 4.80, Figure 4.11

4.3.15 Eating food that is fried – ALSPAC

Only 1% of mothers reported that their children persistently ate food that is fried one or more times a week (for all of the five waves this was asked). Fifty eight percent reported that their child never ate fried food one or more times a week.

The longitudinal pattern of eating fried food at least once a week varied significantly with the mother's highest educational qualification (Figure 4.12, $p=0.035$) and ethnicity, but not for the other covariates examined. Those of non-white ethnicity were more likely to persistently report their children eating fried food one or more times weekly (4% compared to 1%, $p=0.003$). This result is consistent with that found in the Whitehall II cohort.

Tables 4.81 to 4.85, Figures 4.12 and 4.13

4.3.16 Co-occurring behaviours – ALSPAC

There is some evidence from the ALSPAC data that bad food practices co-occur. Those who persistently reported that their children ate the fat on meat (all or some of it) were also more likely to persistently use high saturated fats in frying or on bread or vegetables ($p < 0.001$). Similarly, those who reported that their children persistently ate fried food at least once a week were more likely to persistently use high saturated fats ($p < 0.001$), and also more likely to report that their children persistently ate the fat on meat ($p < 0.001$). In addition, those who persistently used high saturated fat, those who reported that their children persistently ate the fat on meat, and those who reported their children ate fried food at least once a week were all more likely to persistently add salt to their child's food (all $p < 0.001$). However, caution must be taken in interpreting these findings, as some cell sizes are quite small.

Tables 4.86 to 4.91

4.4 References

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5 Choice and access to food

5.1 Summary

This chapter looks at the ability to afford both quality and variety of food, using data from four waves of the Families and Children Survey (FACS) 2002-2005. It describes the incidence of being unable to afford different types of foods or meals, and describes the patterns of poor choice and access over time by key socio-demographic variables among families with children.

Nearly all families could consistently afford to have a cooked meal everyday and a roast (or something similar) every week, while 3-4% persistently could not afford fish or meat every other day. Two to four percent were unable to afford fresh fruit or vegetables on most days and a similar percentage (3-4%) were unable to afford cakes and biscuits on most days. For all seven items relating to choice and access, lone parent families (LPF) and those in receipt of FSM were at greatest risk of having poorer choice and access to food.

Box 5.1 FACS choice and access to food questions

- Whether families...
- Have a cooked main meal everyday
- Have meat or fish every other day
- Have a roast, meat joint or something similar once a week
- Have fresh fruit on most days
- Have fresh vegetables on most days
- Have cakes and biscuits on most days
- Are able to afford good quality/brand name food on most days

Respondent answer options:

'We have this',

'We do not want /need this at the moment', or

'We would like to have this but cannot afford it at the moment'.

Quality of food is an important issue when it comes to choice and access, and it appears that this is the area where cuts are most often made by people. However, there was a reduction in the proportion of families unable to afford good quality or brand food on most days, from 12% in 2002 to 8% in 2005.

5.2 Survey questions and analysis approach

For our analysis responses to each of the seven questions about choice and access to food (see Box 5.1) were re-coded into a binary variables to indicate those with good choice/access (answering either 'We have this' or 'We do not want/need this at the moment') and those with poor choice/access (answering 'We would like to have this but cannot afford it at the moment'). The seven items were then used to derive a cumulative indicator score of 'Poor Choice and Access' (the higher score the more deprived in terms of choice and access to food).

Trends over time

All seven items and the derived score were then analysed, using the appropriate survey weights, by family type (couple or lone parent family), and whether or not they were in receipt of Free School Meals (FSM) for each survey wave.

Longitudinal analysis

FACS data presents us with an opportunity to look at how food choice and access may vary over the four survey waves. We were able to classify choice and access overtime based on the choice and access score, and this provided the following five longitudinal patterns:

- Persistently good choice and access
- Improved choice and access
- Worsened choice and access
- Varying choice and access
- Persistently poor choice and access

We applied two thresholds to indicate poor choice and access. The first, a more inclusive approach, used a score of one or more, and the second, a more conservative approach, used a score of two or more. These longitudinal summary variables were then analysed, using appropriate survey weights, by FSM and family type.

Due to the limitations for analysis with the two or more score (due to smaller sub-sample size of those classified as having persistently poor choice and access), we then focused on using the score of one or more and analysed this by child's age, sex, and parental occupational group.

5.3 Results

5.3.1 Item trends over time

The results suggest that, for all seven items relating to choice and access, lone parent families (LPF) and those in receipt of FSM were at greatest risk of having poorer choice and access to food. Nearly all respondents were able to afford the basics of having a cooked meal everyday (99% for all survey years), having a roast, joint or something similar once a week (range 95-99%), and very few were unable to afford meat or fish every other day (range 3-4%), but lone parent families and those in receipt of FSM were more disadvantaged compared to two-parent families and those not in receipt of FSM. For example, 11-16% of those in receipt of FSM could not afford meat or fish every other day compared to 1-2% of those not in receipt of FSM. Similarly, 8-11% of lone parent families could not afford a roast every week compared to 2-3% of couple families.

Tables 5.1 to 5.6

In 2002 four percent of all families were unable to afford fresh fruit or fresh vegetables on most days, and by 2005 these figures were two percent and three percent respectively. Similar patterns emerged for LPF and those on FSM being less able to afford fresh fruit and vegetables. This was particularly marked for FSM with figures ranging from 11-14% for being unable to afford fruit and vegetables, compared with 2% for those not on FSM.

Tables 5.7 to 5.10

Most people were able to afford cakes and biscuits most days (between 96-97%), but again couples were more likely to be able to afford these compared to lone parents (98% compared to 91-93%), as were those not on FSM compared

to those receiving FSM (98% and 85-89% respectively). Again, those in receipt of FSM appear particularly disadvantaged, for instance in 2005 15% were unable to afford cakes and biscuits compared with just 2% not in receipt of FSM.

Tables 5.11 and 5.12

Quality of food is an important issue when it comes to choice and access, and it appears that this is the area where cuts are most often made by people, although interestingly over the survey years there appears to be a reduction in the proportion unable to afford the good quality or brand food on most days. Overall, in 2005 8% of people were unable to afford such goods, a four point percent decrease from the 2002 figure (12%).

This reduction is particularly marked for those from disadvantaged groups, whilst levels appear relatively stable among the comparison groups. For instance, in 2002, a quarter (25%) of lone parents were unable to afford quality/brand food on most days, declining rapidly in 2003 to a fifth (20%) which was maintained through to 2005, whereas for couples figures decrease from 8 to 5% over this period. However, despite a five point percent decrease for those on FSM between 2002 and 2005 the figure remained high at 35%.

Tables 5.13 and 5.14

Lone parent families were far more likely to have a choice and access score of one or more compared to those where the parents were a couple (25% of LPF in 2005, compared with 7% of couples). There were similar but more striking patterns for those receiving FSM, with 48% having a score of one or more in 2005, compared with just 8% of families that did not receive FSM.

Tables 5.15 and 5.16, Figures 5.1 and 5.2

Figure 5.1: Percentage of families with poor choice and access to food (score of one or more), by FSM, 2002- 2005

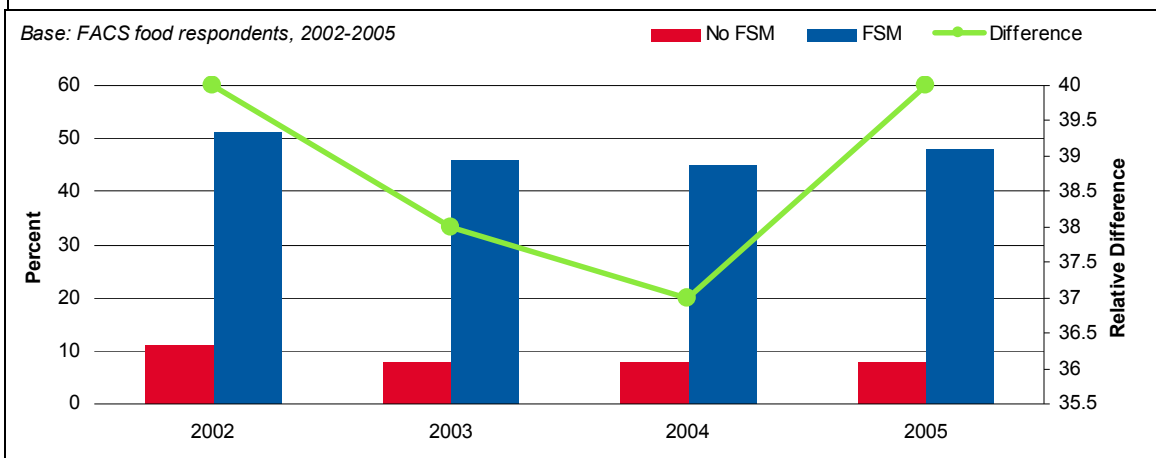


Figure 5.2: Percentage of families with poor choice and access to food (score of one or more), by family type, 2002- 2005



Longitudinal change of choice and access

The longitudinal pattern of choice and access revealed some striking results. As would be expected, those from lone parent families were clearly under represented in the group with consistently good choice and access. Only 48% of lone parent families had consistently good choice and access, compared to 81% of couple families. Similarly, just 29% of those in receipt of FSM had consistently good choice and access, compared to 80% of those who did not receive FSM.

Tables 5.17 to 5.20

Those with persistently bad choice and access tended to be slightly younger (mean age 36.5, compared with 40.2 for those with persistently good choice and access).

Table 5.21

Families where the ethnic group of the mother was not white were also under represented in the group with persistently good choice and access. For example, 58% of families where the mothers were black had consistently good choice and access, whereas this figure was 73% for families where the mothers were white. (Although we should be cautious as some of the base sizes are fairly small).

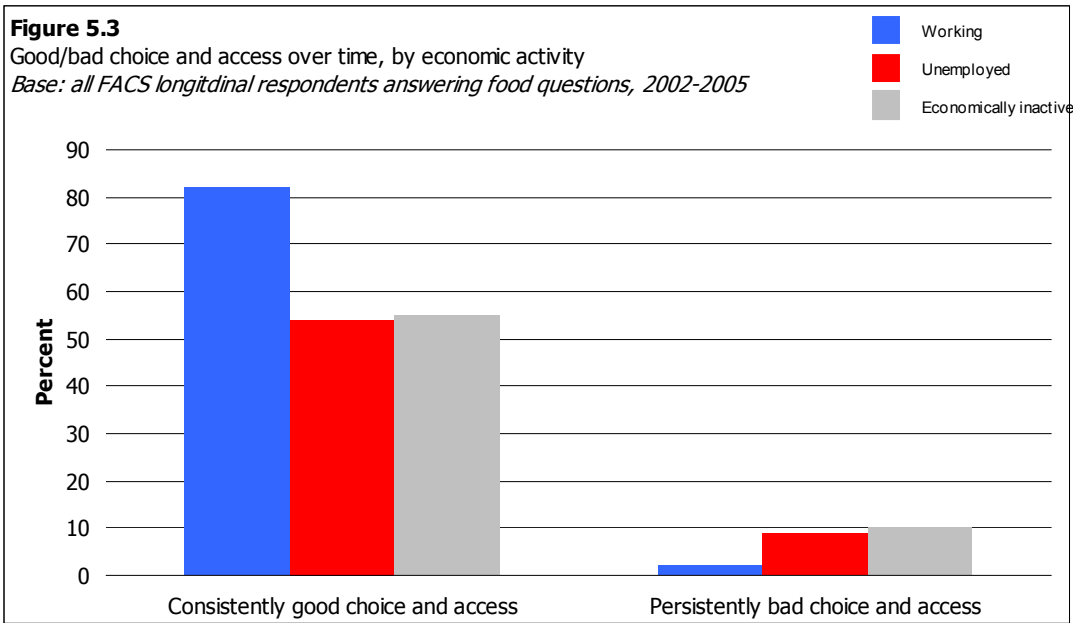
Table 5.23

Some occupations were clearly under represented in the group with consistently good choice and access. For example, 67% of process plant/machine operatives and elementary occupations had consistently good choice and access, compared with 94% from professional occupations and 85% from administrative and secretarial occupations.

Table 5.24

Families where the main respondent (in most cases this was the mother) was working were much more likely to have consistently good choice and access (82%), compared to household where they were economically inactive or unemployed (55% and 54%, respectively).

Table 5.25, Figure 5.3



Non-smokers were more likely to have consistently good choice (79%) and access compared with smokers (58%) but no significant associations emerged for alcohol consumption.

Tables 5.26 and 5.27

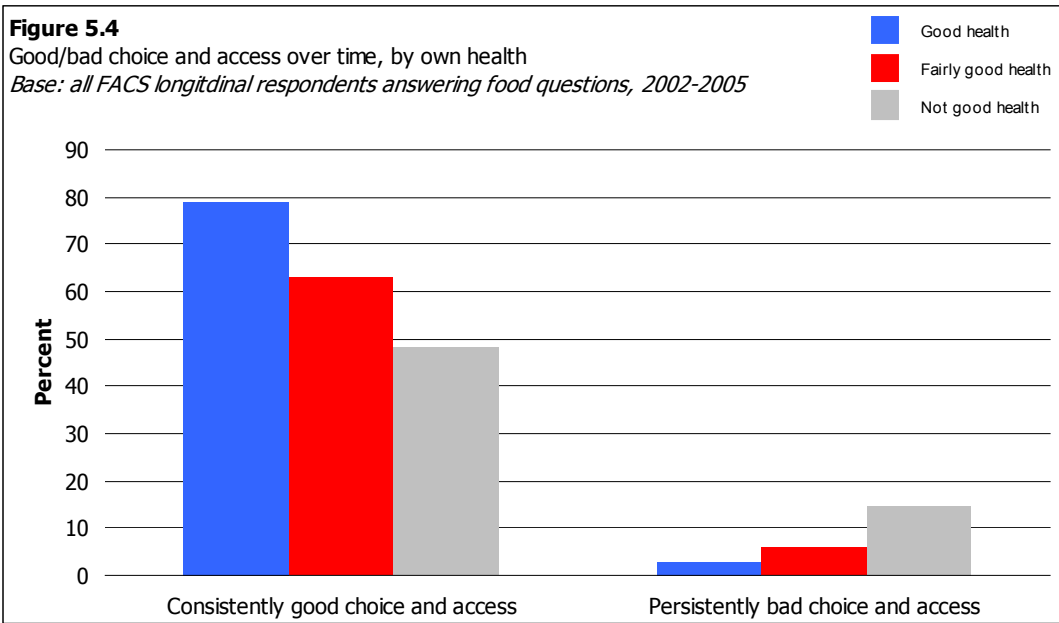
The two measures of health status, long-standing health problems and how respondents best described their own health, both suggested that those reporting health problems in 2002 were least likely to have consistently good choice and access. Fifty-nine percent of those with longstanding health problems, compared with 76% with no such problems, had good choice and access. Similarly, 48% who said their health was not good, 63% who said their health was fairly good and 79% who said their health was good had consistently good choice and access.

Tables 5.28 and 5.29, Figure 5.4

Figure 5.4

Good/bad choice and access over time, by own health

Base: all FACS longitudinal respondents answering food questions, 2002-2005



6 Nutrients

6.1 Summary

This chapter examines nutritional intake, specifically, fat and saturated fat intake. The analysis used data obtained from the NSHD food diary and the Whitehall II food frequency questionnaire (see Box 6.1). Intakes are presented as a proportion of total energy and then compared with the UK Dietary Reference Values (DRVs) (COMA, 1991).¹

Box 6.1 Summary of data collection

ALSPAC

- Food diary: food and drinks consumed recorded in household measures.
- Estimated amounts then converted to grams.

NSHD

- Food diary: amounts recorded using household measures e.g. tablespoons and food photographs provided at the beginning of the diary.
- Estimated amounts then converted to grams.

Whitehall II

- Food frequency questionnaire
- Food frequency converted to grams (frequency X portion weight)

Half of the NSHD adult cohort persistently ate more than the recommended daily total fat intake (33% of total calorie intake). Most of the factors examined were not associated with persistently eating more than the recommended amount. However, in Whitehall II several variables were associated with the longitudinal pattern of saturated fat consumption. Women and people of non-white ethnicity were less likely to persistently exceed recommended fat intake levels, while younger people and those in administrative or professional and executive employment grades were more likely to persistently exceed recommended limits.

¹ It should be noted that the DRVs are intended as population averages, not as targets for individuals.

6.2 Survey questions and analysis approach

6.2.1 NSHD

The NSHD included a five-day food diary in three waves of the survey in 1982, 1989 and 1999. For our analysis, individuals had to have completed a food diary for at least three days to be included in the analysis sample.

To classify respondent's longitudinal pattern of fat intake over the three survey waves the following steps were taken:

- Convert fat intake into calories
- Calculate the percentage of total calorie intake (per day) from fat intake
- Calculate the average percentage over the five-day period for each respondent (where there were at least three days of diary filled in)
- Calculate a binary variable for whether this average daily intake of fat exceeded the DRV (fat should provide not more than 33% of total energy intake (including calories from alcohol)).

It was not possible to analyse the percentage energy from saturated and unsaturated fat separately as saturated fat was only calculated in 1999.

From this binary variable we classified respondents as:

- Consistently did not exceed the daily recommended intake of fat
- Exceeded the daily recommended intake of fat for one wave
- Exceeded the daily recommended intake of fat for two waves
- Persistently exceeded the daily recommended intake of fat (for all three waves)

Data from the NSHD food diaries has already been used extensively to study a range of nutrient intakes and dietary patterns. Mishra *et al.* (2004) examined the extent to which an individual's childhood social circumstances and region of residence influenced their dietary patterns at the age of 43 years. People who remained in the non-manual social class were found to consume significantly higher amounts of food items correlated with a 'health aware' factor (items

included high-fibre breakfast cereals, wholemeal breads, apples and bananas) than those who remained in the manual social class. Those who made the transition from manual social class in childhood to non-manual social class in adulthood partly adopted the distinctive dietary patterns of the non-manual social classes. The authors concluded the results suggest that while adult dietary patterns are developed as a result of childhood influences, these patterns can be modified as a result of social and regional transitions.

A number of studies have investigated whether there have been significant changes in dietary intakes from 1982 to 1999. Prynne *et al.* (2010) found significant changes in total NSP and phytate intake over the three time points. Intakes of NSP rose significantly between 1982 and 1999 for men and women but phytate intakes rose significantly only between 1989 and 1999. Cereal foods were the most important source of both NSP and phytate, but between 1989 and 1999 there was a significant increase in the contribution from pasta, rice and other grains. Their findings suggest that an increase in dietary fibre that is in accordance with dietary guidelines will almost inevitably be accompanied by a rise in phytate.

Johnston *et al.* (2007) investigated whether there had been significant changes in the intake of haem and non-haem Fe between 1982 and 1999. Total Fe intake was found to be significantly higher in 1989 than in 1982 or 1999 for both men and women but haem Fe was significantly lower in 1999 mainly due to a 40% fall in haem Fe from beef during this period. Haem Fe from processed meats fell by more than 50% between 1989 and 1999 but that from poultry rose by more than 50%. One factor that could have driven these changes was the epidemic of BSE from 1990. Cereal foods remained the most important source of non-haem Fe and the contribution from breakfast cereals rose relative to that of bread over the 17 years.

Mishra *et al.* (2006) examined the trends in dietary patterns found using factor analysis. Marked changes were found for all patterns between 1989 and 1999, with only the meat, potatoes and sweet foods pattern in women recording a

decline. They found that both non-manual social class and higher education level were strongly associated with the consumption of more items from the ethnic foods and alcohol pattern (such as Indian and Chinese meals, rice and pasta, shellfish, olives, some vegetables, alcoholic beverages) and the mixed pattern (many fruits and vegetables, low-fat yogurt and soya milk, a range of sweet foods) for men, and the fruit, vegetables and dairy pattern (such as low-fat dairy products, fruit, some vegetables, wholemeal bread) and the ethnic foods and alcohol pattern for women.

Prynne *et al.* (2005) found significant changes in the intake of most nutrients in 1999 compared with the two previous time points. Intakes of fat, Na, Fe and Cu had fallen, but there was a rising trend in the intakes of Ca, P, carotene, thiamin, pyridoxine, folic acid and vitamins C, D and E in both men and women. Additionally, intakes of K, Mg, and vitamin K1 had risen in women. Women also showed a significantly higher percentage rise in the intakes of carotene, riboflavin, folic acid, vitamin C and vitamin E – brought about by an increase in such foods as fruit and vegetables and a shift away from whole milk, butter and red meat.

Several studies have also looked at the impact of diet on various health outcomes. Wagemakers *et al.* (2009) investigated whether a high consumption of red or processed meat is associated with increased risk of coronary heart disease (CHD) using the 1989 and 1999 food diaries. They found no significant association between red and processed meat consumption in both years and serum cholesterol concentrations and blood pressure in 1999. Red and processed meat intakes in 1989, separately and combined, did have a significant positive association with waist circumference in 1999 however.

Prynne *et al.* (2009) investigated whether nutrient intake was predictive of raised glycosylated haemoglobin (HbA(1c)), a recognized risk factor for diabetes, using all three food diaries and blood samples collected in 1999. They found that lower intake of protein, carbohydrate, non-starch polysaccharide, iron, folate, and

vitamin B-12, and a higher percentage energy from fat in 1989 were all significantly predictive of high HbA(1c) status in 1999.

Mishra *et al.* (2009) examined whether prospectively measured childhood and adult dietary intakes of thiamin, riboflavin, niacin, folate, vitamin B6 and vitamin B12 were related to the psychological distress of women in mid-age, taking into account socioeconomic, behavioural and lifestyle factors. Dietary intakes in childhood (at age four years) were determined by 24-hour recall and using the three food diaries in adulthood, while psychological distress was assessed using the General Health Questionnaire (GHQ-28) at the age of 53. Their results provide evidence that intake of vitamin B12 at the age of 53 is related to adult psychological distress but there was no evidence for the effects of other adult B vitamin intakes or childhood intakes on psychological distress.

McNaughton *et al.* (2007) assessed the relations between dietary patterns (found using factor analysis) during adult life and risk factors for chronic disease at age 53. After adjusting for sociodemographic and health-related behaviours, the fruit, vegetables and dairy dietary pattern was inversely associated with BMI, waist circumference, and blood pressure, and positively associated with red cell folate in women. The ethnic foods and alcohol pattern was also inversely associated with blood pressure, whereas the meat, potatoes and sweet foods pattern was positively associated with glycated hemoglobin. In men, a mixed pattern was inversely associated with waist circumference and blood pressure, whereas there were no significant associations with the ethnic foods and alcohol pattern.

A paper by Mishra *et al.* (2007) found no evidence of associations with dietary intakes during childhood (aged four years) or adult life (energy intake, calcium or vitamin D) with mammographic density (a strong marker of breast cancer risk) at age 50. Mishra *et al.* (2008) also looked at the relationship between diet and mammographic density using dietary patterns rather than individual nutrients. Preliminary analyses suggested that variations in dietary patterns in adulthood might explain more than 10% of the variations in percentage mammographic

density at age 50 years, with variables in patterns in childhood explaining slightly less.

6.2.2 ALSPAC

The ALSPAC team have also published extensively on their data related to nutrient intake. Rather than duplicating work, below is a summary of some of their published findings in this area.

Brion *et al.* (2008) examined the sodium intake in infancy and blood pressure (BP) at seven years of age in ALSPAC children. They found that 0.4% of participants at four months and 73.0% at eight months exceeded recommended levels for infant sodium intake. They found a positive association between sodium intake at four months and systolic blood pressure (SBP) at seven years (although this finding was attenuated after adjusting for breastfeeding), but no association between sodium intake at eight months or seven years and SBP at seven years. Also, due to the high sodium-potassium correlations, the effects of sodium independent of potassium could not be estimated with reasonable precision. They thus concluded that the association they found requires replication in studies that can control for the effects of potassium before a verdict can be made regarding the impact of sodium intake in early infancy on future BP.

Diet in the ALSPAC children at the ages of eight months, 18 months, three years and seven years of age has been compared to dietary reference values and with the results of the National Diet and Nutrition Survey (NDNS) (Noble *et al.* 2001, Cowin *et al.* 2007, Emmett *et al.* 2002, Glynn *et al.* 2005). At eight months intakes of energy and nutrients were very similar between ALSPAC and NDNS, the main difference being a higher polyunsaturated to saturated fatty acid ratio in ALSPAC. Other differences included the much lower calcium and iodine intakes of ALSPAC children compared with the NDNS. At 18 months nutrient intakes were again very similar between the two surveys, except for carotene, calcium, vitamin D and iodine, where intakes were considerably higher in ALSPAC, and sugar intake which was lower. At three years of age intakes of energy and all

nutrients were higher in ALSPAC than in the NDNS with the exception of non-milk extrinsic sugar. Finally, at seven years of age nutrient intakes were broadly similar between the two studies. In relation to dietary reference values, at eight months of age energy intakes were similar to the estimated average requirements (EAR), however, breastfed infants were slightly below and non-breastfed slightly above the EAR. Mean intakes of zinc and vitamin D were below the Reference Nutrient Intakes (RNI). At 18 months, intakes of energy were slightly above the EAR, while for most nutrients the mean and median intakes were well above the RNI. The exceptions were vitamin D, iron and zinc. At three years of age energy intakes were now below the EAR while intakes of vitamin D and iron remained below the RNI. At seven years of age mean energy intake remained below the EAR. Similarly median intakes of iron and zinc were below the RNI. However, median nutrient intakes exceeded the RNI for most nutrients. Median sodium intake was greater than the maximum set by the Scientific Advisory Committee on Nutrition. Differences between boys and girls were found at eight months and seven years, with intakes of energy and nearly all nutrients significantly higher in boys than in girls at eight months. At seven years boys still had higher energy intakes and higher iron intakes, while girls had a higher percentage of energy intake from fat.

Rogers *et al.* (2002) investigated the relationship between the percentage of energy from fat and food and nutrient intakes at 18 and 43 months of age. Their results show that the chances of a suboptimal intake of zinc and retinol were higher at lower fat intakes. However, intakes of the fat-soluble vitamins E and D were unrelated to fat intake and intakes of iron and vitamin C fell as fat intakes increased. In a similar study, Rogers *et al.* (2001) also found no evidence that children on higher fat intakes are at a greater risk of becoming obese.

However, Ong *et al.* (2006) found that among formula- or mixed-fed infants, dietary energy intake at four months predicted postnatal weight gain (between birth to age one, two or three years) and childhood obesity risk (larger body weight and BMI at ages one to five years).

Also in 2008 Johnson *et al.* found that a higher dietary energy density (DED) at the age of seven years is a risk factor for excess adiposity (being in the top quintile based on Fat Mass Index, calculated as fat mass (kg) divided by height (m)) at nine years. Higher DED at five years was not however associated with excess adiposity at nine years of age, and the authors state that this could reflect a deterioration in the ability to compensate for extra calories in an energy-dense diet as the children get older.

Jago *et al.* (2010) looked at the associations between diet and physical activity at 11 years of age. They found weak associations between the percentage energy from fat (consistently negatively associated with physical activity levels), total energy and the percentage energy from carbohydrates (positive associations). They concluded that as diet and physical activity behaviour was only weakly associated, this suggests that interventions should focus on implementing strategies that are independently successful at changing diet or physical activity behaviours either separately or in combination.

Several papers have looked at the impact of diet in childhood on health outcomes. Cowin *et al.* (2001) investigated the dietary determinants of blood lipid concentrations at 31 months of age. Elevated total and low-density lipoprotein (LDL) cholesterol concentrations and low high-density lipoprotein (HDL) concentrations are a well-established risk factor for atherosclerosis. They found that total cholesterol concentrations were positively associated with the intake of total fat and saturated fatty acids in boys, while amongst girls HDLC was positively associated with energy intake and negatively associated with intakes of polyunsaturated fat, saturated fat and sugar. These results suggest that dietary determinants of blood lipid concentrations differ between boys and girls. There was also no evidence to suggest that an increase in the intake of polyunsaturated fat by pre-school children would result in improved blood lipid profiles. Rogers *et al.* (2005) examined the associations of diet and insulin-like growth factor (IGF) levels (which are in turn associated with several adult diseases including cancer and coronary heart disease) in the ALSPAC children at seven to eight years of age. They found that IGF levels were positively

associated with intakes of protein, magnesium, zinc, calcium, potassium, phosphorus, and energy, suggesting that the IGF axis is affected by diet - and subsequently childhood diet may have a long-term effect on the risk of chronic disease. Roger *et al.* (2010) discovered that both total and animal protein intakes and higher polyunsaturated fatty acid intake at three and seven years were positively associated with early occurrence of menarche in girls. Early occurrence of menarche may have implications for the lifetime risk of breast cancer and osteoporosis.

The impact of maternal diet on child outcomes has also been investigated by several papers. Leary *et al.* (2005) examined the effect of maternal diet in pregnancy and offspring height, sitting height, and leg length at the age of 7.5 years. Their findings do not provide evidence that maternal diet in pregnancy has an important influence on offspring height, sitting height, or leg length in well-nourished populations. Leary *et al.* (2005:b) also looked at the effect of maternal nutrient intakes in late pregnancy on offspring BP at the same age. Again, their findings suggested that diet in pregnancy does not influence offspring BP in well-nourished populations. Brion *et al.* (2008) also found that maternal iron intake from food during pregnancy was not associated with offspring BP. On the other hand, the findings of Brion *et al.* (2010) provide some evidence for in utero programming of offspring appetite by maternal intake during pregnancy. They found that maternal dietary intakes of protein, fat (when adjusted for energy intake) and carbohydrates in pregnancy were positively associated with child dietary intakes of the same nutrients at 10 years of age. Associations of maternal prenatal-offspring intakes were stronger than those of either maternal postnatal-offspring intakes or paternal-offspring intakes. Cribb *et al.* (2011) found that the quality of children's diets (as measured by micronutrients especially vitamin C, retinol equivalents and folate) at the age of 10 years was related to maternal education level. Lower maternal education was associated with less healthy food choices that could be detrimental to health.

6.2.3 Whitehall II

The Whitehall II team have provided us with the percentage of total energy from total fat and saturated fat for the three waves of the food frequency questionnaire (waves three, five and seven). They do not calculate non-milk extrinsic sugar, and salt is not reliably measured from food frequency questionnaires.

We calculated two binary variables for our analysis:

- Whether daily saturated fat intake exceeded the DRV (saturated fat should provide not more than 10% of total energy intake (including alcohol))
- Whether daily total fat intake was greater exceeded the DRV (fat should provide not more than 33% of total energy intake (including alcohol)).

We then calculated two variables for the longitudinal pattern of saturated and total fat intake as follows:

- Consistently did not exceed the daily recommended intake of saturated/total fat
- Exceeded the daily recommended intake of saturated/total fat for one wave
- Exceeded the daily recommended intake of saturated/total fat for two waves
- Persistently exceeded the daily recommended intake of saturated/total fat (for all three waves).

6.3 Results

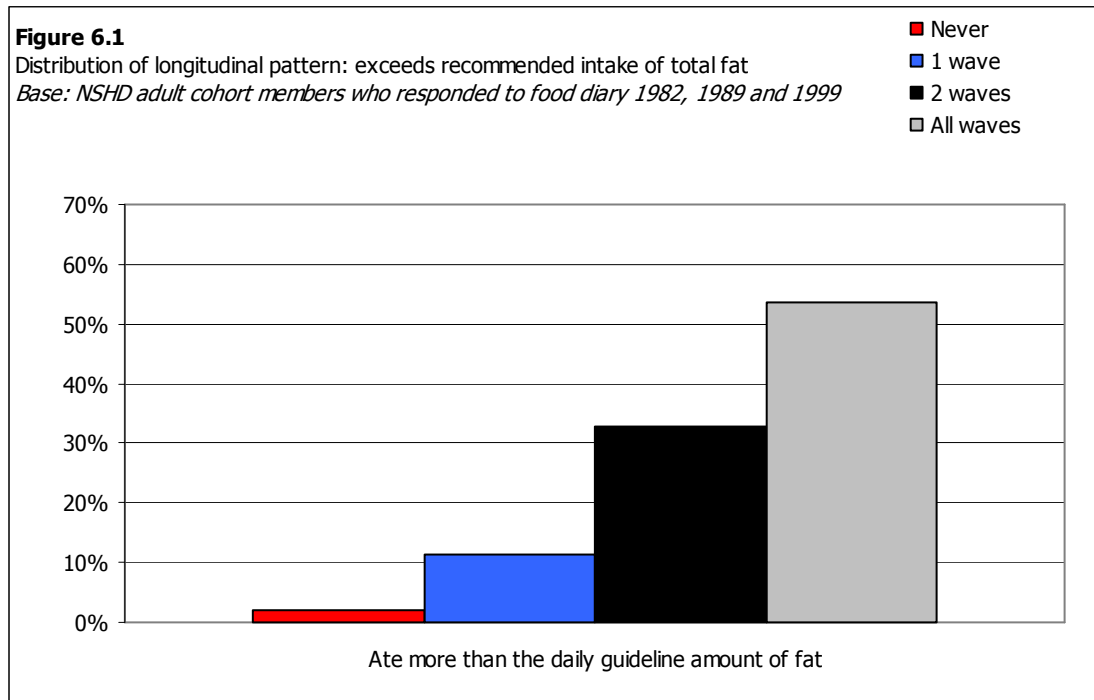
6.3.1 NSHD

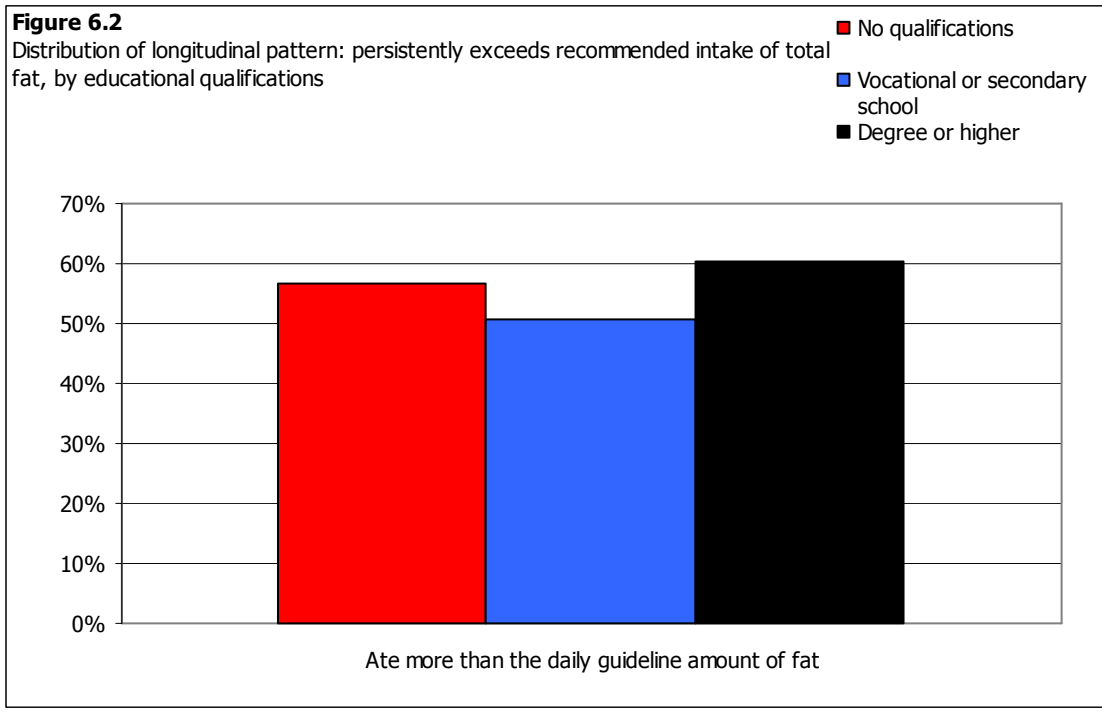
Only 2% of the NSHD adult cohort consistently ate less than or equal to the recommended daily total fat intake (33% of total calorie intake), while the majority (54%) persistently ate over this recommended intake.

Gender, marital status, presence of children in the household, employment status and socio-economic position were all not significantly associated with the

longitudinal pattern of eating more than the recommended daily intake of total fat. There was a non-linear relationship with highest educational qualifications gained, with those who obtained vocational or secondary school qualifications the least likely to persistently eat more total fat than the recommended intake ($p=0.034$, Figure 6.2).

Tables 6.1 to 6.6, Figures 6.1 and 6.2





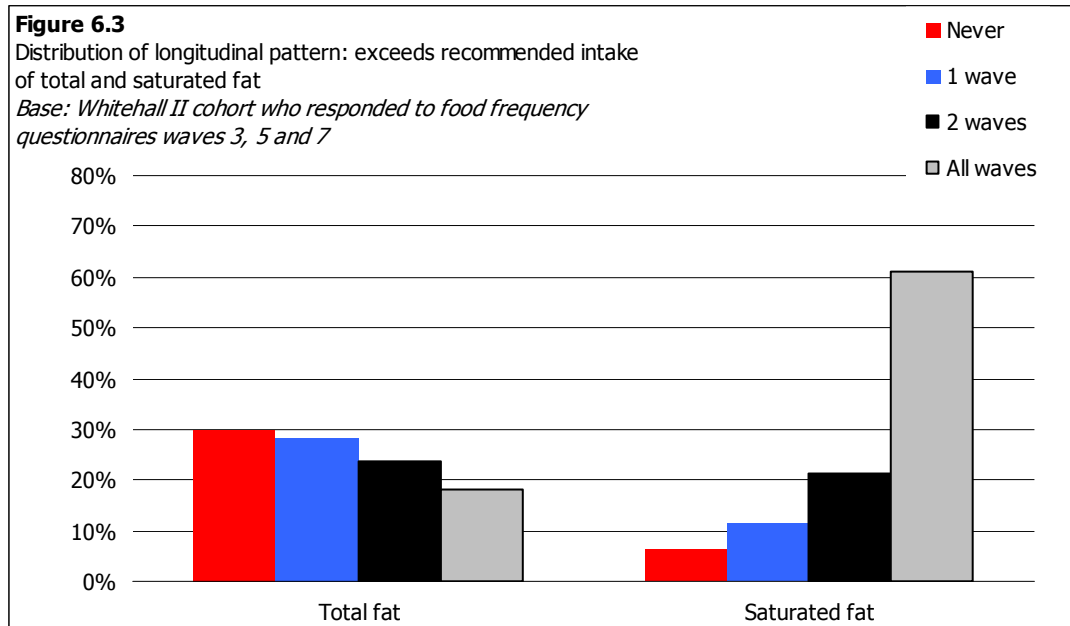
6.3.2 Whitehall II

Sixty one percent of Whitehall II respondents persistently ate more than the recommended daily intake of saturated fat (more than 10% of total energy), while only 18% persistently exceeded recommendations for total fat intake.

Gender, ethnicity, age and employment grade were all related to both the longitudinal pattern of total fat intake and the longitudinal pattern of saturated fat consumption. Women were less likely than men ($p < 0.001$ for both) to persistently exceed recommendations for both, as were those of non-white ethnicity ($p < 0.001$ for both). The youngest age group (39-44) was the most likely to exceed recommendations for both total fat and saturated fat ($p < 0.001$ and $p = 0.008$ respectively). Those in administrative or professional and executive employment grades were more likely to persistently exceed recommendations for both total and saturated fat than clerical and support workers ($p = 0.039$ and $p < 0.001$ respectively).

Smoking status and the presence of children in the household were both related to total fat consumption but not saturated fat intake. Smokers were more likely to persistently exceed recommendations for total fat ($p < 0.001$) as were those with children present in the household ($p = 0.002$).

Tables 6.7 to 6.18, Figure 6.3



6.4 References

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7 Fruit and vegetable consumption

7.1 Summary

Box 7.1 Summary of fruit and vegetable questions

ALSPAC

- Food diary: fruit and vegetable consumption recorded using household measures.
- Food diary records converted to grams.
- Food frequency questionnaire: on the frequency of eating various fruits and vegetables.

ELSA

1. Using the measures below, how much of the following did you eat yesterday?
 - Salad (cereal bowls); Tablespoon of vegetables; Tablespoon of pulses; Tablespoons of dishes made mainly from vegetables
2. Using the measures below, how much of the following did you eat yesterday?
 - Average handfuls of very small fruit
 - Small fruit
 - Medium fruit
 - Half a large fruit
 - Average slices of very large fruit
 - Tablespoons of frozen or tinned fruit
 - Tablespoons of dried fruit
 - Tablespoons of dishes made mainly from fruit
 - Small glasses of fruit juice

BHPS

How often do you eat fresh fruit and vegetables?

1. Everyday or almost everyday
2. About once a week
3. Every now and then
4. Never or hardly ever

Box 7.1 cont. Summary of fruit and vegetable questions

Whitehall II

How often do you eat fresh fruit and vegetables?

1. Seldom or never
2. Less than once a month
3. 1-3 times a month
4. 1-2 times a week
5. 3-4 times a week
6. 5-6 times a week
7. Daily
8. 2 or more times a day

NSHD

- Food diary: fruit and vegetable consumption recorded using household measures and food photographs provided at the beginning of the diary. Food diary records converted to grams.

A diet abundant in fruit and vegetables has been highlighted as a preventative measure against coronary heart disease (WHO, 2003). A diet low in fruit and vegetables accounts for about 20% of chronic disease such as CVD, stroke, diabetes and certain cancers (WHO, 2003; Department of Health (DH); 2004; Allender, 2007). It is estimated that increasing the consumption of fruit and vegetables to at least five a day would result in the reduction of up to 20% in overall deaths from CHD (DH, 2006).

Dietary recommendations for the consumption of fruit and vegetables advise eating at least five portions (400g) or more a day (DH, 1994). The Department of Health used this as a key message in its '5 A DAY' programme, which is a national priority aimed at reducing the risk of heart disease, some cancers and other chronic conditions.

This chapter explores longitudinal patterns in fruit and vegetable consumption using data from most of the surveys covered in this report, including ALSPAC, ELSA, BHPS youth cohort, Whitehall II and NSHD. Some key findings include:

- About half of Whitehall II respondents consistently ate fresh fruit and vegetables daily (Whitehall II, 7.3.3).
- However, looking at the more demanding recommended threshold of five portions a day, 61% of the NSHD cohort did not manage this at any of the waves analysed (NSHD, 7.3.4).
- There was evidence for the co-existence of multiple risk factors. Drinking above the recommended limit and being a regular smoker were both associated with persistent low fruit and vegetable consumption among older adults (ELSA, 7.3.1).
- Young people's attitude to health responsibility was strongly associated with their longitudinal pattern of fruit and vegetable consumption. Those who felt that young people did not need to worry about their health were less likely to consistently eat fresh fruit and vegetables every day (BHPS, 7.3.2).

7.2 Survey questions and analysis

7.2.1 ELSA

In ELSA, questions about fruit and vegetable intake are covered by two questions (summarised in Box 7.1) using paper self-completion questions in wave three (2006-7) and wave four (2008-9). Similar questions were asked in HSE 2001 (wave 0), which provides baseline data for our analysis. We derived a binary variable for each wave to indicate whether respondents were consuming the recommended 400g or more of fruit and vegetables a day. This was then used to create a variable to indicate longitudinal intake of fruit and vegetables.

Respondents were classified into the following four groups:

- Consistently eating five-a-day (reports at least 400g of fruit or vegetables eaten yesterday, at all three waves)

- Two years where eats five-a-day (reports at least 400g of fruit or vegetables eaten yesterday, at two waves)
- One year where eats five-a-day (reports at least 400g of fruit or vegetables eaten yesterday, at one wave)
- Persistently doesn't eat five-a-day (reports having never eaten 400g of fruit or vegetables eaten yesterday, at all three waves)

Overall, 1070 respondents longitudinal provided food-related data for waves 0, three and four and are included in the analysis.

7.2.2 BHPS youth cohort

Unlike the detailed measures in ELSA, waves 12 to 16 of the BHPS youth cohort included one question about fruit and vegetable consumption;

- How often do you eat fresh fruit and vegetables?

With answer options: 'everyday or almost everyday', 'about once a week', 'every now and then' and 'never or hardly ever'. For our analysis this was coded into a binary variable for those who answered everyday and less than once a day for each survey wave. To look at the longitudinal pattern, we then classified respondents to indicate those who:

- consistently ate fresh fruit and vegetables everyday (for all four waves)
- mostly ate fresh fruit and vegetable everyday (three to four waves)
- persistently never ate fresh fruit and vegetables everyday.

We found that only 16 respondents never ate fruit and vegetable for all four waves, so the persistently never group includes those who said they never or rarely did with those who said they had only eaten fresh fruit and vegetables for one or two waves.

7.2.3 Whitehall II

Similarly to the BHPS cohort, the Whitehall II study included one question in the main questionnaire about fruit and vegetables (fruit and vegetables are also

included in the food frequency questionnaire, but conversion to total grams of fruit and vegetables consumed would take a few weeks by the Whitehall II data manager, so it was deemed unnecessary for this report). The question included in the main questionnaire was:

- How often do you eat fresh fruit or vegetables?

With answer options: 'Seldom or never', 'Less than once a month', '1-3 times a month', '1-2 times a week', '3-4 times a week', '5-6 times a week', 'Daily', '2 or more times daily'. For our analysis this was coded into a binary variable for those who answered once or more a day and less than once a day for each survey wave.

To look at the longitudinal pattern, we then classified respondents to indicate those who:

- consistently ate fresh fruit and vegetables daily,
- ate fresh fruit and vegetable daily for one or two waves, and
- persistently never ate fresh fruit and vegetables daily.

7.2.4 NSHD

The NSHD food diary collected information on all fruit and vegetables (and fruit juice) consumed over the five days of recording. This consumption was then converted into total grams consumed per day (as with other food – discussed in chapter 3). For our purposes, we then calculated the average daily intake in grams of all fruit and vegetables (excluding fruit juice), and divided by 80grams to obtain the average number of portions consumed per day. Fruit juice was then added to this, but limiting to a daily average of 80g (one portion) regardless of whether more was consumed (and less than 80g did not count at all). We then calculated a binary variable for each wave of:

- Ate less than five portions of fruit and vegetables on average per day
- Ate five or more portions of fruit and vegetables on average per day.

To look at the longitudinal pattern, we then classified respondents to indicate those who:

- consistently ate five or more portions of fruit and vegetables (for all three waves)
- ate five or more portions for two waves
- ate five or more portions for one wave, and
- persistently ate less than five portions of fruit and vegetables (for all three waves).

7.2.5 ALSPAC

Analysis of fruit and vegetable intake in the ALSPAC study has been extensive, so here we do not attempt to replicate work that has already been done. Instead, we give a brief summary of findings by the ALSPAC team.

In a paper looking at the influences on child fruit and vegetable intake at age seven years (Jones *et al.*, 2010), the authors found that the median daily fruit and vegetable consumption (210g) was below the recommendations for this age group (320g). Girls were found to eat more fruit and vegetables than boys per unit energy (30.3g/MJ compared to 26.7g/MJ; $p < 0.001$). The predictors of fruit and vegetable consumption were found to be mostly similar. Maternal consumption, maternal education status, parental rules about serving fruit/vegetables every day, food expenditure per person and whether the child was choosy about food were all associated with fruit and vegetable consumption. Family income was associated with fruit and vegetable consumption in bivariate analysis, but was no longer significant once other factors had been controlled for. Maternal education status was still found to be significantly associated with fruit and vegetable consumption for the children at 10 years of age (Cribb *et al.*, 2011).

Mothers consumed more portions of fruit and vegetables daily than their children at age seven years (Jones *et al.*, 2010); however, intakes were still low, consuming on average 3.9 portions of fruit and vegetables per day. Only one quarter of the mothers reached the target of at least five portions of fruit and vegetables daily.

In an article employing longitudinal analysis methods Coulthard *et al.* (2010) examined whether fruit and vegetable feeding practices at six months predicted children's fruit and vegetable intake at seven years of age. They found that children who were given home-cooked fruit or vegetables more often at six months were more likely to be eating a higher proportion of fruit and vegetables at seven years. However, they also found that children who were more often given ready-prepared fruits or vegetables at six months were *not* more likely to eat higher proportions of fruit and vegetables at seven years, and state that this finding needs to be investigated further.

Other findings relating to fruit and vegetable consumption from the ALSPAC study include:

- Packed lunches and school dinners both contained only around half the recommended amount of fruit and vegetables at seven years of age (Rogers *et al.*, 2007).
- The proportion of children consuming any vegetables dropped between 18 and 43 months, although fruit eating remained constant (Emmett *et al.*, 2001).
- 17% of children aged 43 months ate no vegetables during the three-day recording period and 17.4% ate no fruit. A quarter of children ate less than 50g per day of fruit and vegetables added together and some ate none of either (4.6%) (Emmett *et al.*, 2001).
- Children (at 18 months of age) of mothers who smoke were less likely to have eaten fruit than children of non-smokers (Rogers and Emmett, 2003).

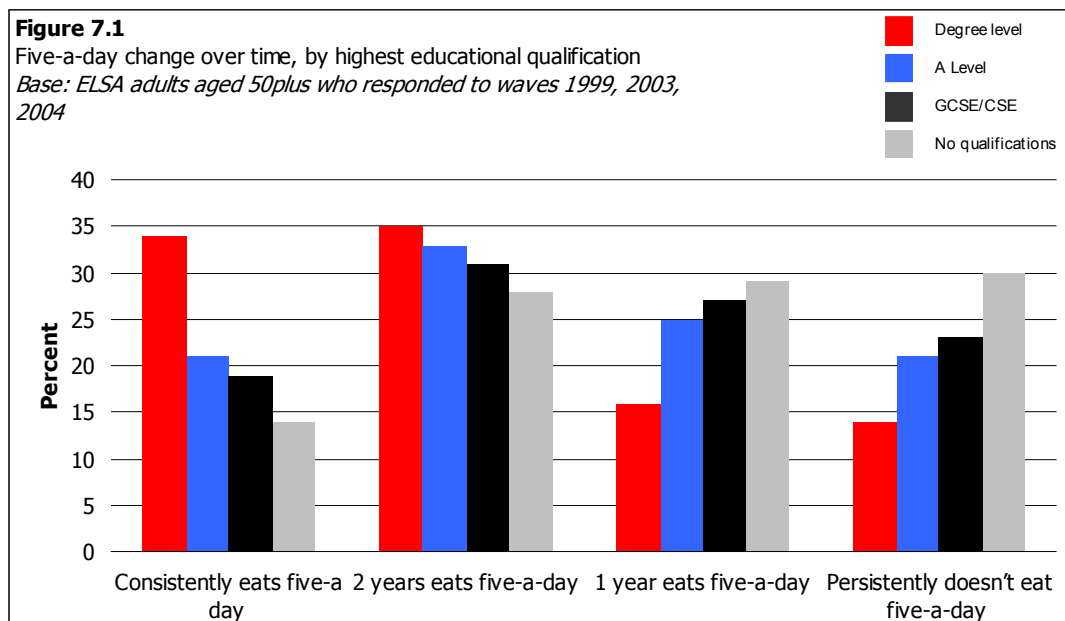
7.3 Results

7.3.1 ELSA

Overall, a quarter (24%) of all older adults persistently failed to eat five portions of fruit and vegetables a day, and only a fifth (19%) consistently ate the

recommended portions. There were no significant differences observed by sex or age.

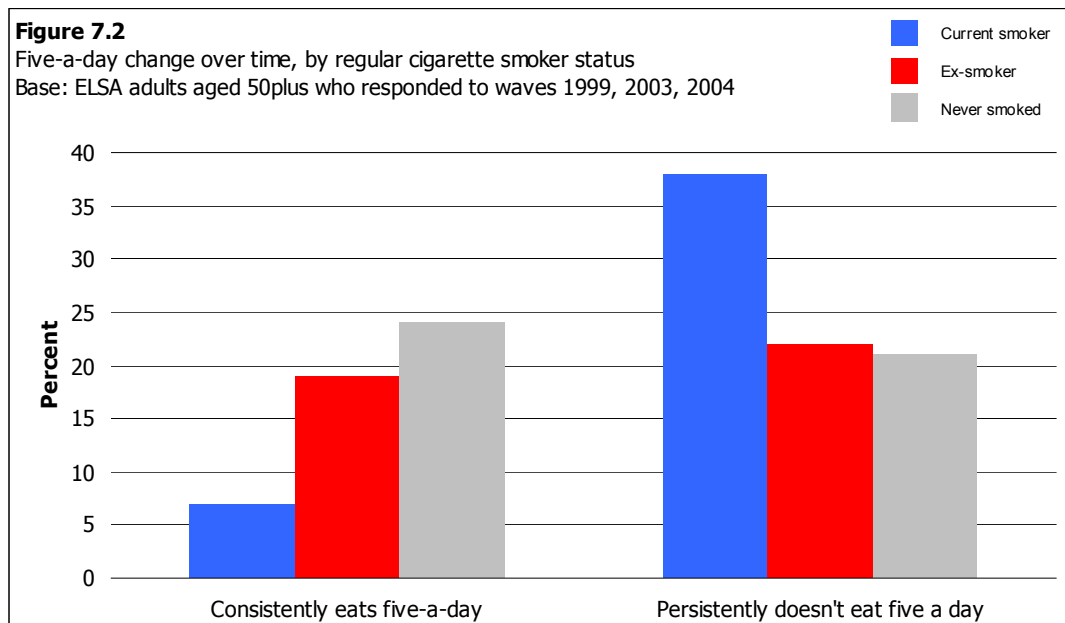
However, significant differences were evident by NS-SEC and highest educational qualification. Older adults from routine and manual occupations were at the greatest risk of persistently failing to eat the recommended portions (31%), compared to those from intermediate or managerial and professional occupations (25% and 18%, respectively). There was a clear association with education with more highly educated older adults being far more likely to eat the recommended five portions of fruit and vegetables, compared to less educated older adults.



There was some evidence for the co-existence of multiple risk factors for health, as drinking more than the recommended weekly units and being a regular smoker were both significantly associated with lower fruit and vegetable consumption. Specifically, 14% of older adults whose alcohol consumption exceeded the maximum recommended weekly units in 2001 consistently ate five portions of fruit and vegetables a day, compared with those who drank within weekly limits (20%). Similarly, only 7% of current regular smokers consistently ate five portions of fruit and vegetables, compared to 19% of ex-regular smokers and 24% those who had never been regular smokers.

While a higher proportion of those who quit smoking in waves three or four started eating five portions of fruit and vegetables in these waves (compared to those who never smoked or always or sometimes smoked), this was not significant. About the same proportion of those who quit smoking in waves three or four and those who always or sometimes smoked consistently never ate the recommended amount of fruit and vegetables.

Tables 7.1 to 7.8, Figure 7.2



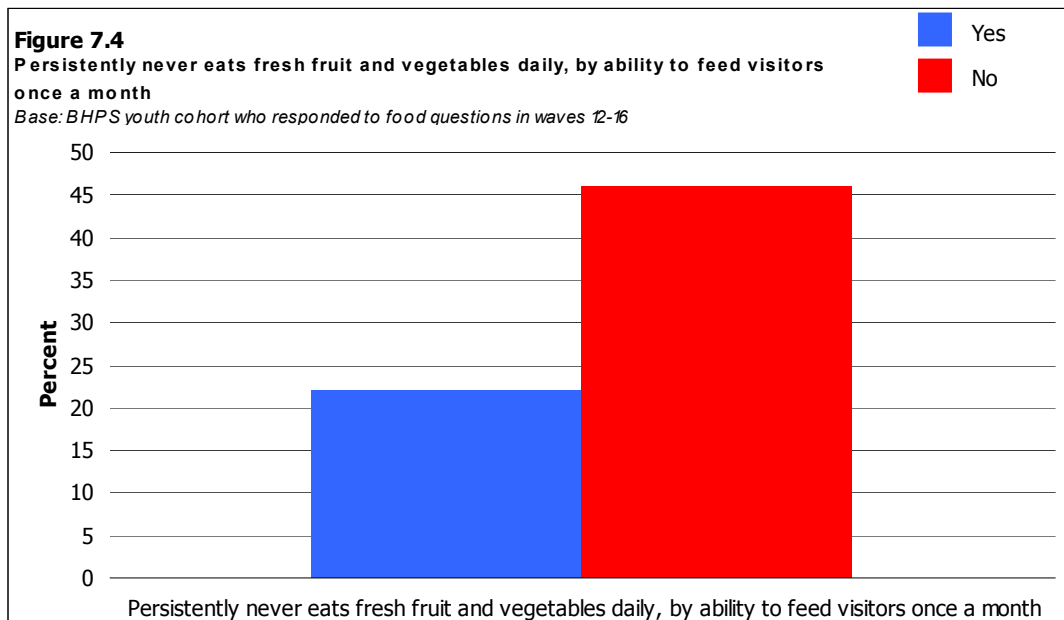
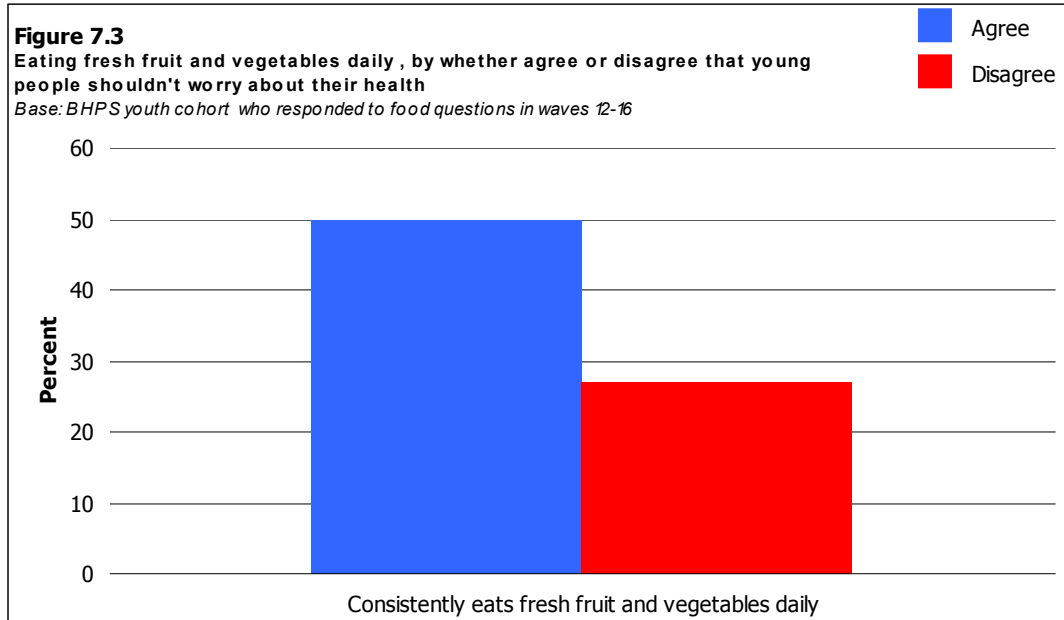
7.3.2 BHPS youth cohort

Overall, between the ages of 11 and 15, 41% of the children consistently ate fresh fruit and vegetables everyday, 29% mostly ate fresh fruit and vegetables daily (for three or four waves), with another 29% persistently failing to eat fruit and vegetables everyday.

Longitudinal patterns for eating fresh fruit and vegetables varied by the child's attitude to health, and by whether their family was able to afford to feed visitors once a month. Half of children who strongly disagreed/disagreed or neither agreed nor disagreed with the statement that young people should not worry about their health consistently ate fresh fruit and vegetables daily (50% and 51%, respectively), compared with a quarter (27%) who agreed or agreed strongly with

this statement. In addition, almost half (46%) of those whose parents said they were unable to afford to feed visitors once a month persistently failed to eat fruit and vegetables, compared to just a fifth (22%) whose families were able to do this.

Tables 7.9 to 7.15, Figures 7.3 and 7.4



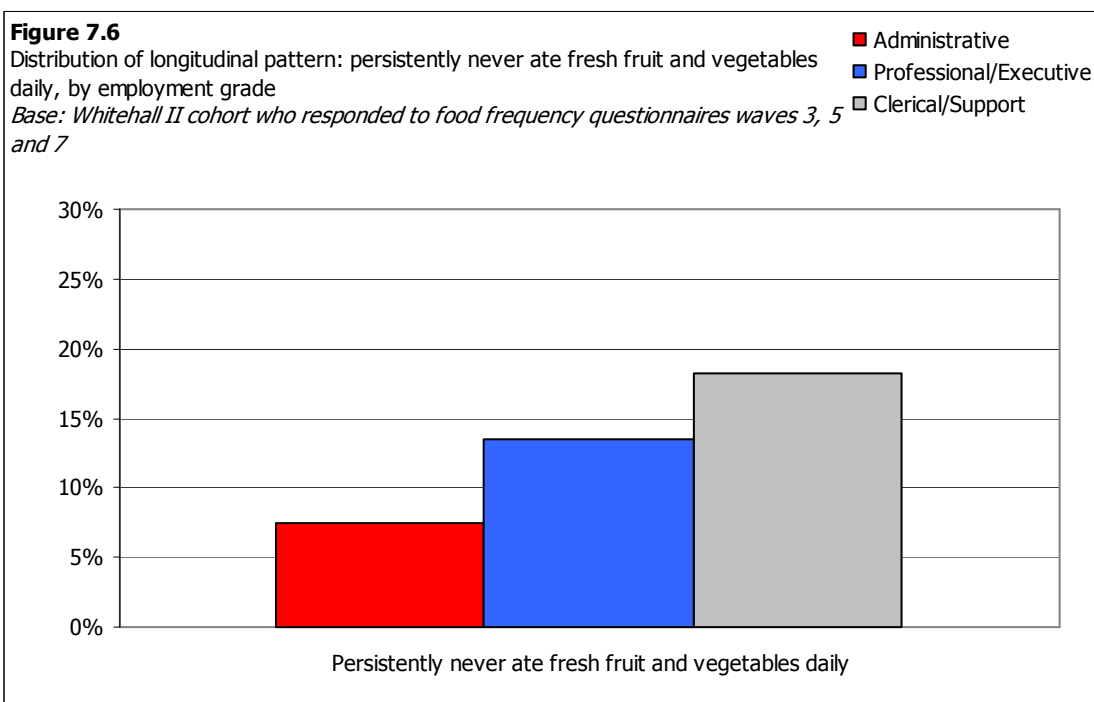
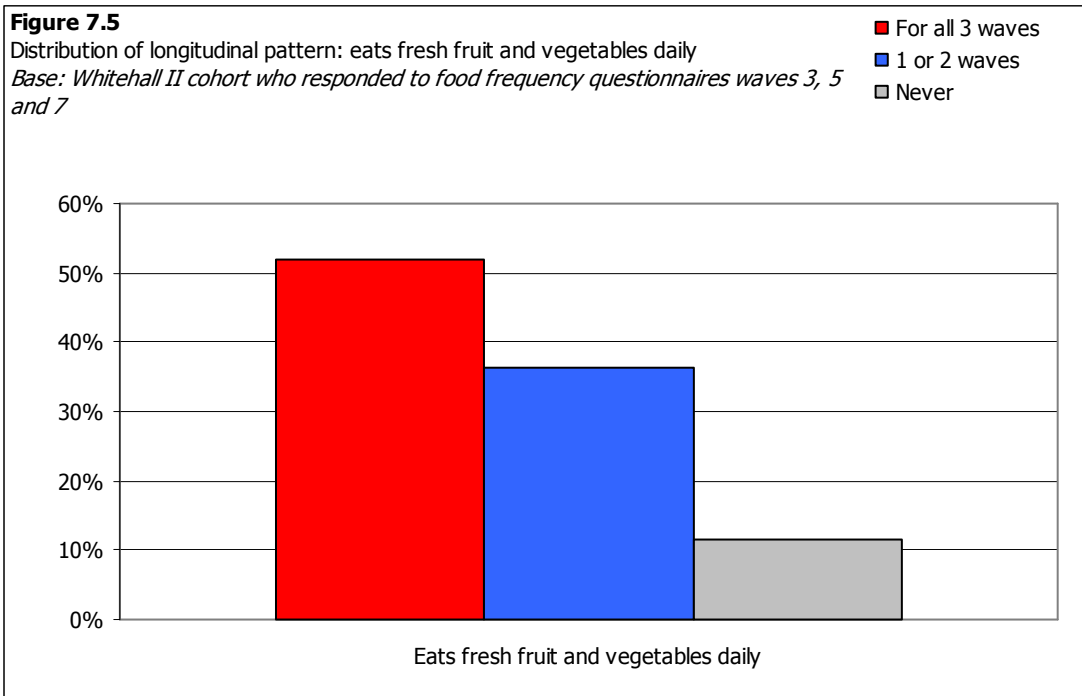
7.3.3 Whitehall II

Around half of respondents in the Whitehall II study consistently ate fresh fruit and vegetables daily for all three waves (52%). Twelve percent never, in any of the three waves considered, ate fresh fruit and vegetables daily.

There were significant associations between persistently not eating fresh fruit and vegetables daily and gender, ethnicity, age group, and employment grade. The existence of a child or children in the household was not associated with whether or not the respondent ate fresh fruit and vegetables daily. Males were more likely to never eat fresh fruit and vegetables daily for all three waves (13% compared to 8% for females, $p < 0.001$), as were those of non-white ethnicity (21% compared to 11%, $p < 0.001$), and those in younger age groups (39-44 and 45-49, $p < 0.001$). The likelihood of persistently not eating fresh fruit and vegetables daily increased as employment grade decreased (Figure 7.6, $p < 0.001$).

Consistent with the findings from ELSA, there was some evidence for the co-existence of multiple risk factors for health. 22% of current smokers persistently never ate fresh fruit and vegetables daily compared to only 10% of non-smokers ($p < 0.001$). The evidence for drinking more than the recommended weekly units was weaker, being only significantly associated with never eating fresh fruit and vegetables daily at the 10% level ($p = 0.079$). 13% of adults whose alcohol consumption exceeded the maximum recommended weekly units persistently never ate fresh fruit and vegetables daily, compared to 11% of adults who drank within weekly limits.

Tables 7.16 to 7.21, Figures 7.5 and 7.6



7.3.4 NSHD

Only 3% of adults in the NSHD who filled in food diaries for all three waves (1982, 1989 and 1999) consistently ate five or more portions of fruit and

vegetables per day (on average). 61% of this cohort never (in all three waves) ate five portions.

Men were more likely than women to persistently not eat five or more portions a day (67% compared to 57%, $p < 0.001$), as were those in households with one or more children (63% compared to 55% of those in households with no children, $p = 0.025$).

Those with no qualifications were more likely to persistently never eat five a day and a similar finding emerged for social class with those in the lowest social class (partly skilled or unskilled) more likely to persistently not consume five or more portions a day (Figures 7.8 and 7.9). These findings are similar to those found in ELSA and Whitehall II.

Marital status and work status were not significantly associated with the longitudinal pattern of eating five or more portions of fruit and vegetables a day.

Tables 7.22 to 7.27, Figures 7.7 to 7.9

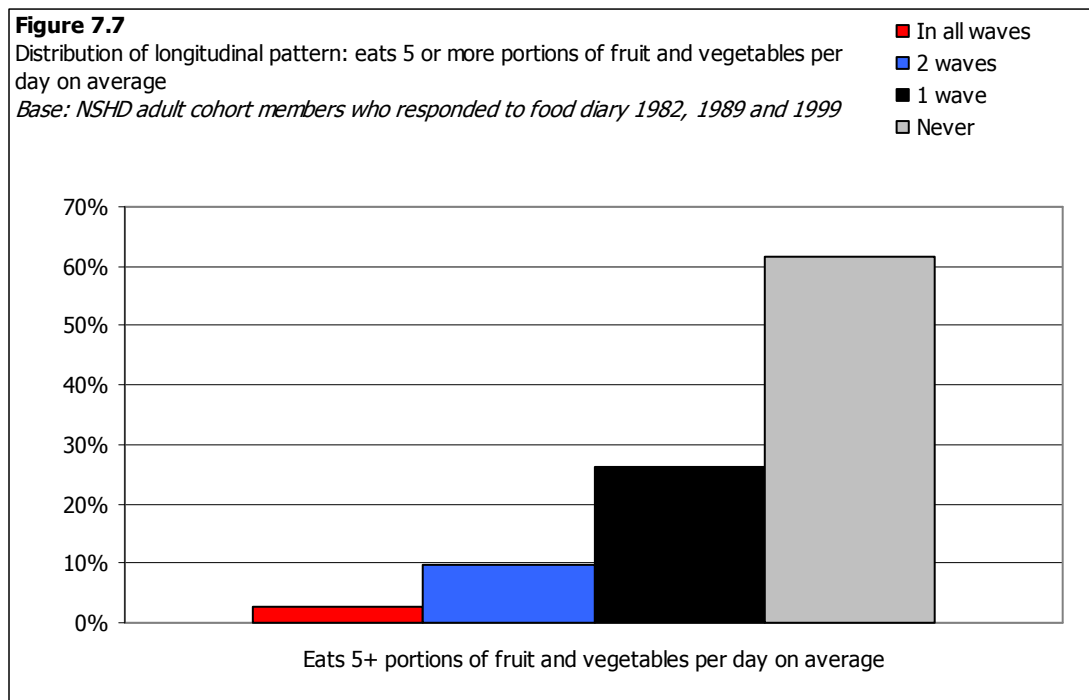


Figure 7.8

Distribution of longitudinal pattern: persistently did not eat 5 or more portions of fruit and vegetables per day, by educational qualifications

Base: NSHD adult cohort members who responded to food diary 1982, 1989 and 1999

- No qualifications
- Vocational or high school qualifications
- Degree or higher



Figure 7.9

Distribution of longitudinal pattern: persistently did not eat 5+ portions of fruit and vegetables per day, by occupational group

Base: NSHD adult cohort members who responded to food diary 1982, 1989 and 1999

- partly skilled or unskilled
- skilled (manual or non-manual)
- professional or intermediate



7.4 References

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8 Food safety

8.1 Summary

The purpose of this chapter is to examine the longitudinal data that are available relating to food hygiene and safety. The lack of both cross-sectional and longitudinal data collected on this topic has been highlighted previously (PSI, 2009). Our analysis for this chapter focuses on the only relevant data we have identified. This is from ALSPAC and relates to the washing of hands before meals among children. The ALSPAC study team have not yet examined this question in any of their published outputs. The questionnaires of surveys that did not meet the basic inclusion criteria were not examined in detail because they were out of scope of this review. It is therefore possible that there are other longitudinal studies with data on this topic.

From the question asked in ALSPAC, it was found that one mother in five consistently reported that their child always or usually had washed hands before meals. Mothers with higher educational qualifications and those in more skilled occupational classifications were less likely to have children with washed hands before meals. Also, the longitudinal pattern in children's hand washing was associated with salt use. Mothers with children who persistently did not have washed hands before eating were also more likely to persistently add salt to their child's food.

Box 8.1 Summary of food safety questions

ALSPAC

- How often in a normal day are [the study child's] hands cleaned before a meal?
 - Always
 - Usually
 - Sometimes
 - Occasionally
 - Never

8.2 Survey questions and analysis

ALSPAC included a question on whether or not children's hands were washed before meals. This was asked, usually of mothers, in the waves conducted when children were aged 15 months, 24 months, 38 months, 54 months, 65 months and 77 months.

As with other food-related self-report questions, it is possible that social desirability bias could be an issue influencing how people respond. King and Bruner (2000) pointed out that social desirability effects are more likely to be present where a response is expected to bring some kind of normative judgement. Therefore, it also seems plausible that mothers may be tempted to under or over-report when it comes to certain aspects of their children's diet or food-related behaviours. We are not aware of this issue having been investigated by the ALSPAC team.

For the purposes of our analysis, we first created a binary variable at each wave of 'always or usually cleaned hands before a meal' versus 'sometimes, occasionally or never cleaned hands before a meal'.

To further examine the longitudinal pattern of hand washing before meals, the following variable was derived:

- Consistently 'always or usually' washed hands before meals for all six waves
- Always or usually washed hands before meals: for four or five waves
- Always or usually washed hands before meals: for one to three waves
- Persistently never washed hands before meals for all six waves (includes sometimes or occasionally).

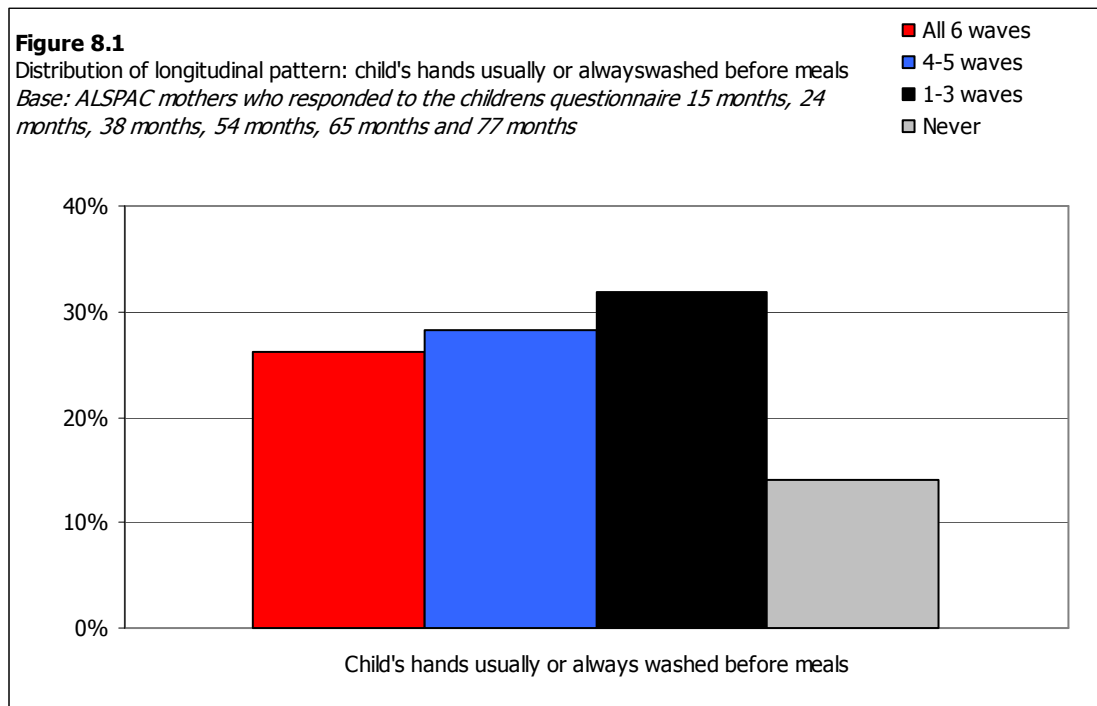
8.3 Results

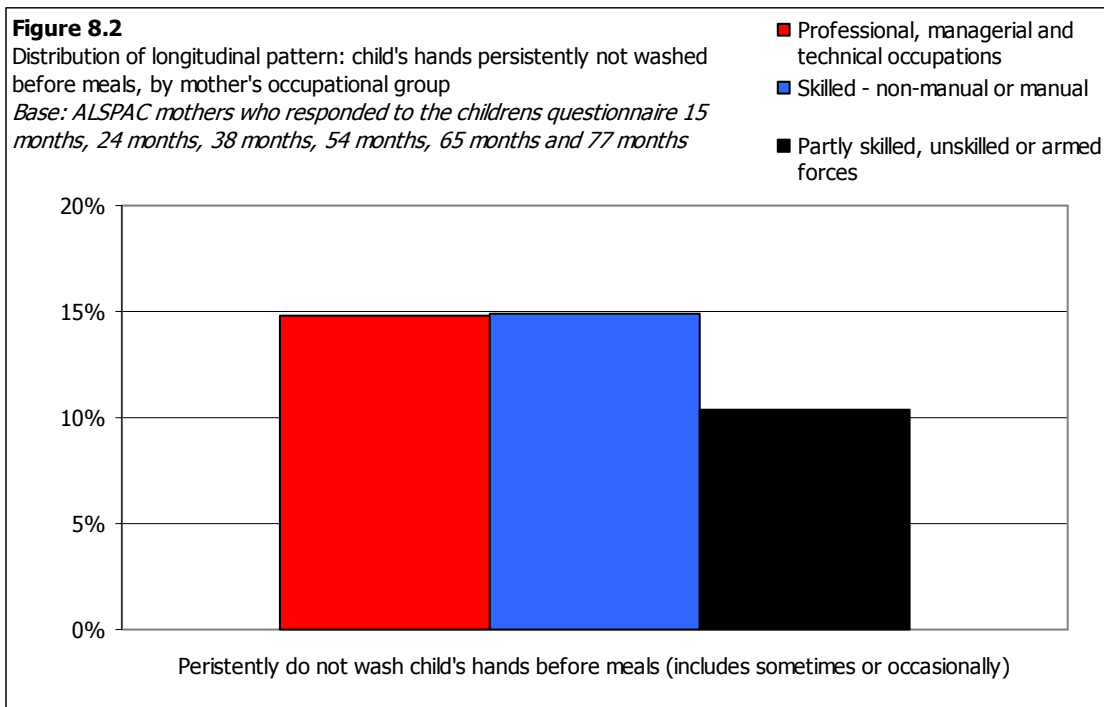
One mother in seven (14%) persistently reported that their child did not have washed hands before meals (for all the six waves that this was asked). Only one

in five (20%) consistently reported that their child always or usually washed their hands before meals.

Hand washing before meals was associated with maternal levels of education and employment, with those with higher qualifications and more skilled work being **less** likely to have children who's hands were usually washed before meals. 21% of mothers with degrees persistently did not always or usually wash their child's hands before eating, compared with 9-14% of women with lower levels of educational qualifications ($p < 0.001$). Similarly, 15% of mothers employed in skilled, professional, managerial or technical occupations persistently reported that their child's hands were not washed, compared with 10% of women employed in partly skilled or unskilled occupations. The longitudinal pattern did not vary by marital status or ethnicity, and was only significant at the 10% level for whether or not the child qualified for free school meals ($p = 0.066$).

Tables 8.1 to 8.5, Figures 8.1 & 8.2





8.3.1 Associations with other eating and cooking practices

The longitudinal pattern of a child having washed hands before meals was not associated with any of the following longitudinal patterns of eating behaviours:

- The use of high saturated fats
- Eating the fat on meat
- Eating fried food once or more a week.

However, mothers with children who persistently did not have washed hands before eating were also more likely to persistently add salt to the child's food or in preparing their food (23% compared to 16% of those who consistently always or usually washed their child's hands before meals, $p=0.002$).

Tables 8.6 to 8.9

8.4 References

PSI (2009) Attitudes and Behaviours towards to healthy eating and food hygiene: a scoping study. FSA: London.

<http://www.food.gov.uk/multimedia/pdfs/foodandyousscoping.pdf>

King, Maryon F, Bruner GC (2000) Social Desirability Bias: A Neglected Aspect of Validity Testing *Psychology and Marketing*, 17 (2), 79-103.

9 Discussion

This review has identified six key British longitudinal surveys with data covering a range of different groups of the population and a variety of food-related behaviours. In conclusion, a number of observations and recommendations can be drawn:

- While patterns of fruit and vegetable consumption are asked (in different ways) on most of the surveys, this review confirms that **there are few longitudinal data sources on food safety and hygiene practices**. This remains a gap in the available data, and something that any potential longitudinal component to the FSA's Food and You Survey could seek to address.
- Descriptive analysis suggests **an interesting socio-economic profile to hand washing practice**, with poorer hygiene practices among better-educated mothers and those with more employment skills. This observation would benefit from further examination, given potential implications for the targeting of health promotion.
- The food-related data in some of the datasets identified in this review (in particular NSHD and ALSPAC) have been analysed and written up quite extensively in published journal papers. Findings from these outputs will have relevance for policy development. Further, the report has highlighted that there is much more that could be examined but this requires **investment in management of data already collected**.
- To avoid duplication, **future planning of food-related data needs should factor in the coverage of future waves of Understanding Society** (a new longitudinal household panel survey). This is detailed in this report.

- **There are a number of longitudinal surveys that do not collect food-related data.** There is great competition for space on such studies, and representation on consultation groups, such as that recently held for BCS70, is key. For advice on the types of questions and methods for capturing diet-related information, see the question development toolkit that accompanies this report (d'Ardenne, 2011).
- There are also a number of surveys that were not included in this review because they currently have too few relevant data points. Some of these will emerge as key data sources for the future. The Millenium Cohort Survey (MCS) is an example.
- The last wave of FACS was carried out in 2010, and there are currently no plans for further waves. The ALSPAC 'children of the 90s' are entering adulthood. This means that **for the coming decade there may emerge a gap in available data on children.** Understanding Society will include food-related questions on its youth self-completion, but there may also be a role for the MCS to broaden its coverage of this topic to fill the gap left by FACS and ALSPAC. There is also a new birth cohort planned for 2012 which could also provide an opportunity. Currently no national longitudinal survey collects food diary data from children.
- Data linkage is increasingly bringing a longitudinal element, even to cross-sectional surveys. Hospital Episode Statistics cover years of health care contacts, and coupled with mortality and cancer registry data allows for the impact of behaviours at an earlier stage of life to be examined on subsequent health outcomes. Other administrative datasets can provide a longitudinal socio-economic dimension. **Asking for permission for data linkage should always be part of surveys like Food and You.**

- A further survey development with relevance to understanding the longitudinal outcomes associated with different food choices and behaviours is the collection of **biomarker information**, particularly as all dietary assessment methods have some sort of bias associated with them. Understanding Society collects height, weight, blood pressure and cholesterol levels which can provide indicators of problems such as heart disease and diabetes. It is also starting to collect genetic data. Given the direct relevance, inclusion of food-related questions should be a priority on such surveys. Cross-sectional studies like the National Diet and Nutrition Survey (NDNS) and the Diet and Health Study 2011 use a 24-hour urine sample to assess for salt intake, and there is scope for the introduction of such measures to longitudinal surveys.
- Basic statistical approaches are used in this report to describe the sample and the substantive coverage of available food-related data, and to examine associations with persistence in poor food practices. However, further analysis techniques are also relevant. A companion report to this one, *Food choices and behaviour: trends and the impact of life events* (Hall *et al.*, 2011), makes different use of the longitudinal nature of these data sources to consider the impact of life events on changes in behaviour. But **other statistical techniques would yield different insights**: such as using Latent Class Analysis to examine population clustering in multiple risk behaviours. As an approach that segments the population, such an analysis could be particularly useful for targeting health promotion in a more holistic way.
- Investigations into outcomes associated with food choices and behaviours can be strengthened by increasing numbers. **Pooling cohorts from different surveys** is one way of achieving this. Healthy Ageing across the Life Course (HALCyon) is currently bringing together a number of life course cohorts to examine effects of lifestyle factors, including diet, on physical and cognitive capability in ageing. The project includes developing methods for combining food-related data

across cohorts to allow for the fact that not all cohorts collect dietary information in the same way and this methodology could be useful in further analysis of existing datasets.