

Project Final Report

Multiple risk behaviours among parents with dependent children

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Abbreviations and glossary of key terms

Abbreviations

CAPi	Computer assisted personal interview
CYP	Children and young people
F&V	Fruit and vegetable
HSE	Health Survey for England
LCA	Latent Class Analysis
O/E	Observed-Expected ratio
PA	Physical activity
UKHLS	UK Household Longitudinal Study

Key terms used in the report

Risk behaviour: a behaviour that does not meet current government recommendations e.g. eating fewer than five portions of fruit and/or vegetables per day.

Co-occurrence of risk behaviours: engaging in two or more risk behaviours e.g. smoking and harmful drinking.

Clustering of risk behaviours: engaging in two or more risk behaviours where the proportions with the combined behaviours differ from the proportions expected if the behaviours were independent.

Observed-Expected Ratio: the observed prevalence divided by the expected prevalence. An observed-expected ratio greater than one represents a higher prevalence than would be expected if the behaviours were independent and indicates clustering of behaviours.

Latent Class Analysis (LCA): a statistical technique that identifies underlying patterns of behaviours. LCA has advantages over traditional clustering methods, allowing for membership to clusters (classes) to be assigned on the basis of statistical probabilities.

Lifestyle groups: these are the clusters of health behaviours identified through the latent class analyses.

Preface: What the study adds to knowledge

This is the first study of multiple health behaviours in families in England. It focuses on parents and their dependent children, a group making up almost half of England's population.

The study investigates four behaviours linked to ill-health and premature mortality - smoking, harmful alcohol intake, low fruit and vegetable (F&V) intake, and low physical activity - among mothers, their co-resident partners and children and young people (CYP). Where these behaviours occur at levels that do not meet current government recommendations, they are referred to as 'risk behaviours'.

Analyses are based on two high-quality surveys: the Health Survey for England (HSE), which has particularly rich data on health behaviours, and the UK Household Longitudinal Study (UKHLS), which has larger ethnic minority group samples. Analyses of CYP focus on those aged 10 to 15.

The study adds to knowledge by providing evidence for mothers, co-resident partners and CYP on:

- prevalence of single and multiple risk behaviours
- co-occurrence of risk behaviours
- underlying associations between risk behaviours (analyses of clustering using observed-expected ratios)
- broader clusterings of health behaviours produced by latent class analysis; we refer to these clusters as lifestyle groups
- social profiles of lifestyle groups
- similarities in the health behaviours of mothers and co-resident partners, and mothers and their children, including belonging to the same or similar lifestyle groups

1 EXECUTIVE SUMMARY

BACKGROUND

Smoking, harmful alcohol consumption, poor dietary habits and physical inactivity are major determinants of ill health. They increase the odds of poor health and premature mortality, with evidence of both separate and combined effects (Khaw et al, 2008; Kvaavik et al, 2010; Martin-Diener et al, 2014; WHO, 2008). As a result, they have high costs for individuals, the NHS and the wider society (Scarborough et al, 2011; NHS, 2014). The four behaviours therefore serve as important indicators of the public's health as well as its future healthcare needs.

Promoting healthy lifestyles is central to achieving the twin goals of England's public health strategy: to improve health and reduce health inequalities (PHE, 2014; DOH, 2014) and the wider goal of containing healthcare costs. There are government guidelines on the four behaviours for both adults and children and young people (CYP); these are summarised in Box 1. The public health strategy is supported and monitored via the Public Health Outcomes Framework, and health behaviour represents one of the four domains of the Framework. The Health Improvement domain includes a set of indicators relating to health behaviours (DoH, 2012; DoH 2014). Adult indicators in the Outcomes Framework include fruit and vegetable (F&V) consumption, physical activity and smoking; harmful drinking is proxied by alcohol-related hospital admissions. The Framework also includes an indicator for CYP relating to smoking.

Box 1: Government guidelines on the four health behaviours

ADULTS

Smoking

- do not smoke at all

Alcohol consumption

- for women on most days do not drink more than 2-3 units of alcohol a day and on no days drink more than 6 units
- for men on most days do not drink more than 3-4 units of alcohol a day and on no days drink more than 8 units

Fruit and vegetable consumption

- eat at least 5 portions of fruit and/or vegetables a day

Physical activity

- engage in at least 150 minutes a week of moderate to vigorous intensity physical activity per week in bouts of 10 minutes or more, or engage in at least 75 minutes a week of vigorous intensity physical activity or an equivalent of the two

CHILDREN AND YOUNG PEOPLE AGED 10-15

Smoking

- do not smoke at all

Alcohol consumption

- do not drink at all

Fruit and vegetable consumption

- eat at least 5 portions of fruit and/or vegetables a day

Physical activity

- engage in at least 60 minutes moderate to vigorous intensity activity every day

Sources: DoH, 2003, 2005, 2009, 2011a 2013a, 2011b, 2013b

Lifestyles consist of a range of health behaviours and most adults in England engage in two or more behaviours that fail to meet government recommendations (Buck and Frosini, 2012; Poortinga, 2007; Graham and Hutchinson, 2015). Although research on multiple health behaviours is increasing (McAloney et al, 2013), there are still major evidence gaps, particularly in relation to key population

sub-groups like parents and children. Almost half (47%) of the UK population lives in a household with dependent children, and parental lifestyles are an important influence on children's health behaviour (ONS 2014a). Yet to our knowledge, no UK study has focused on multiple health behaviours in families.

Our study addresses this evidence gap. It investigates the health behaviours of mothers and children aged 10 and over. We also investigate the health behaviours of co-resident partners.

AIMS AND OBJECTIVES

Our aim is to inform public health policies in England by providing evidence on multiple health behaviours among mothers, co-resident partners and CYP aged 10-15. Such evidence is important to inform both population wide and targeted strategies to improve health (DoH 2010; NHS, 2014; PHE, 2014).

Focusing on smoking, harmful alcohol intake, low F&V consumption and low physical activity, the project objectives are to investigate:

1. the prevalence, co-occurrence and clustering of health behaviours among mothers, co-resident partners and CYP aged 10 to 15 years
2. the social patterning of multiple health behaviours among mothers, co-resident partners and CYP aged 10 to 15 years
3. within-household associations in the health behaviours of mothers and co-resident partners, and mother and their children

DESIGN AND METHODS

We used two large nationally representative studies with information on households in England: the Health Survey for England (HSE) and the UK Household Longitudinal Study (UKHLS). The HSE has richer data on health behaviours and the UKHLS includes larger samples from minority ethnic groups (as seen in Tables E.2 and E.3 in Appendix E).

We use both the HSE and the UKHLS for analyses of all mothers and CYP aged 10-15 living with them. We use the UKHLS for analyses of mothers and co-resident partners.

Government recommendations for the four behaviours (Box 1 above) are used to define unhealthy behaviours; when recommendations are not met, we call these 'risk behaviours'. We derived comparable measures of the four behaviours in the two surveys (Box 2). For alcohol intake in adults, we used twice the average daily recommended amount (i.e. binge drinking) as the cut-off point for risk behaviour (over 6 units for women and over 8 units for men on their heaviest drinking day in the last 7 days). For physical activity in adults, we used engagement in less than 30 minutes of moderate to vigorous activity for at least five days a week (i.e. less than 150 minutes of moderate to vigorous activity a week); for the UKHLS, this measure was derived using questions on brisk/fast walking and sports activity.

To meet our first objective, the report examines the prevalence, co-occurrence and clustering of the four behaviours. In line with usual practice, we define co-occurrence as engagement in two or more risk behaviours, e.g. smoking and harmful drinking. We provide evidence on the numbers of risk behaviours (on a scale of 0 to 4) reported by mothers, co-resident partners and CYP as well as the

prevalence of different behaviour combinations (e.g. the proportion reporting 4 risk behaviours – i.e. meeting none of the recommendations).

The term ‘clustering’ is used in different ways in health research. Some studies, including those in England, use the term to describe analyses focused only on co-occurrence (e.g. Poortinga, 2007; Buck and Frosini, 2012). Where risk behaviours are widespread – for example, low F&V consumption and low physical activity – co-occurrence is to be expected. ‘Clustering’ is therefore usually reserved for statistical associations between behaviours, and we follow this practice. We investigated clustering through two statistical approaches increasingly used by health researchers (McAloney et al, 2013).

Firstly, we investigated clustering by determining whether the co-occurrence of the behaviours was greater than would be expected given the prevalence of each in the sub-population. We produced observed-expected ratios (O-E ratios) by dividing the observed prevalence of different behaviour combinations by the expected prevalence. A value in excess of one indicates that the prevalence of the behaviour combination is higher than expected from their independent distributions; a value below one indicates a lower than expected prevalence.

Secondly, we identified clusters of behaviours by using latent class analysis (LCA). Like other more advanced statistical approaches, LCA identifies underlying (latent) clusters of behaviour. Unlike O-E ratios which use single cut-off points to separate healthy and unhealthy behaviours (e.g. smoking/not smoking), LCA can use a wider set of behavioural measures (e.g. never smoked, ex-smoker, current smoker) to produce distinct groupings (classes) of health behaviours. We use the term ‘lifestyle groups’ to describe these classes.

Box 2: Measures of risk behaviour used in the report

ADULTS

Smoking

Smokes ≥1 cigarette a day

Alcohol consumption

Consumed more than twice the daily recommended units of alcohol on their heaviest drinking day in the past week

- for women: drank more than 6 units
- for men: drank more than 8 units

Fruit and vegetable consumption

Consumed less than 5 portions of fruit and vegetables on average per day

Physical activity

HSE: Did less than 30 minutes of moderate to vigorous physical activity 20 times in the past four weeks.

UKHLS: Did not engage in

- 30 minutes or more of brisk or fast walking 20 times in the past four weeks
- or moderate to vigorous activity more than 3 days a week
- or did not engage in a combination of these activities (i.e. 30 minutes or more brisk or fast walking for 4 days a week and 1 day or more a week moderate to vigorous sports activity)

CHILDREN AND YOUNG PEOPLE AGED 10-15

Smoking

HSE: Smokes 1 or more cigarettes a week or had a cotinine reading of 15+ ng/ml

UKHLS: Smokes 1 or more cigarettes a week

Alcohol consumption

Had an alcoholic drink in the four past weeks

Fruit and vegetable consumption

Consumed less than 5 fruit and vegetable portions on average per day

Physical activity

HSE: Did less than 60 minutes of physical activity every day

UKHLS: Did not exercise every day

To meet our second objective, we investigated the social patterning of multiple health behaviours by identifying the socio-demographic factors that predict the lifestyle groups (latent classes) of mothers, partners and CYP. For this analysis, we used a more extensive set of covariates than gender, age and socioeconomic background, the factors most commonly investigated in studies of health behaviours. We also included the contribution of household structure, ethnic identity and, for parents, health status (limiting long-standing illness) to predicting membership of a particular lifestyle group.

To meet our third objective, we provide evidence on intra-household associations in health behaviours among mothers and CYP and among mothers and co-resident partners. We examined the concordance of single behaviours and the number of risk behaviours as well as the concordance in the lifestyle groups to which they were allocated.

MAIN FINDINGS

As far as we are aware, our analyses of the HSE and UKHLS present the first evidence on multiple risk behaviours for mothers, CYP and co-resident partners in England. Main findings include:

- The majority of mothers, partners and CYP do not meet at least two of the recommendations; the largest group meet neither the F&V nor the physical activity recommendation. However, while the two behaviours often go together, there is no evidence that they cluster; having low F&V intake does not increase the chances of also having low physical activity level or vice versa.
- A very small proportion (less than 10%) of mothers, partners and CYP engage in no risk behaviours; similarly less than 8% have all four risk behaviours. Both these patterns cluster: having no risk behaviours and having four risk behaviours occur more often than the prevalence of each behaviour would suggest.
- Among mothers with co-resident partners, couples typically shared the same health behaviour. Over 80% of couples shared the same smoking status; in 70% of couples, both were both non-smokers and in 13% of couples were both smokers. Shared behaviours were also the norm for the other three health behaviours. For example, in over 70% of couples, neither parent met the recommendations for F&V intake; in around 60% of couples, neither parent met the physical activity recommendation.
- There were also strong associations in the health behaviours of CYP and their mothers. Similarity in lifestyle was most evident for the two behaviours where government recommendations were the same for CYP and adults: smoking and F&V intake.
- Using a wider range of measures of the health behaviours, it is possible to identify a set of lifestyle groups. For example, we identified five lifestyle groups to which mothers and co-resident partners could be allocated. These groups ranged from 'Abstainers' (non-smokers who occasionally/never drank, had average F&V intake and lower than average physical activity) to the 'Unhealthiest behaviour group' (the highest proportions of smokers, heavy smokers and binge drinkers, together with low F&V intake and the lowest levels of physical activity). Around one in ten mothers and partners were in the Unhealthiest behaviour group.

- Three to four lifestyle groups could be identified for CYP. The majority of CYP were Abstainers who had never smoked and had rarely/never drank, but had low F&V consumption and very low levels of physical activity. A minority (10% in the HSE and 24% in the UKHLS) were in the 'Healthiest behaviour group' (never smokers, non-drinkers with the highest levels of both F&V intake and physical activity). Less than one in five were in the Unhealthiest behaviour group, a group that had smoked and/or were smokers, contained the highest proportion of drinkers, were unlikely to consume 5 portions of F&V a day and, in the UKHLS, were very unlikely to meet the physical activity recommendations.
- For mothers and co-resident partners, each lifestyle group had its own distinctive social profile. For example, the largest group among both mothers and partners was 'Never-smoked drinkers'. This group had never regularly smoked but were characterised by frequent drinking and, for a sizeable minority (around one in four mothers and over a third of partners), binge drinking. Parents in this group were socially advantaged: they tended to be older, white, married, in good health, have higher educational levels or have higher household incomes. The second largest group was Abstainers who were also never smokers but also never or rarely drank. Their social profile was very different. They were more likely to be from a minority ethnic background (particularly Indian, Pakistani, Bangladeshi, Black African or Arab) or from low to middle-income households.
- As this lifestyle group analysis suggests, disadvantage is not always or consistently associated with unhealthy lifestyles. Health-promoting and health-damaging behaviours can cluster in both advantaged and less advantaged groups. For example as noted above, non-smoking and frequent drinking was associated with being white, older, higher-educated and better-off; conversely, non-smoking and non-drinking was more strongly associated with being Asian and living in low to middle-income households.
- The mother's lifestyle group was a strong predictor of the lifestyle group of their child. Young people in the Unhealthiest group tended to have mothers from an unhealthy lifestyle group. Conversely, young people who were Abstainers were likely to have mothers who were Abstainers.
- Mothers and partners tended to belong to the same lifestyle group. Nearly half (45%) of couples shared the same group. Around half of the Never-smoked drinkers were partnered with a Never-smoked drinker and this group represented 15% of couples. Among Abstainers, four in ten (39%) of the mothers who were Abstainers lived with a partner who was also an Abstainer and 60% of Abstainers partners lived with an Abstainer mother.

Findings were broadly similar across the two studies (HSE and UKHLS) when similar measures and the same statistical methods were used; this was despite differences in questions and data collection methods in the two studies. The consistency between the two high quality and nationally representative studies lends confidence to the findings.

2 BACKGROUND, AIMS AND OBJECTIVES

2.1 Introduction

Four lifestyle factors – cigarette smoking, harmful alcohol intake, poor diet and physical inactivity – underlie the chronic diseases (cardiovascular disease, cancer, lung disease and type-2 diabetes) responsible for around 70% of premature deaths in Europe (WHO, 2008). Socioeconomic inequalities in these four behaviours (Craig and Mindell, 2008a) make a significant contribution to socioeconomic inequalities in morbidity and premature mortality (Mackenbach, 2005).

Studies of adults and CYP in England suggest that social disadvantage is associated with physical inactivity, poorer diets and smoking (Craig and Mindell, 2008a; Craig and Mindell, 2013). The picture is more complex for alcohol consumption. Non-drinking is associated with greater disadvantage and moderate drinking with greater advantage, but gradients are less evident for heavy episodic drinking (i.e. ‘binge drinking’) (Craig and Mindell, 2013). For adolescents, associations between socioeconomic background and harmful alcohol consumption have been found to vary between socioeconomic measures and age groups (Melotti et al, 2011; Kipping et al, 2014).

Promoting healthy lifestyles at all stages of life is central to public health policy in England, and the government’s wider vision of combining improvements in health at all stages of life with greater improvements in disadvantaged communities (DoH 2010; DoH, 2013c; PHE 2014; NHS, 2014). Promoting health lifestyles is also central to containing NHS costs at a time of constrained public spending (NHS, 2014). Studies confirm the high costs of health-damaging behaviours for healthcare systems worldwide (Specchia et al, 2014). In the UK, the costs to the NHS of smoking, alcohol consumption, physical inactivity and poor diet are estimated to be over £50bn per annum, with overweight and obesity adding a further £5.1bn to costs (Scarborough et al, 2011). Building on such evidence, the NHS Forward View pointed to the potential public health and economic benefits of improving people’s lifestyles (NHS, 2014).

The Public Health Outcomes Framework is designed to support lifestyle change. The two overarching public health goals are represented in the Framework by two ‘high-level’ outcomes: increased healthy life expectancy and reduced differences in life expectancy and health life expectancy between communities (DOH, 213). To focus action and monitor progress, the Framework sets out four domains for action at the national and local level, each with a set of indicators. One of the domains is Health Improvements, a domain with healthy lifestyles at its core (DoH ,2012; DoH, 2013). Indicators for this domain are aligned, where data permit, to government recommendations for the four health behaviours (Box 1). Adult indicators in the Outcomes Framework include physical activity, smoking and F&V consumption, and these are based on government recommendations (Box 1); harmful drinking is measured by alcohol-related hospital admissions. The Outcomes Framework also includes an indicator for CYP: smoking prevalence among 15 year olds.

The Outcomes Framework is designed to frame both national and local strategies. The 2012 Health and Social Care Act (TSO, 2012) conferred a duty on local authorities to improve the health of their local populations – and the Framework sets out the indicators against which progress is monitored. Evidence, advice and support to local authorities in fulfilling their public health duties is provided by Public Health England, an executive agency of the Department of Health established following the 2012 Act. Public Health England, in turn, has identified 7 priorities to guide its work, the first three of which relate to the four lifestyle risks of poor diet, physical inactivity, cigarette smoking and harmful alcohol intake (PHE, 2014). The three priorities are tackling obesity, reducing smoking and reducing harmful drinking.

2.2 Evidence on health behaviours

Health behavioural research has two features. Firstly, the main focus has been on the adult population, including major studies of adult health like the Whitehall II study (Sabia et al, 2009) and the EPIC-Norfolk study (Khaw et al, 2008). However, childhood and adolescence are formative periods for the development of health behaviours which persist into adulthood (Schooling and Kuh, 2002; Ebrahim et al, 2004; Jefferis et al, 2004). Parents are an important influence on the health behaviours of their children (Brown et al, 2004; Edwardson et al, 2010; Gilman et al, 2009; Pearson et al, 2008; van de Vorst et al, 2005) and, together, parents and their dependent children represent a large population sub-group. Almost half of England's population (47%) lives in a household with dependent children (ONS 2014a). Broader patterns of social diversity and social disadvantage are particularly evident among this population. For example, one in four children are born to mothers born outside the UK (ONS, 2014b) and around one in five live in poverty (in households where income is less than 60% of median household income before housing costs) (DWP, 2014).

Secondly, much of what is known about lifestyles in England derives from studies of single behaviours. A recent review of studies of multiple risk behaviours (Meader et al, submitted) identified only four recent studies with data for England that specifically examined clustering or co-occurrence of the four health behaviours that contribute most to premature morbidity and mortality (Buck and Frosini, 2012; Dodd et al, 2010; Poortinga, 2007; Sabia et al, 2009). We found no UK study of these four health behaviours among CYP.

While limited, this small evidence base on multiple risk behaviour confirms that most people in England do not meet government guidelines for two or more behaviours (Buck and Frosini, 2012; Poortinga, 2007). Of the four risk behaviours, the two most commonly-reported among adults in England are low F&V intake and low physical activity (Poortinga, 2007; Graham and Hutchinson, 2015). Among CYP, the majority again do not meet government recommendations for their age group (McAloney et al, 2013). Evidence for CYP in England also indicates that smoking prevalence and low levels of physical activity are higher among girls than boys (Craig and Mindell, 2008a; MacArthur et al, 2012). The lack of more comprehensive information on the four health behaviours among CYP is partly explained by the focus on other behaviours, such as substance use, criminal/antisocial behaviour and unprotected sex along with smoking and alcohol intake (Kipping et al, 2014).

At population level, social advantage in the UK is associated with no or one risk behaviour and social disadvantage with three or more risk factors, a pattern reported for both adults (Buck and Frosini, 2012; Poortinga, 2007; Meader et al, submitted; Graham and Hutchinson, 2015) and for CYP (Kipping et al, 2014). However, while at greater risk of social disadvantage, adults from the UK's minority ethnic communities report fewer risk behaviours than the white majority (Lawder et al, 2010; Graham and Hutchinson, 2015). Ethnic differences in health behaviours have also been reported among adolescents in the UK (MacArthur et al, 2012; Rodman et al, 2005; Viner et al, 2006). Compared to white British adolescents, smoking and drinking are less prevalent in CYP from minority ethnic groups (Bangladeshi, Pakistani, Indian, White other and black African), among Muslims and among those born outside the UK (Viner et al, 2006).

Very few studies of multiple risk behaviours focus on parents. Studies of single behaviours suggest that couples with children have lower levels of alcohol consumption than other adults (Schoon and Parsons, 2003). Mothers have poorer diets than other women of similar age (Robinson et al, 2004). Mothers are also less likely to be current smokers and to smoke heavily than fathers and are less likely to consume alcohol and to drink every day or almost every day (Bartley et al, 2004). In line with patterns in the general population, mothers from South Asian backgrounds are less likely to smoke and more likely to be non-drinkers than other mothers (Bartley et al, 2004; Hawkins et al, 2008). However, we found no UK study of mothers that included all four health behaviours (smoking, alcohol intake, diet and physical inactivity) and investigated either co-occurrence (combinations of health behaviours) or clustering (whether behaviours co-occur more frequently than their prevalence would suggest).

Our project addresses the gap in evidence on multiple risk behaviours (smoking, physical inactivity, F&V consumption and alcohol intake) among parents and CYP aged 10-15. By focusing on families, we are able to look at single behaviours, co-occurring behaviours and clusters of behaviours among mothers and among the CYP who live with them. We can also examine the health behaviours of co-resident partners. We can further investigate the clustering of health behaviours among mothers, partners and CYP and identify the lifestyle groups (latent classes) into which they fall.

We also examine the social patterning of lifestyle groups identified for mothers, partners and CYP. Finally, we consider within-family associations of health behaviours: do mothers and partners, and mothers and CYP, have the same risk behaviours and belong to similar lifestyle groups?

Through these analyses, the project provides an in-depth picture of the lifestyles of families in England. It provides information on the overall prevalence and patterning of unhealthy behaviours as well as identifying sub-groups with distinctive combinations of health behaviours. Such evidence can inform both population wide and targeted strategies to improve health (DoH 2010; NHS, 2014; PHE, 2014). For example, it can be helpful for those designing and delivering school-based interventions to have evidence on similarities in the health behaviours of both mothers and their children and mothers and their partners. At the same time, evidence on how social advantage and disadvantage is differently related to parental risk behaviours can help tailor interventions around the risk profiles of different sub-groups.

2.3 Project aim

We aim to strengthen the evidence base of public health policies in England by providing detailed and up-to-date information on multiple health behaviours among parents and the CYP aged 10-15 who live with them. We use two major UK surveys with comparable information on smoking, alcohol consumption, F&V consumption and physical activity among mothers, partners and CYP in England. Risk behaviours are defined in terms of government recommendations for four health behaviours: smoking, alcohol intake, fruit and vegetable intake and physical activity (see Box 1).

2.4 Project objectives

Focusing on smoking, alcohol consumption, F&V consumption and physical activity, the project's objectives are to investigate:

1. the prevalence, co-occurrence and clustering of health behaviours among mothers, co-resident partners and CYP aged 10 to 15 years
2. the social patterning of multiple health behaviours among mothers, co-resident partners and CYP aged 10 to 15 years
3. within-household associations in the health behaviours of mothers and co-resident partners, and mother and their children

The report is structured around these objectives (Box 3). The sections of the report address the objectives by presenting evidence on prevalence, co-occurrence and clustering (sections 4-7) before turning to social patterning (section 8) and within-households associations (sections 9 and 10).

Box 3: Objectives and the structure of the report

	<u>Section of the Report</u>
<u>Objective 1: Prevalence, co-occurrence and clustering</u> <ul style="list-style-type: none"> • Prevalence • Co-occurrence • Clustering using observed-expected ratios • Clustering using latent class analysis 	4 5 6 7
<u>Objective 2: Social patterning</u> <ul style="list-style-type: none"> • Social patterning of latent classes (lifestyle groups) 	8
<u>Objective 3: Within-household associations</u> <ul style="list-style-type: none"> • Associations between mothers and partners (single behaviours, number of behaviours and lifestyle groups) • Associations between mothers and CYP (single behaviours, number of behaviours and lifestyle groups) 	9 10

3 DESIGN AND METHODS

3.1 Data sets

The project involved separate analyses of two nationally-representative surveys with data on residents in England: the Health Survey for England (HSE) and Understanding Society: the UK Household Longitudinal Study (UKHLS). For both surveys, information is collected on the circumstances and health behaviours of adults (16 years and over) and CYP living with them.

We used data from HSE 2006 and HSE 2008 core samples (which involved different individuals at the two timepoint) and these were combined to provide a sufficient sample size for reliable analyses. They were the most recent data collections to include the relevant behaviours for adults and children.

We also used data from English residents in the second wave of the UKHLS collected in 2010/2011, which was again the wave that provided the relevant information on health behaviours. Further details of the design and methods of the studies can be found in Appendix A.

3.2 Analysis groups

Mothers were defined as adult non-pregnant women (aged 16 years and over) who had a child under the age of 16 living with them at the time of the interview whom they reported to be their natural, step, foster, or adoptive child.

Partners were the co-resident partners of mothers; non-resident partners were not included. Almost all (99.6% in UKHLS and 99.9% in the HSE) of the partners were male.

Mothers with partners were mothers who were living with a partner, whether married or cohabiting.

CYP were individuals aged between 10 and 15 years resident in a household in which their mother was recorded as being present at the time of survey participation. We restricted the analyses of both studies to this age group as the UKHLS questionnaire was specifically for this age group. Furthermore, CYP under the age of 10 have very low prevalence of smoking and drinking.

The analysis groups are summarised in Box 4. Further details about the analysis groups can be found in Appendix A.

Box 4: Analysis groups: mothers, partners and CYP

<u>Analysis</u>	<u>Description</u>
All mothers	Women aged ≥ 16 years with a child < 16 years living with them who they report to be their child.
Partners	Co-resident partners of mothers.
Mothers with partners	Mothers living with a partner.
CYP	A child aged 10-15 years living with a mother.

3.3 Data on health behaviour

Like other large surveys, the HSE and UKHLS rely on self-reported data. In addition and along with self-reported smoking status, the HSE uses information derived from cotinine testing to identify CYP who are smokers. Self-completed data tend to underestimate the prevalence of health-damaging behaviours (Tipping et al, 2010). However cost constraints, together with the burden on participants and the consequent challenge of obtaining a sufficiently high response, means that objective measures of health behaviours (e.g. using biological samples and food diaries) are not often not used in large studies.

In the HSE, data on the four health behaviours in adults, along with F&V intake and physical activity in CYP, were collected by computer-assisted telephone interviewing. CYP reported their smoking and drinking status in a confidential self-completion booklet.

For UKHLS adults, information on smoking, F&V consumption and physical activity was collected as part of the main Computer Assisted Personal Interview (CAPI). Alcohol consumption was collected by a separate self-completion questionnaire. CYP reported all four health behaviours in a confidential self-completion booklet. Self-completion questionnaires may provide more 'honest' responses but can also be subject to higher rates of non-response, due to the lack of interviewer involvement. An example was the high rate of missing values for alcohol consumption in the UKHLS among adults from minority ethnic groups. Methods to take account of missing values are described in Appendix A.

The HSE collects the most detailed national information on the four health behaviours using a range of questions that encourage recall of relevant activities and items. For example, the question on physical activity for adults opens by asking about 'things you have done that involve physical activity' and goes on to ask about physical activity in the context of paid work, housework, gardening and DIY, walking and cycling, and sports activity. Questions in the UKHLS are more limited; there are questions on a wide range of sports activities (including fitness, gym and conditioning activities) in the last week and on days of fast/brisk walking for 30 minutes or more in the last four weeks, but no questions on other types of activity. With this more restricted set of activities, it is to be expected that a larger proportion in the UKHLS will fail to meet the physical activity recommendation – and our analysis indeed confirms that this is the case.

Similarly, the HSE includes a wide range of questions on diet to derive estimates of the proportion meeting the F&V recommendation. Questions ask explicitly about salad, pulses, fruit juice and vegetable dishes like vegetable curry as well as about fruit and vegetables (fresh, tinned, frozen, dried). Again the questions in the UKHLS are less detailed, asking only about portions of fruit and vegetable with a follow-up question that refers to tinned, frozen, dried and fresh fruit. Further information on the health behaviour questions in the HSE and the UKHLS is provided in Appendix A.

3.4 Health behaviour measures

Using the range of questions asked in the two surveys, we derived common measures of risk behaviour that were aligned as closely as possible to current government recommendations for the four behaviours (see Box 1 and 2). The more limited questions on physical activity in the UKHLS meant that we relied on an approximate measure (see Appendix A).

These risk behaviour measures are therefore simple binary ones (meeting/not meeting the relevant recommendation). These binary measures are used in sections 4 and 5 in the analyses of prevalence and co-occurrence (the latter examining both the number and combinations of risk behaviours). The measures are also used in section 6 to examine clustering of health behaviours using observed-expected ratios.

We moved beyond this set of dichotomous measures of health behaviours for the latent class analyses (section 7). These analyses used a wider range of categories (e.g. never smoked, ex-smoker, current smoker) to produce distinct groupings (i.e. clusters) of health behaviours. These categories can be found in Appendix H (Tables H1-H6). As discussed below, we refer to these clusters as 'lifestyle groups'.

3.5 Analysis techniques

The analyses were weighted for the complex survey designs of the HSE and UKHLS; weighting also took account of non-response and over-sampling to produce nationally representative results. Weighted values are presented in the tables unless otherwise indicated.

As part of the analyses of co-occurrence (section 5, 9 and 10), a multiple risk behaviour index was used. This was based on the number of behaviours that did not meet government recommendations; the individual index therefore ranged from 0 to 4 and the couple index from 0 to 8.

For the analysis of clustering, we used two techniques. Firstly, we produced observed-expected ratios (O-E ratios) by dividing the observed prevalence of different behaviour combinations by the prevalence expected if the behaviours were independent. With four behaviours, there are 16 possible behaviour combinations and these were examined in turn for all mothers, mothers and partners, and CYP. An O-E ratio where 95% confidence intervals are both greater or both less than one suggests that there is an underlying association between the behaviours. It indicates that they are not independent of each other and engaging/not engaging in one behaviour changes the odds of engaging/not engaging in another.

Secondly, we used Latent Class Analysis (LCA) (Vermunt and Magidson, 2008). LCA serves as a data reduction technique, by consolidating behaviour combinations into salient classes which reflect overall patterns in the data. It enables identification of different lifestyle groups (latent classes) to which individuals can be allocated. LCA has advantages over traditional clustering methods, accommodating a wider range of behavioural measures and allowing for membership to classes to be assigned on the basis of the statistical probabilities. Taking account of differences in the data available in the HSE and UKHLS, we developed behavioural measures for the latent class analyses that were broadly similar across the two surveys. The measures are detailed in Tables H.1 to H.6 in Appendix H.

The social patterning of multiple health behaviours was investigated using the lifestyle groups (latent classes). The analysis of within-household associations in health behaviours used a range of behavioural measures, including single behaviours and lifestyle groups (see sections 9 and 10). Further details of methods used for the analysis can be found in Appendix A to D.

4 PREVALENCE OF THE FOUR HEALTH BEHAVIOURS AMONG MOTHERS, PARTNERS AND CHILDREN AND YOUNG PEOPLE

4.1 Introduction

Section 4 addresses the first objective of the project, relating to the prevalence of the four health behaviours (see Box 3).

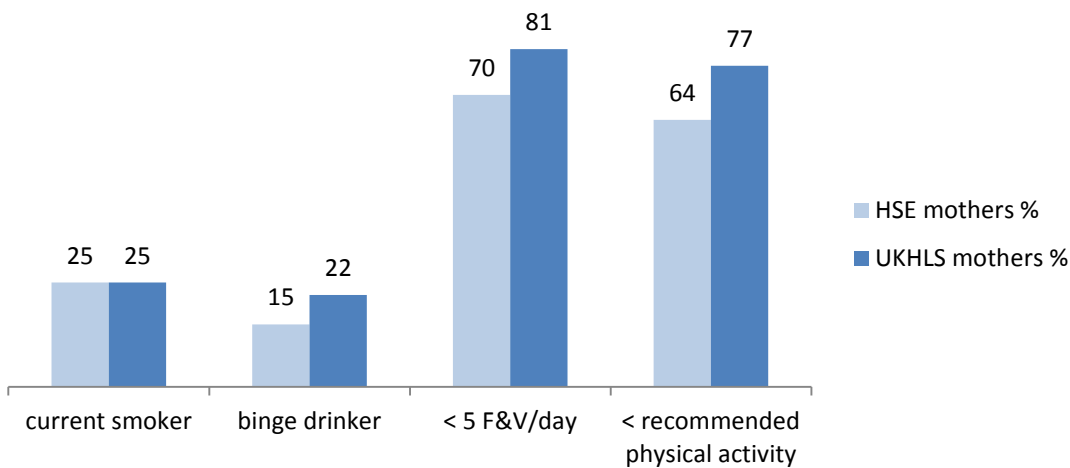
As noted in section 3, our measures of healthy and unhealthy behaviours are based on government recommendations (Box 1 and 2) and behaviours not meeting the recommendations are referred to as risk behaviours. Both the HSE and the UKHLS are used for analyses of all mothers with dependent children (aged 0-15); for analyses of health behaviours among CYP, we focus only on those aged 10-15. Findings for co-resident partners are based on the UKHLS and these are compared to the mothers who live with them.

The section begins by looking at prevalence of the four risk behaviours among mothers, and general points about differences in the methods and measures used in the two surveys are noted. Subsequent sections describe patterns among partners and CYP; methodological points are not repeated but full details are provided in Appendices A and C.

4.2 Prevalence of single risk behaviours among all mothers

Figure 4.1 summarises the prevalence of single risk behaviours among all mothers with dependent children in the HSE and UKHLS.

Figure 4.1 Prevalence of single risk behaviours in HSE (2006 & 2008) and UKHLS mothers (2010/11)



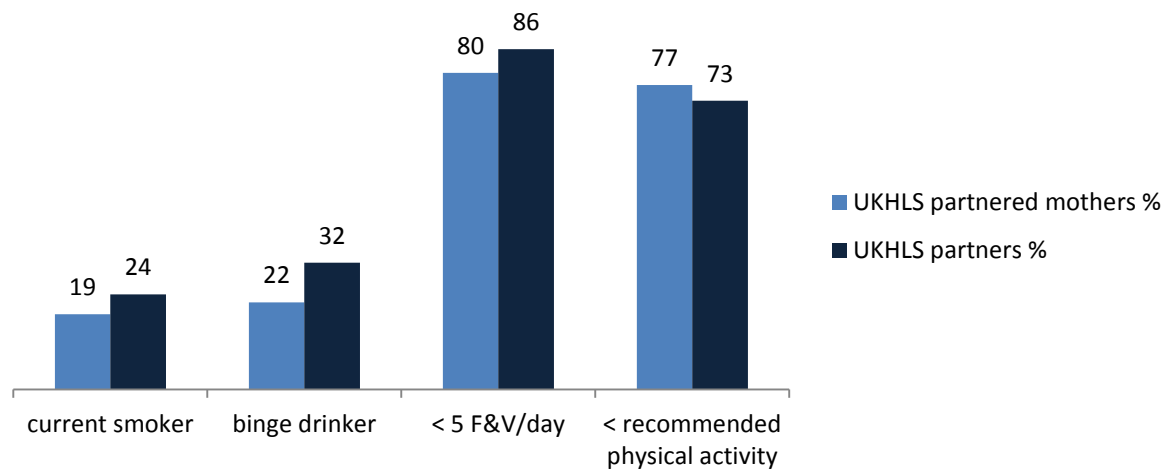
As Figure 4.1 indicates, most mothers met the recommendations for smoking and binge drinking. Nonetheless, one in four mothers was a regular smoker and a sizeable minority reported binge drinking (consuming more than twice the recommended units of alcohol on their heaviest drinking day in the previous seven days). The proportion who reported binge drinking was higher in the UKHLS (22%) than the HSE (15%). Differences in the mode of data collection may be a factor here (Tipping et al. 2010); the UKHLS used a separate self-completion questionnaire while the HSE included questions on alcohol intake as part of the interview (see Appendix A).

A large majority of mothers did not meet the recommendations for F&V consumption and physical activity (see Box 1 and Box 2). The proportions were higher in the UKHLS than the HSE for both risk behaviours. Differences in the questions asked are likely to explain these differences (see section 3.3 and Appendices A and C). Unlike the UKHLS which relies on a simple question about F&V consumption, the HSE asks separately about pulses, salads, vegetable-based dishes and fruit juice. For physical activity, the HSE measures includes moderate or vigorous activity related to housework, home-based manual work and occupational activity as well as walking, cycling and sports; the UKHLS questions only capture brisk/fast walking and sports activities, including fitness, gym or conditioning activities. Full details on mothers’ health behaviour questions can be found in Appendix A and the prevalence of additional behaviour categories are tabled in Appendix E.

4.3 Prevalence of single risk behaviours among mothers and their partners

Figure 4.2 describes the prevalence of single risk behaviours among partners living with mothers and dependent children. It also includes information on the four behaviours for the mothers living with them.

Figure 4.2 Prevalence of single risk behaviours among UKHLS mothers and their partners (2010/11)



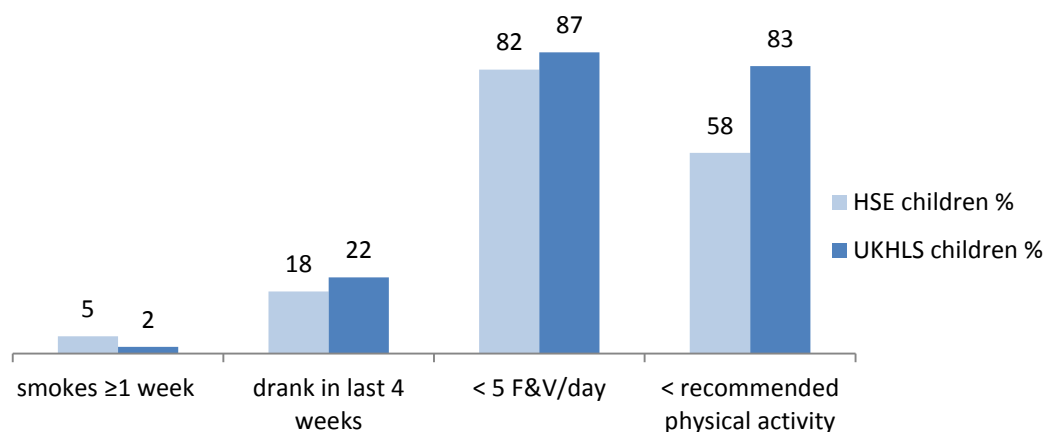
As the figure indicates, there were broad similarities in the health behaviours of partners and mothers. Again, a large majority of partners did not meet recommendations for F&V consumption (86%) and physical activity (73%). A larger proportion of partners (32%) than cohabiting and all mothers (22%, Figure 4.1 and 4.2) reported binge drinking in the previous seven days and around one in four (24%) of partners were current smokers, higher than cohabiting mothers (19%, Figure 4.2) but similar to all mothers (25%, Figure 4.1). Further data on mothers’ and their partners’ health behaviours are tabled in Appendix E (Table E.1 and Table E.4).

4.4 Prevalence of single risk behaviours among children and young people aged 10-15

Figure 4.3 describes single risk behaviours among CYP aged 10-15. As it indicates, patterns across the two surveys were broadly similar for F&V consumption and also similar to patterns among mothers (Figure 4.1) and partners (Figure 4.2). For example in the UKHLS, over 80% of mothers, partners and 10-15 year olds consumed less than 5 portions of F&V a day. Patterns were more divergent for physical activity.

Only a small proportion of CYP were current smokers. The inclusion of cotinine measurement meant that prevalence in the HSE was higher than in the UKHLS; self-reported prevalence in the two surveys was very similar (3% and 2% respectively in the HSE and UKHLS). Differences in physical activity (83% of CYP in the UKHLS were physically inactive compared with 58% in the HSE) are again likely to reflect differences in the measures used in the two surveys. The UKHLS asked CYP about sport, aerobics and other keep fit activities; the HSE physical activity measure also included walking, sports and informal activities (active play, housework and gardening). More information is available in Appendix A and Appendix C.

Figure 4.3 Prevalence of single risk behaviours among (2012/11) HSE (2006 & 2008) and UKHLS children aged 10-15 (2010/11)



Three risk behaviours – smoking, alcohol intake and physical inactivity - increased with age in both studies. The proportion not meeting recommendations for physical activity and smoking increased substantially at ages 14-15, and alcohol intake increased substantially in both 12-13 and 14-15 age groups. F&V intake decreased with age in the UKHLS; the increase in intake with age in the HSE was not statistically significant. CYP's health behaviours by age group are tabled in Appendix E (Table E.5 and E.6) for both HSE and UKHLS.

4.5 Summary

Most mothers met the recommendations for smoking and binge drinking; nonetheless, one in four was a regular smoker and a sizeable minority reported binge drinking in the previous seven days. A large majority did not meet the recommendations for F&V consumption and physical activity.

We found broad similarities in the health behaviours of partners and mothers. The smoking prevalence for partners was higher than cohabiting mothers but similar to all mothers. A larger proportion of partners than cohabiting and all mothers reported binge drinking in the previous seven days. As observed among mothers, a large majority of partners did not meet the recommendations for F&V consumption and physical activity.

A large majority of CYP did not meet the recommendations for F&V consumption and for daily physical activity. Three risk behaviours – smoking, alcohol intake and physical inactivity – increased with age in both studies. The proportions not meeting the recommendations for physical activity and smoking increased substantially at ages 14-15, and the proportion not meeting the alcohol recommendations increased substantially in both the 12-13 and the 14-15 age groups.

5 CO-OCCURRENCE OF RISK BEHAVIOURS

5.1 Introduction

Section 5 addresses the first objective of the project relating to the co-occurrence of the four health behaviours (see Box 3). Both the HSE and UKHLS are used for the analyses of all mothers and CYP. Analyses of co-resident partners are based on the UKHLS only.

As section 4 made clear, a large majority of mothers, partners and CYP did not meet government recommendations for F&V consumption and for physical activity. In addition, a minority of mothers and partners were smokers and a minority had consumed alcohol in the previous seven days at levels defined as binge drinking. Given these patterns, it is to be expected that many parents and children will have multiple risk behaviours. Evidence for the adult population as whole suggests that around 70% of adults in England fail to meet two or more of the recommendations for smoking, alcohol intake, F&V consumption and physical activity (Poortinga 2007; Graham and Hutchinson, 2015).

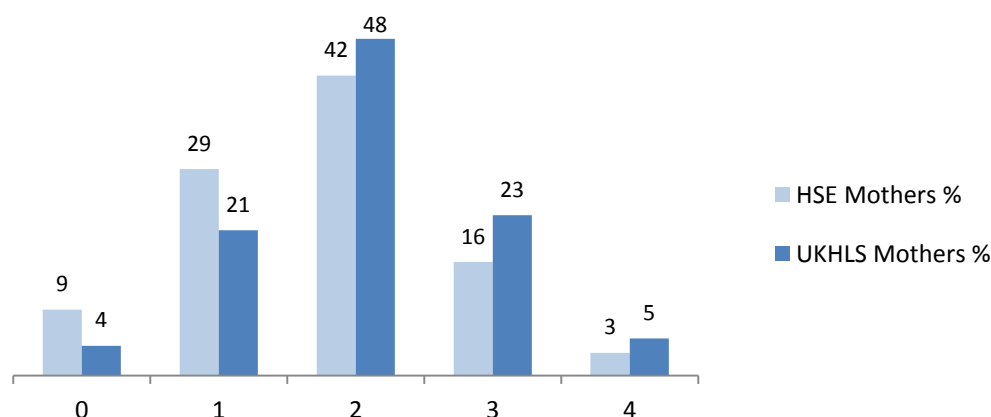
In this section, we examine the number of risk behaviours reported by parents and children. In line with other studies (Poortinga 2007; Buck and Frosini, 2012), we constructed a multiple risk behaviours index ranging from 0 (no risk behaviours) to 4 (all four risk behaviours). Evidence on the clustering of risk behaviours is considered in sections 6 and 7.

5.2 Number of risk behaviours among all mothers

Figure 5.1 describes the number of risk behaviours reported by mothers in the HSE and UKHLS. Again, differences between the two surveys in the behavioural measures should be noted, particularly the narrower range of activities and food items captured in the UKHLS questions on physical activity and F&V consumption (see Appendix A).

In both surveys, the majority of mothers had at least two risk behaviours: 62% in the HSE and 75% in the UKHLS, with only 38% and 25% respectively reporting one or none. In both surveys, the largest group of mothers (over 40%) was those who reported two risk behaviours. A small minority reported all four risk behaviours (3% in the HSE and 5% in the UKHLS). The proportion of mothers with no risk behaviours was also small in both surveys, but was higher in the HSE (9%) than the UKHLS (4%). (See also Table F.1 in Appendix F).

Figure 5.1 Number of risk behaviours among HSE (2006 & 2008) and UKHLS mothers (2010/11): percentage with each number of risk behaviours



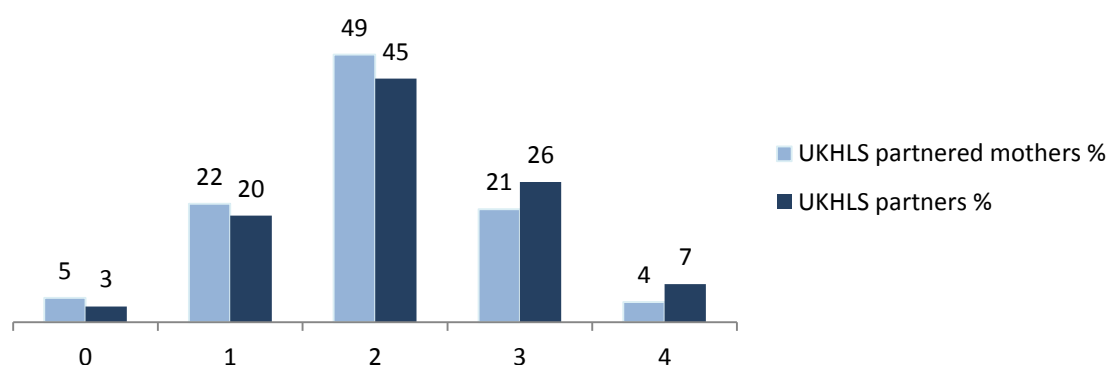
Note: where percentages add up to 99% or 101% instead of 100% this is due to rounding

5.3 Number of risk behaviours among mothers and their partners

Figure 5.2 describes the number of risk behaviours reported by partners living with mothers and dependent children. It also provides the same information for the mothers living with them.

As the figure indicates, partners reported more risk behaviours than mothers. Overall patterns were broadly similar to those found among cohabiting and all mothers: as among mothers, the largest group of partners reported two risk behaviours (45%) and the majority (78%) had two or more risk behaviours. A smaller proportion of partners than mothers reported no risk behaviours and a higher proportion reported all four risk behaviours. (See also Table F.2 in Appendix F).

Figure 5.2 Number of risk behaviours among UKHLS mothers and their partners (2010/11) – percentage with each number of risk behaviours



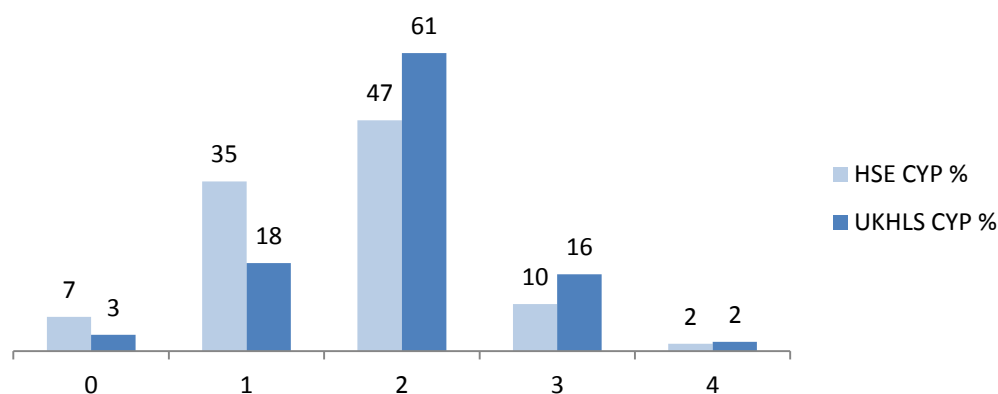
Note: where percentages add up to 99% or 101% instead of 100% this is due to rounding

5.4 Number of risk behaviours among children and young people aged 10-15

Figure 5.3 summarises the evidence on multiple risk behaviours among CYP in the HSE and UKHLS. Like mothers and their partners, the largest group of CYP reported two risk behaviours, with a larger

proportion in the UKHLS (61%) than the HSE (47%). Again like their parents, the majority had two or more risk behaviours (79% in the UKHLS and 59% in the HSE) but very few reported all four risk behaviours (2% in both surveys).

Figure 5.3 Number of risk behaviours among children and young people aged 10-15 in the HSE (2006 & 2008) and UKHLS (2010/11) – percentage with each number of risk behaviours



Note: where percentages add up to 99% or 101% instead of 100% this is due to rounding

5.5 Combinations of risk behaviours

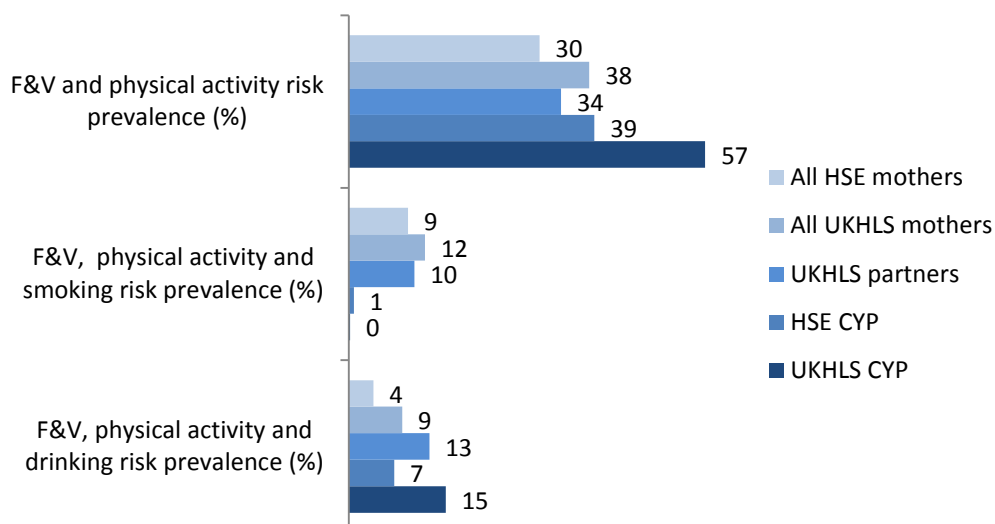
With four risk behaviours, there are 16 possible behavioural combinations. These possible combinations and their observed prevalence for mothers, partners and CYP are reported in Tables G.1-G.3 in Appendix G.

The most commonly-occurring combination of risk behaviours for all three groups – all mothers, partners and CYP - was not meeting government recommendations for both F&V intake and physical activity (with no risks relating to the other two behaviours).

For all mothers, the proportion with this combination of risk behaviours was 30% in the HSE and 38% in the UKHLS. For partners in the UKHLS, the proportion was 34% (and 41% for mothers living with them). For CYP, the proportions were 39% and 57% in the HSE and UKHLS respectively.

Other common combinations were low F&V intake, low physical activity and smoking (9% and 12% of all mothers in the HSE and UKHLS respectively and 10% of partners in the UKHLS) and low F&V intake, low physical activity and harmful drinking (4% and 9% of all mothers in the HSE and UKHLS respectively and 13% of partners in the UKHLS).

Figure 5.4 Prevalence of common combinations of risk behaviours among mothers, partners and children and young people aged 10-15 in the HSE (2006 & 2008) and UKHLS (2010/11)



5.6 Summary

The majority of mothers, partners and CYP did not meet at least two of the recommendations; the largest group meet neither the F&V nor the physical activity recommendation.

A small proportion (less than 10%) of mothers, partners and CYP engaged in no risk behaviours. A smaller proportion reported all four risk behaviours: 2% of CYP, 3-5% of mothers and 7% of partners.

6 CLUSTERING OF RISK BEHAVIOURS USING OBSERVED-EXPECTED RATIOS

6.1 Introduction

Section 6 continues to address the first objective of the project by focusing on the clustering of risk behaviours. We investigated the clustering of health behaviours among mothers and CYP using the HSE and the UKHLS; for partners, we used the UKHLS.

We established in section 5 that a large majority of mothers, partners and CYP had two or more risk behaviours. In this section, we look in more detail at whether particular behaviours occur in combination with other behaviours. We examine whether there are behaviour combinations (for example, low F&V consumption and low physical activity) that occur more often than their separate prevalence would predict. This clustering of health behaviours is identified by comparing the observed and expected prevalence of different behaviour combinations; an observed prevalence that is significantly different than the expected prevalence indicates that the two behaviours are not independent of each other. Details of the method are given in Appendix A.

6.2 Clustering of risk behaviours among mothers

As noted in Section 5, around a third of mothers (38% in the UKHLS and 30% in the HSE) met neither the F&V nor the physical activity recommendation. However, this high proportion may simply reflect the fact that these two risk behaviours were widely reported. Clustering tells us if the two behaviours are associated, with engaging in one affecting the chances of engaging in the other. In fact, there was no evidence of clustering of these two behaviours.

Looking across both surveys, we found only two behavioural patterns with an observed-expected ratio significantly greater than one. The two patterns with significant 95% confidence intervals (CI) in both the HSE and UKHLS were:

- No risk behaviours (about 60% higher in the UKHLS and 40% higher in the HSE than would be expected)
- All four risk behaviours (about 60% higher in the UKHLS and 80% higher in the HSE than would be expected)

A few other combinations of risk behaviours showed significant evidence of clustering in one of the studies for example, drinking risk only in the UKHLS, and the combination of F&V, smoking and drinking risk in the HSE. None of these were common combinations.

There were a number of behavioural patterns in both the HSE and UKHLS that occurred with a prevalence less than that expected if the behaviours were independent. These were:

- Having smoking only as a risk behaviour (about 20% to 30% less than expected in both)
- Having both low physical activity and smoking as risk behaviours (about 50% less than expected in both)
- Having the three risk behaviours of low F&V consumption, low physical activity and harmful drinking (about 20% less than expected in both)

For ease of comparison with partners, Table 6.1 presents the findings for UKHLS mothers living with partners (i.e. for mothers in two-parent families). It summarises the risk behaviour combinations that are significantly more or less likely to occur than expected for mothers with partners, their partners and CYP in the UKHLS. Full details, including results for the HSE and for all mothers, are given in Appendix G Table G.1-G.3.

6.3 Clustering of risk behaviours among mothers and their partners

Among partners, low F&V intake and low levels of physical activity were also the most common combination of risk behaviours – but again there was no evidence of clustering.

As Table 6.1 indicates, there were three behaviour patterns which clustered for partners (observed-expected ratios significantly greater than one); these three patterns also clustered for mothers. They were:

- No risk behaviours (1.5 times and 1.4 times higher in mothers and partners respectively than would be expected)
- All four risk behaviours (1.5 times higher in both)
- Drinking risk only (1.8 and 2.0 times higher in mothers and partners respectively)

There were four risk behaviour combinations that were less likely to occur together than expected for both mothers and partners in the UKHLS. These were:

- Smoking risk only (60% less than expected in both)
- F&V and smoking risk (40% and 30% less than expected in mothers and partners respectively)
- Physical activity and smoking risk (60% less than expected in both)
- F&V, physical activity and drinking risk (20% less than expected in both)

The prevalence of all four combinations was low, particularly smoking risk only.

6.4 Clustering of risk behaviours among children and young people

Among CYP, there was evidence of clustering (observed-expected ratios significantly greater than one) in both the HSE and the UKHLS for two patterns of behaviour. Again, these were:

- No risk behaviours (1.2 times and 2.0 times higher than would be expected in the HSE and UKHLS respectively)
- All four risk behaviours (3.2 and 4.9 times higher than would be expected in the HSE and UKHLS respectively)

It should be noted that the observed-expected ratios were based on a very small proportion of CYP engaging in all four risk behaviours, so these estimates are imprecise.

Table 6.1 Observed-expected ratios of mothers with partners, their partners and children and young people in the UKHLS (2010/11) that are significantly more or less likely to occur than expected

Risk Patterns	Mothers with partners			Partners			CYP		
	Observed	Expected	O/E (95%CI)	Observed	Expected	O/E (95%CI)	Observed	Expected	O/E (95%CI)
	%	%		%	%		%	%	
No risk	4.5	2.9	1.5 (1.2, 1.8)	2.9	2.0	1.4 (1.1, 1.8)	3.3	1.7	2.0 (1.6, 2.4)
Smoking risk only	0.3	0.7	0.4 (0.1, 0.7)	0.2	0.6	0.4 (0.1, 0.7)			
Drinking risk only	1.5	0.8	1.8 (1.3, 2.4)	1.9	0.9	2.0 (1.4, 2.6)			
F&V and smoking risk	1.7	2.7	0.6 (0.4, 0.8)	2.7	3.9	0.7 (0.5, 0.9)			
Physical activity and smoking risk	1.0	2.3	0.4 (0.3, 0.6)	0.7	1.6	0.4 (0.2, 0.6)			
F&V, physical activity and smoking risk							0.2	1.4	0.2 (0.0, 0.3)
F&V, physical activity and drinking risk	8.8	10.8	0.8 (0.7, 0.9)	12.8	15.2	0.8 (0.8, 0.9)			
Physical activity, smoking and drinking risk				0.2	0.8	0.3 (0.0, 0.5)			
All four risk behaviours	3.7	2.5	1.5 (1.2, 1.8)	7.0	4.7	1.5 (1.2, 1.7)	1.9	0.4	4.9 (3.6, 6.2)

Risk behaviour combinations that are significantly more likely to occur than would be expected are shown in bold

There were other behavioural patterns – all involving alcohol consumption - in the HSE with an observed-expected ratio significantly greater than one, indicating clustering of the associated behaviours. However, again only a small proportion of CYP reported these behaviour combinations so the estimates shown in the Table G.3 are very imprecise; no clustering other than the two shown above was observed in the UKHLS.

6.5 Summary

While the majority of mothers, partners and CYP did not meet the recommendations for F&V consumption and physical activity, there is no evidence that the two behaviours cluster. Having low F&V intake did not increase the chances of also having low physical activity levels or vice versa.

However, there was evidence of clustering of the most healthy lifestyles (i.e. having no reported risk behaviours) among mothers and partners and among CYP. Similarly, having all four risk behaviours occurred more often than the prevalence of each individual behaviour would suggest

7 CLUSTERING OF HEALTH BEHAVIOURS USING LATENT CLASS ANALYSIS

7.1 Introduction

Section 7 is the last of the four sections that address the first objective of the project (see Box 3). Like section 6, it explores links between the four health behaviours. Again, the HSE and UKHLS are used for analyses of mothers and CYP, and the UKHLS for analyses of partners.

The analyses presented in section 6 focused on observed patterns; they are based on differences in the observed and expected prevalence of combinations of behaviours. Latent class analysis (LCA) identifies latent (unobserved) clusters or classes of behaviour. Unlike O-E ratios, it does not need to represent behaviour as dichotomous (e.g. as meeting/not meeting government recommendations). Instead, it can incorporate a range of values for the behaviour. We used the range of health behaviour questions asked in the HSE and UKHLS to produce a list of behavioural measures for mothers, partners and CYP (Box 5).

Box 5: Behavioural measures used in the Latent Class Analysis for mothers, partners and children and young people

HSE: MOTHERS

- Smoking status (6 categories incl. non-smoker, ex-regular smoker & average current daily cigarette consumption)
- Age started smoking (5 categories)
- Drinking frequency (10 categories)
- Number of units consumed on the heaviest day in the past 7 days (8 categories)
- Fruit portions consumed per day (4 categories)
- Vegetable portions consumed per day (4 categories)
- Number of days walking briskly or fast paced in the past 4 weeks (7 categories)
- Number of sporting occasions in the past 4 weeks (7 categories)

UKHLS: MOTHERS AND PARTNERS

- Smoking status (6 categories incl. non-smoker, ex-regular smoker & average current daily cigarette consumption)
- Age started smoking (5 categories)
- Drinking frequency (9 categories)
- Number of units consumed on the heaviest day in the past 7 days (8 categories)
- Fruit and vegetable portions consumed per day (4 categories)
- Number of days walking briskly or fast paced in the past 4 weeks (7 categories)
- Frequency of participation in moderate to vigorous sporting activities over the last 12 months (7 categories).

HSE: CHILDREN AND YOUNG PEOPLE AGED 10-15

- Smoking status (3 categories including never smoked and cotinine readings)
- Age when first had a cigarette (4 categories)
- Drinking frequency (4 categories)
- Age of first alcoholic drink (4 categories)
- Vegetable consumption (4 categories)
- Fruit consumption (4 categories)
- Time spent walking in the last 7 days (6 categories)
- Time spent doing sports in the past week (6 categories)
- Time spent actively playing in the past week (6 categories).

UKHLS: CHILDREN AND YOUNG PEOPLE AGED 10-15

- Smoking status (6 categories)
- Drinking in last 4 weeks (6 categories)
- Fruit and vegetable intake (4 categories)
- Number of days engaged in sport during the last 7 days (6 categories)

LCAs for a particular set of behaviours for different numbers of classes were estimated several times, each LCA producing a different set of lifestyle groups (latent classes). Individuals were allocated on the basis of high predicted probabilities of class membership. The different sets were then subjected to a range of statistical tests to help guide the decision over which set to choose but important, too, was the interpretability and relevance: do the classes make sense and are they helpful? Appendix A and B discusses this process in more detail and Appendix H presents the latent class summaries.

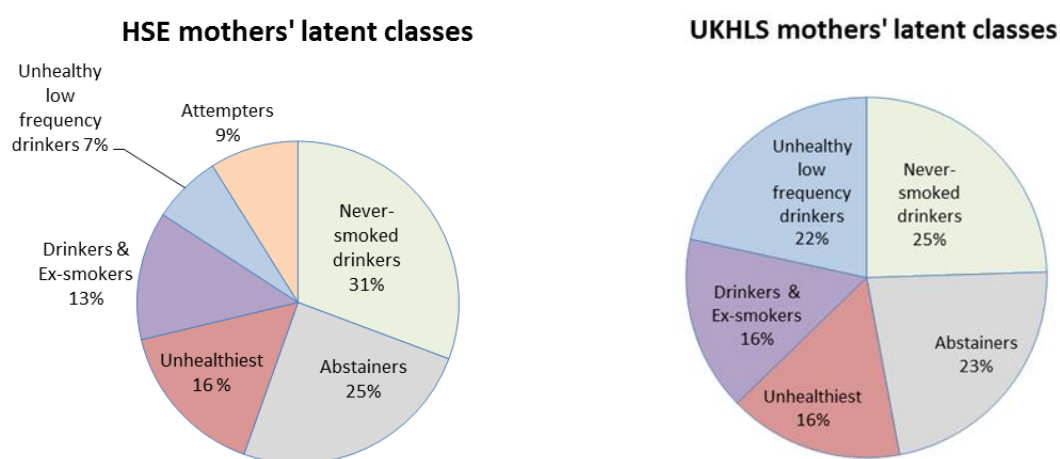
In the sections below, we present the final set of latent classes (lifestyle groups) selected for mothers, partners and CYP. As the sections indicate, there was a high degree of consistency in the latent classes identified in the two studies (HSE and UKHLS) for mothers and for CYP. There was also a high degree of consistency in the latent classes of mothers and their co-resident partners (based on UKHLS). This lends further support to the lifestyle groups that we identified.

7.2 Mothers' lifestyle groups (latent classes)

Figure 7.1 presents the lifestyle groups identified for all mothers and the proportion of mothers allocated to each group.

As it indicates, the analysis of the HSE suggested that a 6-class solution was optimal; for the UKHLS, the one that best met the criteria was a 5-class solution (see Appendix H, Tables H.1 and H.2). The five classes in the UKHLS LCA were very similar to five out of the six classes in the HSE 6-class solution; the behaviours included in the classes were also similar despite the average prevalence of behaviours being somewhat different. These five classes were therefore given the same descriptors (Figure 7.1).

Figure 7.1 Latent classes of mothers in the HSE (2006 & 2008) and UKHLS (2010/11)



Below, we give a brief description of patterns of health behaviours in each class. By way of illustration, Box 6 also gives the prevalence of the four risk behaviours in each class in the UKHLS (the HSE prevalence can be found in Appendix H). Interestingly in both the HSE and the UKHLS, we found that the lifestyle groups were primarily distinguished by smoking and drinking behaviours rather than by the commonest risk behaviours, F&V intake and physical activity.

Box 6: Lifestyle groups for all mothers

Never-smoked drinkers: the largest group of mothers in both the HSE and UKHLS. The mothers had never regularly smoked, frequently consumed alcohol (over 70% drank at least once a week) and binge drank (27% in the last 7 days; however, they binge drank less than other groups who engaged in binge drinking. The group were about average in relation to physical activity and F&V intake compared to other mothers in their study.

UKHLS mothers (25% of all UKHLS mothers). In terms of risks of not meeting government recommendations:

- *no current smokers*
- *27% had drunk over 6 units on their heaviest drinking day & 31% drank more than twice a week*
- *77% did not consume 5+ F&V on average per day*
- *73% did not meet physical activity recommendations*

Abstainers: the second largest group in both the HSE and UKHLS. Like the 'Never-smoked drinkers', the mothers were all non-smokers. But while the large majority of Never-smoked drinkers drank regularly, almost all the Abstainers were occasional or non-drinkers. The Abstainers had about average F&V intake and engaged in below average physical activity.

UKLHS mothers (23%)

- *no current smokers*
- *1% had drunk over 6 units on their heaviest drinking days & none drank more than twice a week; 37% did not answer these questions*
- *82% did not consume 5+ F&V each day*
- *80% did not meet physical activity recommendations*

Unhealthiest behaviour group: this group had a high proportion of current smokers, the remainder being ex-smokers. Many started smoking under the age of 16. The group also had the highest prevalence of binge drinking, although they did not drink more frequently than other groups who drank. Mothers in this group had low F&V intake, with a high percentage consuming less than one portion of vegetables or fruit per day in the past week, and had low participation in physical activity compared to average.

UKHLS mothers (16%)

- *73% current smokers with 14% being heavy smokers*
- *61% had drunk over 6 units on their heaviest drinking days & 33% drank more than twice a week*
- *93% did not consume 5+ F&V each day*
- *85% did not meet physical activity recommendations*

Drinkers, ex-smokers but healthier physical activity and F&V consumers: this group consisted mainly of ex-regular smokers along with some current light or moderate smokers, and had a lower proportion that started smoking under 16 than the other groups with current or ex-smokers. The group had the highest proportion of drinking more than twice a week and a high proportion who binge drank. Conversely this group had the highest intake of F&V and the most frequent participation in physical activity.

UKHLS Mothers (16%)

- *13% current light or moderate smokers, 87% ex-smokers*
- *38% had drunk over 6 units on their heaviest drinking days & 43% drank more than twice a week*
- *65% did not consume 5+ fruit and vegetables each day*
- *65% did not meet physical activity recommendations*

Unhealthy low frequency drinkers: although this group consisted of occasional or non-drinkers, the mothers were unhealthy with respect to the other three health behaviours. The majority in this group were current smokers, with many in the HSE being heavy smokers. They were low F&V consumers, with a high proportion in the HSE doing no physical activity or eating less than one portion a week, and were low participators in physical activity.

UKHLS Mothers (22%)

- 56% current smokers, 14% heavy smokers
- none had drunk over 6 units on their heaviest drinking days & none drank more than twice a week
- 87% did not consume 5+ F&V each day
- 83% did not meet physical activity recommendations

Attempters: this group was only produced in the HSE LCA. Attempters were a group that appeared to be trying to be healthy. The group consisted mainly of ex-regular or current light smokers, infrequent drinkers, average participators in walking and sports, and the second highest F&V consumers.

UKHLS Mothers (0%)

There was no corresponding class in the UKHLS and none appeared similar to HSE 'Attempters' when a UKHLS 6-class solution was tried.

7.3 Partners' and mothers' lifestyle groups (latent classes)

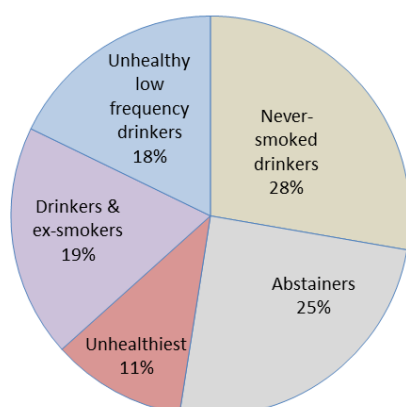
Separate latent class analyses were undertaken for partners and for partnered mothers in the UKHLS. Respondents were included in the relevant analysis whether or not their partner had responded to all the health behaviour questions listed in Box 5 above. The resulting lifestyle groups for mothers and for partners were compared.

In terms of statistical checks, interpretability and relevance, a 5-class solution was found to be optimal for UKHLS partners and partnered mothers. This is summarised in Figure 7.2, together with information on the proportions in each lifestyle group. The 5-class solution for the partners (Table H.4 in Appendix H) was very similar to the 5-class solution for mothers with partners (Table H.3), and was similar to those for all mothers in the UKHLS mothers (Figure 7.1, Table H.1).

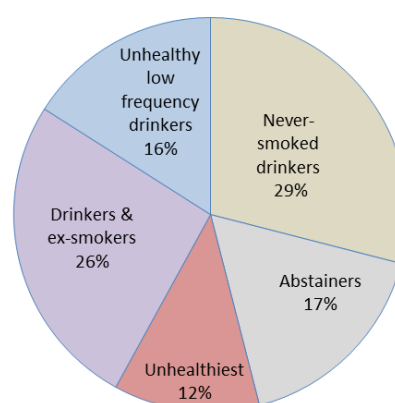
In most of the lifestyle groups, partners had unhealthier behaviours with respect to alcohol and F&V intake than mothers. A brief summary of each class is given below, along with information on the prevalence of risky behaviours in each class (see Box 7).

Figure 7.2 Latent classes of partners and partnered mothers in the UKHLS (2010/11)

UKHLS partnered mothers' latent classes



UKHLS partners' latent classes



Box 7: Lifestyle groups for partners and partnered mothers

Never-smoked drinkers: this was the largest group among both partnered mothers and partners. They had never-regularly smoked. They frequently consumed alcohol (74% of mothers and 89% of partners drank more than once a week) and binge drank (25% of mothers and 37% of partners) but binge drank less than other groups who engaged in binge drinking. They were above average consumers of F&V and engaged in average physical activity compared to other mothers and partners in the UKHLS.

UKHLS partnered mothers (28%)

- *No current smokers*
- *25% had drunk over 6 units on their heaviest drinking days & 32 % drank more than twice a week*
- *76% did not consume 5+ F&V each day*
- *71% did not meet physical activity recommendations*

UKHLS partners (29%)

- *no current smokers*
- *37% had drunk over 8 units on their heaviest drinking day & 44% drank more than twice a week*
- *80% did not consume 5+ F&V each day*

Abstainers: this group also consisted of non-smokers, but unlike the Never-smoked, drinkers, they were occasional or non-drinkers. They had average F&V intake and engaged in slightly below average physical activity.

UKHLS partnered mothers (25%)

- *No current smokers*
- *none had drunk over 6 units on their heaviest drinking days & none drank more than twice a week and 37% did not answer these questions*
- *81% did not consume 5+ F&V each day*
- *80% did not meet physical activity recommendations*

UKLHS partners (17%)

- *No current smokers*
- *1% had drunk over 8 units on their heaviest drinking days & 0% drank more than twice a week, but 29% did not answer these questions*
- *88% did not consume 5+ F&V each day*
- *76% did not meet physical activity recommendations*

Unhealthiest behaviour group: this group had the highest proportion of current smokers and heavy smokers; many started smoking under the age of 16. The group also had the highest proportion of binge drinkers. They had lowest fruit and vegetable intake and the lowest participation in physical activity. With the exception of physical activity, partners had less healthy behaviours than mothers. A higher proportion of partners drank almost every day (26% of partners vs 10% of mothers) and did not eat any F&V (73% of partners vs 59% of mothers with partners).

UKHLS partnered mothers (11%)

- *67% current smokers with 15% being heavy smokers (33% ex-regular smokers)*
- *53% had drunk over 6 units on their heaviest drinking days & 32% drank more than twice a week*
- *94% did not consume 5+ F&V each day*
- *91% did not meet physical activity recommendations*

UKHLS partners (12%)

- *86% current smokers with 42% being heavy smokers (14% ex-regular smokers)*
- *69% had drunk over 8 units on their heaviest drinking days & 51% drank more than twice a week*
- *98% did not consume 5+ F&V each day*
- *81% did not meet physical activity recommendations*

Drinkers, ex-smokers but healthier PA and F&V consumers: this group consisted mainly of ex-regular smokers along with some current light or moderate smokers, and had a lower proportion that started smoking under 16 than the other groups with current or ex-smokers. The group contained frequent drinkers and a high proportion that binge drank; however it had the highest intake of F&V and most frequent participation in physical activity. Partners had unhealthier behaviours than mothers, except for physical activity.

UKHLS partnered mothers (19%)

- 19% current light or moderate smokers, 81% ex-smokers
- 44% had drank over 6 units on their heaviest drinking days & 42% drank more than twice a week
- 66% did not consume 5+ F&V each day
- 65% did not meet physical activity recommendations

UKHLS partners (26%)

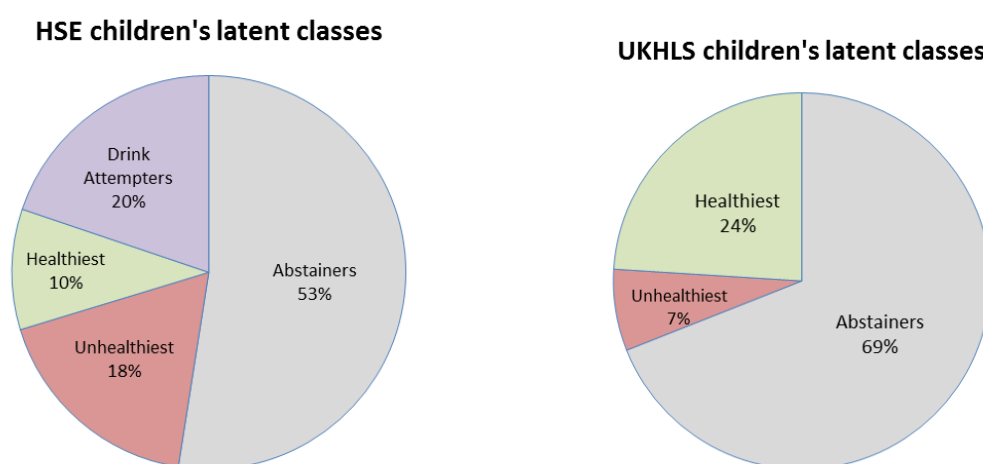
- 27% current light or moderate smokers, 73% ex-smokers
- 64% had drank over 8 units on their heaviest drinking days & 52% drank more than twice a week
- 83% did not consume 5+ F&V each day
- 65% did not meet physical activity recommendations

7.4 Children and young people's lifestyle groups (latent classes)

Figure 7.3 describes the lifestyle groups identified for CYP. As it indicates, a four-class solution was considered the optimal solution for the HSE and a 3-class solution for the UKHLS. The reduced number of health behaviour measures in the UKHLS (Box 5) may have limited the numbers of latent classes produced. For further details, see Tables H.5 and H.6.

Three of the four HSE groups were similar to the UKHLS 3-class solution: Abstainers, Healthiest and Unhealthiest groups. However, the HSE LCA also produced a Drink attempters group. In addition, there were some differences between studies in the characteristics of groups and in the proportion of CYP in the groups (see Box 8 below).

Figure 7.3 Lifestyle groups of children and young people in the HSE (2006 & 2008) and UKHLS (2010/11)



Box 8: Lifestyle groups for children and young people

Abstainers: in the HSE, the group consisted of CYP who had never smoked a cigarette or never had an alcoholic drink; however in the UKHLS, 18% had drunk in the last month. Members of this group had low F&V intake and the lowest participation in physical activity.

HSE CYP (53%)

- *no regular smokers*
- *none had drunk in the last four weeks*
- *84% did not consume 5+ F&V on average per day*
- *68% did not meet physical activity recommendations*

UKHLS CYP (69%)

- *no regular smokers*
- *18% had drunk in the last four weeks*
- *96% did not consume 5+ F&V on average per day*
- *92% did not meet physical activity recommendations*

Healthiest behaviour group: this group were likely to have never smoked, and most had not drunk alcohol. They were the best F&V consumers and also the best physical activity participants.

HSE CYP (10%)

- *no regular smokers*
- *none had drunk in the last four weeks*
- *58% did not consume 5+ F&V on average per day*
- *10% did not meet physical activity recommendations*

UKHLS CYP (24%)

- *1% regular smokers*
- *12% had drunk in the last four weeks*
- *58% did not consume 5+ fruit and vegetables on average per day*
- *56% did not meet physical activity recommendations*

Unhealthiest behaviour group: this group consisted of smokers or those who had tried smoking and had the highest percentage of drinkers. In addition in the UKHLS, the group were low F&V consumers and had low engagement in physical activity.

HSE CYP (18%)

- *29% regular smokers*
- *42% had drunk in the last four weeks*
- *85% did not consume 5+ F&V on average per day*
- *51% did not meet physical activity recommendations*

UKHLS CYP (7%)

- *29% regular smokers*
- *98% had drunk in the last four weeks*
- *90% did not consume 5+ F&V on average per day*
- *91% did not meet physical activity recommendations*

Drink Attempters: only the HSE LCA produced this group; they were similar to the HSE Abstainers, except that all had tried alcohol at some point (although only 29% had drunk in the last four weeks).

HSE CYP (20%)

- *no regular smokers*
- *29% had drunk in the last four weeks*
- *87% did not consume 5+ F&V on average per day*
- *61% did not meet physical activity recommendations*

UKHLS CYP (0%)

There was no similar group in the UKHLS.

7.5 Summary

Using a wide range of measures of the health behaviours in the latent class analyses, we were able to identify five lifestyle groups to which mothers and co-resident partners could be allocated. The lifestyle groups of partners were very similar to the mothers' groups.

These groups ranged from 'Abstainers' (non-smokers who occasionally/never drank, had average F&V intake and lower than average physical activity) to the 'Unhealthiest behaviour group' (highest proportion of smokers, heavy smokers and binge drinkers, low F&V intake and the lowest levels of physical activity). Around one in ten mothers and partners were in the Unhealthiest behaviour group. A higher proportion of mothers than partners were in the Abstainer group, but more partners were in the groups characterised by unhealthy drinking.

The largest group of mothers and partners were Never smoked drinkers; around a quarter of mothers and three in ten partners fell into this group. While they did not smoke, they were frequent drinkers and a sizeable minority (around one in four mothers and over a third of partners) had been binge drinkers in the last seven days.

Three to four lifestyle groups were identified for CYP; four groups were optimal in the HSE which had the richer health behaviour measures. The majority of CYP were Abstainers who had never smoked and had rarely/never drunk, but had low F&V consumption and very low levels of physical activity. A minority (10% in the HSE) were in the 'Healthiest behaviour group' (never smokers, non-drinkers with the highest levels of both F&V intake and physical activity). Less than one in five were in the Unhealthiest behaviour group, a group that included CYP who had smoked and/or were smokers, were unlikely to consume 5 portions of F&V a day and contained the highest proportion of drinkers.

8 SOCIAL PATTERNING OF LIFESTYLE GROUPS (LATENT CLASSES)

8.1 Introduction

Section 8 addresses the second objective of the project: to investigate the social patterning of multiple health behaviours (see Box 3).

As noted in section 2, previous studies have pointed to socioeconomic gradients in individual health behaviours, like smoking, poor diet and physical inactivity, with social disadvantage increasing the risk of a health-damaging lifestyle. However, beyond these broad conclusions, little is known about the social patterning of multiple health behaviours, including patterns across ethnic groups.

This section addresses this gap with respect to mothers, co-resident partners and CYP. It does so by exploiting the latent class analyses presented in section 7. As noted in that section, latent class analysis provides a richer picture of people's lifestyles than is possible using observed-expected ratios. By including a wider range of measures of health behaviours, we were able to identify a set of lifestyle groups (latent classes in Figures 7.1, 7.2 and 7.3) to which individuals could be allocated on the basis of high predicted probabilities of membership.

This section describes the social profile of these lifestyle groups, looking in turn at mothers, partners and CYP. To aid analysis, a common set of socio-demographic measures was used in analyses of the UKHLS and the HSE for mothers and partners (Box 9) and for CYP (Box 10). For mothers and partners, this included individual-level (education, economic activity) and household (income) measures of socioeconomic position as well as age, ethnic group, domestic relationships and health status (Box 9). For CYP, the set included gender, age and ethnic origin, together with a range of household and maternal measures, the latter including mother's age, socioeconomic position, health status and lifestyle group.

Because of the small number of participants in the HSE from minority ethnic groups, only a broad white/non-white classification of ethnicity could be used for the HSE analysis. Tables E.2 and E.3 in Appendix E provide further information on the single behaviours by both ethnic and religious group among UKHLS mothers.

Using logistic regression, we began by identifying individual factors that were significantly associated with single health behaviours (summarised in Appendix E). These factors were then included as potential predictors in models for each lifestyle group whilst all the other potential predictors were held constant (see Appendix A).

Both the HSE and the UKHLS were used for the analyses of all mothers and CYP; the UKHLS only was used for partners. To aid the interpretation of findings, the focus below is more on the UKHLS for mothers and partners, and more on the HSE for CYP. The full set of analyses is provided in Appendix J.

Box 9: Socio-demographic measures in analyses of mothers and partners

- Age group (Mothers: 16-24; 25-34; 35-44; 45-74. Partners 25-34; 35-44; 45-74).
- Marital status (Mothers: single or previously married; married or civil partnership; cohabitees. Partners: married or civil partnership; cohabitees.)
- Number of children in the household (1;2; 3+)
- Highest educational qualifications (degree or equivalent or higher; higher education or A- level equivalent; O-level or equivalent; other or none)
- Equivalised household income quintile groups (5 groups)
- Economic activity (in employment, self-employed or government training; unemployed or economically inactive)
- Ethnicity (UKHLS: white; mixed; Indian, Pakistani, Bangladeshi, black African, Arab; Otherⁱ. HSE: white; non-white)
- Limiting long-standing illness (limiting long-standing illness; non-limiting long-standing illness or no limiting illness)
- Age of youngest child in household (UKHLS only: <5; ≥5≤10;>10 years of age)

ⁱ includes Black Caribbean

Box 10: socio-demographic measures in analyses of children and young people

- Gender
- Age group (10-11; 12-13; 14-15 years old)
- Ethnicity (HSE: White; Non-white. UKHLS – Mothers' ethnicity: White; Mixed; Indian, Pakistani, Bangladeshi, black African, Arab; Otherⁱ)
- Mother's lifestyle group (latent class)
- Mother's age group (25-34; 35-44; 45-74)
- Mother's marital status (single or previously married; married or civil partnership; cohabitees)
- Number of children in the household (1;2; 3+)
- Mother's highest educational qualifications (degree or equivalent or higher; A level or equivalent or diploma; O level or equivalent; other or none)
- Equivalised household income quintile groups
- Mother's economic activity (in employment, self-employed or government training; unemployed or economically inactive)
- Mother's limiting long-standing illness (limiting long-standing illness; non-limiting long-standing illness or no limiting illness)
- Age of youngest child in the household ((UKHLS only: <5; ≥5≤10;>10 years of age)

ⁱ includes Black Caribbean

8.2 Social patterning of mothers' lifestyle groups

As noted above, analyses of the social patterning of lifestyle groups (latent classes) was undertaken for both the HSE and the UKHLS (see Appendix J). We pay particular attention to the UKHLS because its larger sample of participants from minority ethnic groups enabled analysis of the ethnic patterning of lifestyle groups. Nevertheless, the socioeconomic variables that remained significant predictors of the mothers' lifestyle groups in regression models were fairly consistent in both the UKHLS and HSE analyses; in both, household income and ethnicity were predictors in the greatest number of classes (Table 8.1). Mother's economic activity and limiting long-standing illness were less likely to be predictors. The number of children in the household and youngest children in the household did not remain predictors in the adjusted analyses (See Appendix J, Tables J.1 and J.3).

We present the social patterning of lifestyle groups in three ways, enabling the reader to select the one they find most helpful. Firstly, we give a textual description of the social profile of the lifestyle groups (Box 11) based on regression results shown in Tables J.1 and J.3 in Appendix J.

Secondly, we summarise these details in a table (Table 8.1) where comparisons between UKHLS and HSE results can easily be seen. The table shows the socio-demographic factors that are significant predictors of being in a particular lifestyle group (latent class) and it indicates what aspects of these factors are most likely to be found in members.

Finally in Figure 8.1, for those factors that are significant predictors we add information on the probability of the social composition of mothers' lifestyle groups to the pie-chart given in section 7 (Figure 7.1). These probabilities along with their confidence intervals are tabled in Appendix J (Table J.2). In Figure 8.1, typical engagements in the four health behaviours for each lifestyle group are indicated through the colour of the health behaviour abbreviations within their pie segment, e.g. a green **Sm** indicates the majority in the lifestyle groups are not current smokers, a red **AC** indicates the majority are binge drinkers. The boxes attached to each lifestyle group in Figure 8.1 detail the probability of being in that group based on the category an individual is in for each socio-demographic predictor and at the average values of the other predictors. For instance, on average, the probability of being in the Never-smoked drinkers group was 25%, but this increased to 31% if the mothers were 45 years old or over, and reduced to 19% if they were below 25. Further textual description of these predicted probabilities is given in Appendix J. Additionally, the proportions of UKHLS mothers in each lifestyle group by all the individual social characteristics in Box 9 above can be found in table J.8 in Appendix J.

Box 11: Social profiles of mothers' lifestyle groups (UKHLS & HSE)

Never-smoked drinkers

Mothers in the Never-smoked drinkers group were more likely than mothers in other lifestyle groups to be older (45+ in the UKHLS or 35+ in the HSE), married, with higher educational qualifications, to have a higher income, to be white or not have a limiting long-standing illness. The UKHLS analysis also found they were likely to be in employment and they were less likely to be Indian, Pakistani, Bangladeshi, Black African or Arab.

Abstainers

Mothers in this lifestyle group were more likely than other mothers to be non-white, to live in middle income households (to have lower income in the HSE), to be married (or co-habiting in the HSE), or to be unemployed or economically inactive. The UKHLS analysis also found they were highly likely to be Indian, Pakistani, Bangladeshi, Black African or Arab.

Unhealthiest behaviour group

Compared to other mothers, mothers in this lifestyle group were more likely to be between 25-35 years of age in the UKHLS (or below 45 years old in the HSE), white or to not have a degree. They were also more likely to be single (HSE) or not married (UKHLS). Not living in the highest income households, but being in employment and having a limiting long-standing illness were other predictors found in the HSE analyses. The UKHLS analysis also found that they were least likely to be Indian, Pakistani, Bangladeshi, Black African or Arab.

Drinkers, ex-smokers but healthy PA and F&V consumption

Mothers in this lifestyle group were more likely than other mothers to be white, to have higher educational qualifications, or to have a household income which is not in the bottom quintile. UKHLS mothers in the group were also likely to be over 35 or not have a limiting long-standing illness than mothers in other lifestyle groups.

Unhealthy but low frequency drinkers

Mothers in this group were more likely than mothers in other lifestyle groups to be younger (below 35 years old in the HSE and below 25 in the UKHLS), white, with a limiting long-standing illness, lower qualifications or no qualifications at all or to live in middle to lower income households. The UKHLS mothers were also less likely to be married, to be economically active, or to be Indian, Pakistani, Bangladeshi, Black African or Arab.

Attempters (HSE only)

HSE mothers in this lifestyle group were more likely than other mothers to be less than 45 years old, white, not currently married or to live in a low-income household.

Table 8.1 Comparison of the socio-demographic patterning of UKHLS (2010/11) and HSE (2006 & 2008) mothers' lifestyle groups

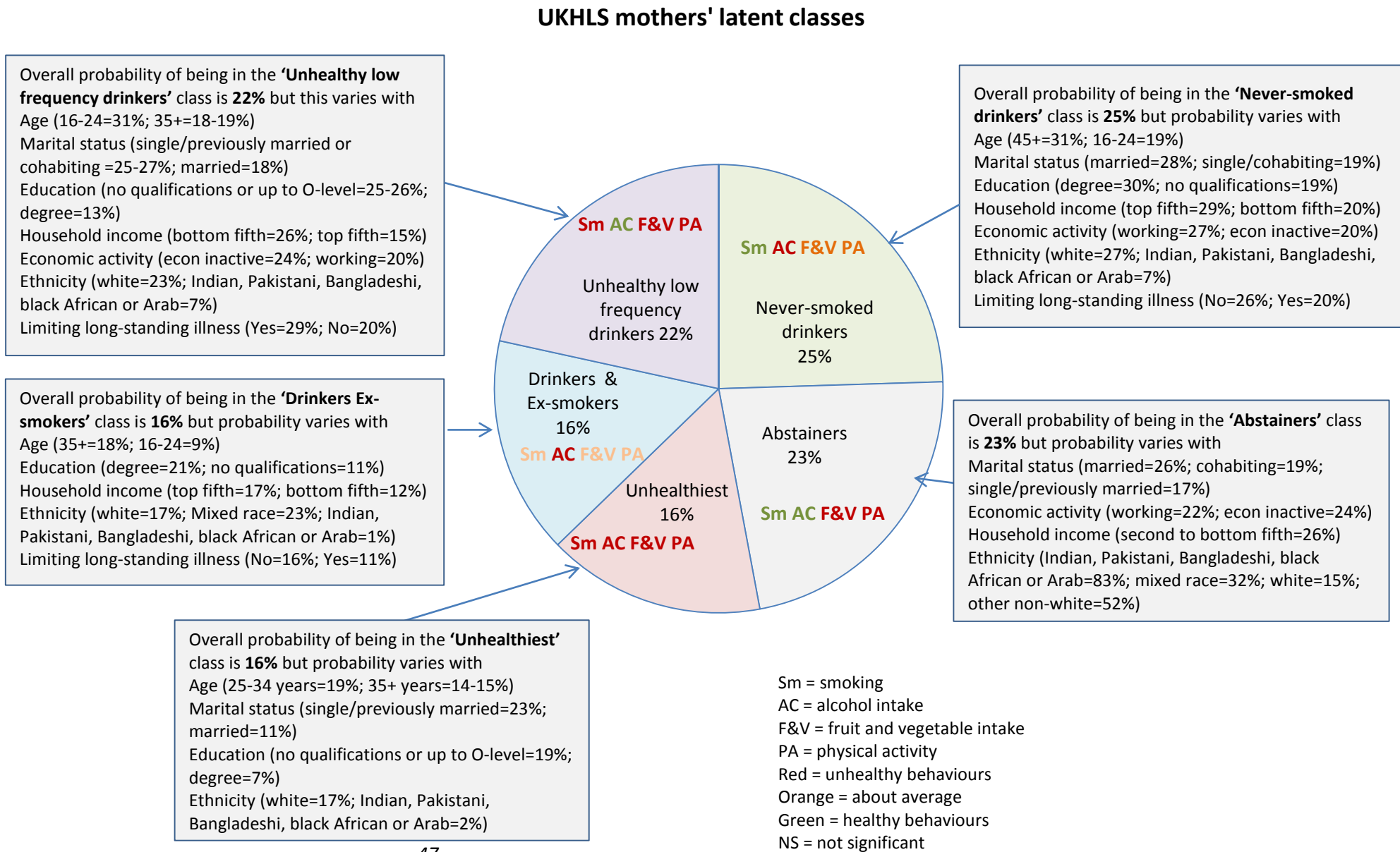
Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	Attempters	number LCAs predictors
Age group							
UKHLS	45+	-	25-34	35+	<25	N/A	4
HSE	35+	-	<45	-	<35	<45	4
Marital status							
UKHLS	married	married	not married	-	not married	N/A	4
HSE	married	married/co-hab	single	-	-	not married	4
Educational qualification							
UKHLS	higher	-	<degree	higher	<degree	N/A	4
HSE	higher	-	<degree	higher	<degree	-	4
Equivalised household income quintiles							
UKHLS	high	middle	-	high	low-mid	N/A	4
HSE	high	low-mid	not highest	(mid-)high	lower	lower	6
Economic activity							
UKHLS	working	econ inactive	-	-	econ inactive	N/A	3
HSE	-	econ inactive	working	-	-	-	2
Ethnic group							
UKHLS	white	non-white ^a	white ^b	white ^b	white	N/A	5
HSE	white	non-white	white	white	white	white	6
Limiting long-standing illness (LLI)							
UKHLS	no LLI	-	-	no LLI	Yes LLI	N/A	3
HSE	no LLI	-	Yes LLI	-	Yes LLI	-	3
Numbers of socio-demographic factors							
UKHLS	7	4	4	5	7	N/A	
HSE	6	4	7	3	5	4	

^aHighly likely to be Indian, Pakistani, Bangladeshi, black African, Arab

^bHighly unlikely to be Indian, Pakistani, Bangladeshi, black African, Arab

The table shows the socio-demographic factors that are significant predictors of lifestyle group membership and it indicates what aspects of these factors are most likely found among members of that group

Figure 8.1: The social patterning of lifestyle groups of all UKHLS mothers



8.3 Social patterning of partners' lifestyle groups

Analysis of the social patterning of partners' lifestyle groups was based on the UKHLS. As for the mothers' analysis, the logistic regression models included the set of socio-demographic factors summarised in Box 9 to derive the probabilities of membership of different latent classes (lifestyle groups). Overall compared to all UKHLS mothers, we found fewer social predictors of lifestyle group membership for UKHLS partners. However, there were some similarities; these similarities are noted in Box 12 below. Table J.4 in Appendix J presents the adjusted odds ratios and their confidence intervals for the logistic regression.

Again, we present our findings in three ways. We provide a textual description of the social profile of the lifestyle groups (Box 12) and a table (Table 8.2) summarising the socio-demographic factors that were significant predictors of membership of each lifestyle group. We also include a figure (Figure 8.2) that details the probability of being in a lifestyle group based on the category an individual is in for each socio-demographic predictor, holding the other predictors at their average values. For instance, on average the probability of being in the Never-smoked drinkers group for partners was 29%, but this increased to 34% if they were 45 years old or over, and reduced to 22% if they were younger than 25 years old. These probabilities along with their confidence intervals are tabled in Appendix J. Additionally, the proportions of UKHLS partners in each lifestyle groups by all the individual social characteristics in Box 9 above can be found in table J.9 in Appendix J.

Box 12: Social profiles of partners' lifestyle groups (UKHLS)

Never-smoked drinkers

UKHLS partners in the Never-smoked drinkers group, like all UKHLS mothers in this group, were more likely than those in other lifestyle groups to be older (35+), married, with higher educational qualifications, to be in employment or training, or to have a higher income. Like the UKHLS mothers, they were unlikely to be Indian, Pakistani, Bangladeshi, Black African or Arab. Partners in this group were also more likely to have children younger than 11 years of age in the household.

Abstainers

Partners in this lifestyle group were more likely than other partners to live in middle income households. They were also highly likely to be Indian, Pakistani, Bangladeshi, Black African or Arab, as found for UKHLS mothers.

Unhealthiest behaviour group

As found for UKHLS mothers, partners in this lifestyle group were more likely to be younger, not married or to not have a degree. They were also unlikely to be Indian, Pakistani, Bangladeshi, Black African or Arab. They were more likely to be economically inactive than those in other lifestyle groups.

Drinkers, ex-smokers but healthy PA and F&V consumption

Partners in this lifestyle group were more likely than other partners to have educational qualifications or to have a household income which is not in the bottom two quintiles. They were unlikely to be Indian, Pakistani, Bangladeshi, Black African or Arab (as found for UKHLS mothers). They were most likely to have only one child in the household.

Unhealthy but low frequency drinkers

As found for UKHLS mothers, partners in this lifestyle group were more likely than other partners to have no qualifications, to live in middle to lower income households, or have a limiting long-standing illness than those in other groups.

Table 8.2 The socio-demographic patterning of UKHLS (2010/11) partners' lifestyle groups

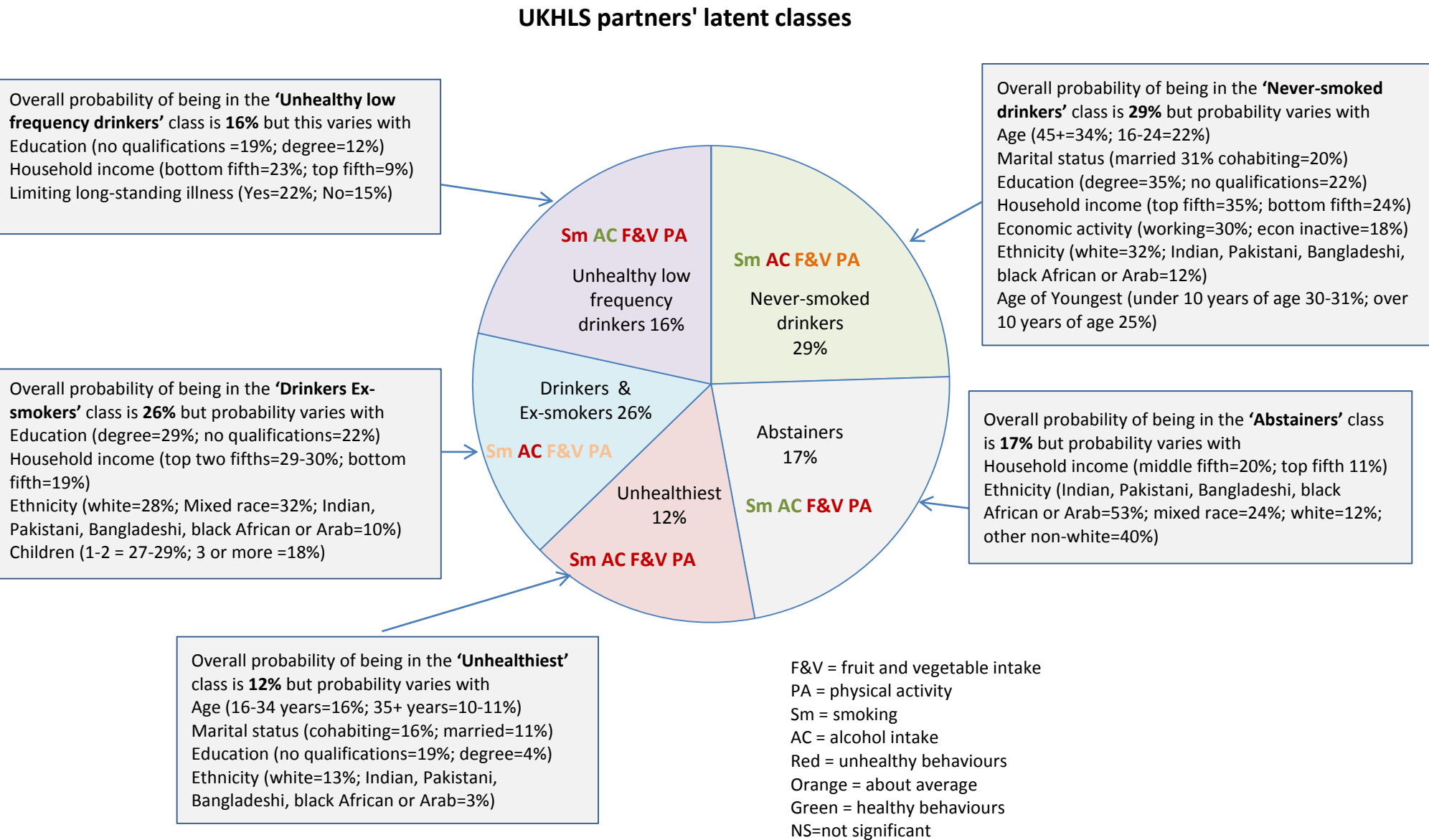
Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	number LCAs predicts
Age group	35+	-	16-34	-	-	2
Marital status	married	-	cohabiting	-	-	2
Educational qualification	higher	-	<degree	higher	lower	4
Equivalised household income quintiles	high	middle	-	higher	lower	4
Economic activity	working	-	econ inactive	-		2
Ethnic group	white	non-white ^a	white ^b	white ^b		4
Limiting long-standing illness (LLI)	-	-	-	-	Yes LLI	1
Age of Youngest child	<10	-	-	-	-	1
Number of children	-			<3		1
Numbers of socio-demographic factors	7	2	5	4	3	

^aLikely to be Indian, Pakistani, Bangladeshi, black African, Arab

^bUnlikely to be Indian, Pakistani, Bangladeshi, black African, Arab

The table shows the socio-demographic factors that are significant predictors of lifestyle group membership and it indicates what aspects of these factors are most likely found in members of that group

Figure 8.2: The social patterning of lifestyle groups of UKHLS partners



8.4 Social patterning of the lifestyle groups of CYP aged 10-15

We investigated the social patterning of lifestyle groups among CYP, focusing particularly on the HSE because of its more detailed information on health behaviours at this life stage, as explained in Appendices A and C. As noted in section 7, four lifestyle groups (latent classes) were the optimum solution in the HSE analysis compared to three groups for the UKHLS (details of the UKHLS analysis are given in Appendix J).

We present our findings on the social patterning of lifestyle groups in the HSE as a textual description (Box 13). The socio-demographic measures that remained significant in the regression models for each of the four lifestyle groups in the HSE and in the three groups in the UKHLS CYP are summarised in Table 8.3 (and reported in more detail in Tables J.6 and J.7 in Appendix J). (Additionally, the proportions of UKHLS children in each lifestyle group by all the individual social characteristics in Box 10 above can be found in table J.10 in Appendix J).

Box 13: Social profiles of the lifestyle groups of CYP (HSE)

Abstainers

CYP in this lifestyle group were more likely than children in other groups to be younger (10-11 years old), non-white or to live in a high income household with another child. Their mother was more likely than mothers of CYP in other lifestyle groups to be unemployed or economically inactive or their mothers were likely to be either an Abstainer or Never-smoked drinker.

Healthiest behaviour group

Compared to other CYP lifestyle groups, children in this group were more likely to be younger (10-13 year old) and to be boys. They were also more likely to have mothers who were either Never-smoked drinkers rather than in the Unhealthiest behaviour group, or Drinkers, ex-smokers but healthier PA and F&V consumers, rather than Never-smoked drinkers.

Unhealthiest behaviour group

Compared with children in other HSE CYP groups, this lifestyle group was more likely to include girls, older (12-15 years old) and white children. Children in this group were more likely than other children to have mothers with a limiting long-standing illness, who were not married, or were either in the Unhealthiest behaviour group, Attempters or Unhealthy but low frequency drinker.

Drink Attempters

CYP in this lifestyle group were more likely to be older (12-15 years old) and to be white. They were also more likely to live in middle to low income households or in a single-child household. They were more likely to have a mother in employment or a mother who was a Never-smoked drinker as opposed to an Abstainer.

As Box 13 indicates, age was a predictor of a young person's lifestyle group; those with healthier patterns of behaviour (the Healthiest Behaviour group and Abstainers) were more likely to be younger, while older CYP were more likely to be in the lifestyles groups characterised by less healthy behaviours. The mother's lifestyle group was also a strong influence on the CYP's lifestyle group: young people with mothers in the Unhealthiest lifestyle group tended to belong to the Unhealthiest group. Conversely, young people who were Abstainers were likely to have mothers who were Abstainers. Ethnicity was a predictor in three of the CYP lifestyle groups; non-white young people were more likely to be Abstainers compared to other groups. Boys were more likely to be found in the Healthiest group and girls in the Unhealthiest group.

Table 8.3 Comparison of the socio-demographic patterning of HSE (2006 & 2008) and UKHLS (2010/11) children's lifestyle groups

Socio-demographic and health characteristics	Abstainers	Healthiest	Unhealthiest	Drink Attempters	LCAs predictors
Child's Age group					
HSE	Youngest	Youngest	Oldest	Oldest	4
UKHLS	Middle (12-13)	Youngest	Oldest	N/A	3
Gender					
HSE		Boys	Girls		2
UKHLS				N/A	0
Ethnic group					
HSE (Child's)	Non-white		White	White	3
UKHLS (Mother's)	Not mixed	Mixed	Not Indian ^a	N/A	3
Mother's LCA class (compared to Never-smoked drinkers)					
HSE	Abstainer	Not unhealthiest ^b	Various unhealthy	Not Abstainer	4
UKHLS			Unhealthiest	N/A	1
Marital status & Mother's age group					
HSE			Not married		1
UKHLS			Not aged 35-44	N/A	1
Mothers' educational qualification					
HSE					0
UKHLS		Qualifications		N/A	1
Equivalised household income quintiles					
HSE	Not middle			Middle	2
UKHLS	Middle	Highest		N/A	2
Mothers' economic activity					
HSE	Econ inactive			Econ active	2
UKHLS				N/A	0
Number of children in house (& age of youngest)					
HSE	2			1	2
UKHLS		3+	Not 3+ ^(c)	N/A	3
Mother's Limiting long-standing illness (LLI)					
HSE			LLI		1
UKHLS				N/A	0
Numbers of socio-demographic factors					
HSE	6	3	6	6	
UKHLS	3	5	6	N/A	

^aNot Indian, Pakistani, Bangladeshi, black African, Arab; ^bAlso 'Drinkers and ex-smokers but healthier PA and F&V'; ^cAnd youngest in household aged under five
The table shows the socio-demographic factors that are significant predictors of lifestyle group membership

8.5 Summary

For mothers and partners, we found that the different lifestyle groups had their own distinctive social profile. The largest group among both mothers and partners was 'Never-smoked drinkers'. This group had never regularly smoked and had about average for F&V intake and physical activity but were frequent drinkers and a sizeable minority (around one in four mothers and over a third of partners) were binge drinkers. Parents in this group were characterised by their social advantage: they tended to be older, white, married, in good health and have higher educational levels and higher household incomes. The second largest group was Abstainers. Their social profile was very different. They were more likely to be from a minority ethnic background (particularly Indian, Pakistani, Bangladeshi, Black African or Arab) and to be from low to middle-income households.

The analysis indicates that social disadvantage is not always or consistently associated with unhealthy lifestyles. Health-promoting and health-damaging behaviours can cluster in both advantaged and less advantaged groups. In the examples given above and examined in more depth in the previous sub-sections, non-smoking and frequent drinking, together with binge drinking for a sizeable minority, were found among parents who were more likely to be white, older, higher-educated and better-off; conversely, the combination of non-smoking and non-drinking was more strongly associated with being Asian and living in a low to middle-income household.

For CYP, age was a strong predictor of lifestyle group; those with healthier patterns of behaviour (the Healthiest Behaviour group and Abstainers) were more likely to be younger. The mother's lifestyle group was also a strong predictor of the young person's lifestyle group: young people with mothers in the Unhealthiest lifestyle group tended to belong to the Unhealthiest group. Conversely, young people who were Abstainers were likely to have mothers who were Abstainers. Ethnicity was also a predictor; non-white young people were more likely to be Abstainers compared other groups.

9 WITHIN-HOUSEHOLD ASSOCIATIONS IN HEALTH BEHAVIOURS: MOTHERS AND PARTNERS

9.1 Introduction

Section 9 and 10 address the third objective of the project: to investigate within-household associations in the four health behaviours (see Box 3). This section sheds light on the lifestyles of couples in two-parent families by focusing on couples (mothers with co-resident partners). It only includes couples where both individuals in a couple had answered the behaviour questions. As noted in section 3.2, almost all the partners were male.

Using the UKHLS, similarities between the lifestyles of mothers and partners are examined with respect to single risk behaviours, number of risk behaviours and lifestyle groups (latent classes). Section 10 looks at similarities in the lifestyles of mothers and their children.

9.2 Single risk behaviours

As noted in section 4, a higher proportion of partners than mothers did not meet government recommendations with respect to smoking, alcohol consumption and F&V intake (Figure 4.2). Nonetheless, there was a high degree of concordance among couples in their risk behaviours (the distributions in Table 9.1 were significantly associated i.e. different from expected if the health behaviours of couples were independent of each other). Not surprisingly, the proportion of couples in the same behaviour categories was considerably lower when finer-grained behavioural measures were used (as observed in Appendix K).

The proportion with the same behaviour was highest for smoking. In 83% of couples, the mother and her partner had the same smoking status. In 70%, both were non-smokers; however, in 13% of families, children were living in households where both parents were smokers. Drawing on data on the prevalence of smoking among mothers and partners (Figure 4.2 and totals in Table 9.1), this means that, in over half (55% to 70%) of couples where at least one of the couple smoked, both were smokers.

Over 70% of couples shared the same alcohol risk status. In 59% of couples, neither partner reported binge drinking in the last week; however, in 13% of couples, both partners reported binge drinking in the last week. Drawing on data on the prevalence of binge drinking (Figure 4.2 and totals in Table 9.1), this indicates that, in 40% to 60% of couples where at least one parent binge drank, both were binge drinkers.

For F&V intake, in a large majority (78%) of couples, the mother and her partner again shared the same risk status. In 72% of these couples, neither the mother nor her partner met the '5 a day' recommendations; in 6% of couples, both partners met the recommendations. Drawing on data on the prevalence of not consuming 5-a-day (Figure 4.2 and totals in Table 9.1), this indicates that, in about 80-90% of couples where at least one parent did not meet the recommendations, both parents did not meet them.

The proportion with the same behaviour was lowest for physical activity. Nonetheless, 66% of couples shared the same risk status. In only a small minority of couples (8%) were both the mother

and her partner achieving the recommended level of physical activity; in 58% of couples, neither met the recommendations. Drawing on data on the prevalence of not meeting the physical activity recommendations (Figure 4.2 and totals in Table 9.1), this indicates that, in about 75-80% of couples where at least one parent did not meet the recommendations, both parents did not meet them.

Table 9.1 Single risk behaviours of mothers and their partners (UKHLS 2010/11)

Behaviours		Mothers		Total
		No Risk	Risk	
Smoking		Non-smoker	Smoker	
Partners	Non-smoker	70%	6%	76%
	smoker	11%	13%	24%
<i>Weighted N=2630</i>		81%	19%	100%
Binge drank in last 7 days		Below binge levels	Binge drank	
Partners	Below binge levels	59%	9%	68%
	Binge drank	19%	13%	32%
<i>Weighted N=2557</i>		78%	22%	100%
Fruit and vegetable portions per day		5 or more a day	Less than 5 a day	
Partners	5 or more a day	6%	7%	14%
	Less than 5 a day	14%	72%	86%
<i>Weighted N=2629</i>		20%	80%	100%
Walking fast or briskly 5 days / week or moderate+ activity 3 days/ week		High physical activity	Low physical activity	
Partners	High PA	8%	20%	28%
	Low PA	15%	58%	72%
<i>Weighted N=2628</i>		23%	77%	100%

p<0.001 for all

83% of individuals are in the same category as their partner for smoking

72% of individuals are in the same category as their partner for alcohol intake

78% of individuals are in the same category as their partner for fruit and vegetable intake

66% of individuals are in the same category as their partner for physical activity (PA)

Only includes couples where both individuals in a couple had answered the behaviour questions

9.3 The number of risk behaviours

The number of risk behaviours among mothers and their partners is described in Table 9.2. As indicated by the sum of the centre diagonal, 41% of couples had the same number of risk behaviours; in the majority of these couples, both the mother and her partner had two risk behaviours (25% of all couples). When we included couples where one member has one more/less risk behaviour than the other, the proportion increased to 85% (the extended grey area in Table 9.2).

We also examined how many risk behaviours couples had between them (minimum: 0, maximum: 8). In over 99% of couples, at least one risk behaviour was reported (Figure 9.1). In only 13% of two-parent families (less than one in eight) were children living with parents with two or fewer risk behaviours between them. The majority of the couples had between three and five behaviours in total per couple. In nearly one in five of the families (17%), children were living with parents who had six or more risk behaviours between them (Figure 9.1).

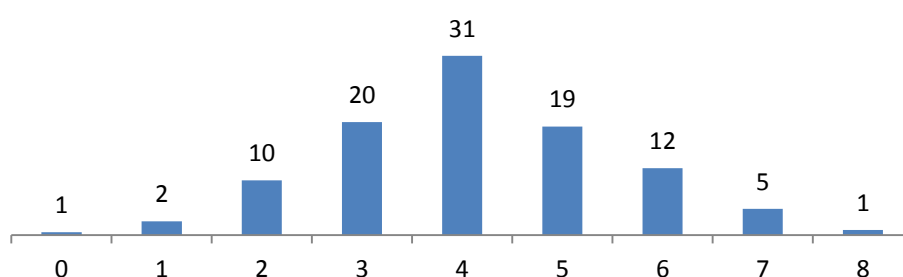
Table 9.2 Number of mothers' and partners' risk behaviours (UKHLS 2010/11)							
N=2553		Mothers' number of risks					total
		None	1	2	3	4	
Partners' number of risks	0	0%	1%	1%	2%	0%	3%
	1	1%	7%	9%	2%	0%	20%
	2	2%	10%	25%	6%	1%	45%
	3	0%	4%	12%	8%	2%	26%
	4	0%	1%	2%	3%	1%	7%
Total		4%	22%	49%	21%	4%	100%

p<0.001

41% of couples had the same number of risks (85% of couples were one number different or the same).

Only includes couples where both individuals in a couple had answered the behaviour questions

Figure 9.1: Number of risk behaviours among UKHLS mothers and their partners (UKHLS 2010/11) – percentage with each number of risk behaviours



Note: Figure only includes couples where both individuals in a couple had answered the behaviour questions

9.4 Lifestyle groups (latent classes)

In nearly half (45%) of couples, the mother and her partner shared the same lifestyle group (sum of the shaded diagonals in Table 9.3). Overall, the group we identified as Never-smoked drinkers were most likely to share their lifestyle group with their partner. Of the mothers and partners in this group (i.e. 28% of mothers and 30% of partners), about half of these (15% of all couples) were partnered with a Never-smoked drinker. This means that, in around 1 in 7 two-parent families, never smoking but frequent alcohol consumption by both parents is the norm, along with a sizeable minority (25% of mothers and 37% of partners) who binge drink – and we know from section 8 that this group are relatively advantaged. They are more likely than parents in other lifestyle groups to be older, white or in higher educational or higher income groups. If not partnered by Never-smoked drinkers, those in this group tended to be partnered with Drinkers and ex-smokers (Table 9.3).

Abstainers were also likely to share their lifestyle group with their partner. In one in ten couples, both partners were both Abstainer (Table 9.3). Of the 25% of mothers in the Abstainers group, 39% lived with a partner who was also an Abstainer (and 60% of partners who were Abstainers live with a mother who was an Abstainer). The lifestyles of these couple are stand in contrast to the couples who are Never-smoked drinkers. While both lifestyle groups are non-smokers, the Abstainer couples are occasional or non-drinkers; the proportions meeting the recommendations for F&V intake and physical activity are also lower than the Never-smoked drinkers (see section 7). Their family circumstances are also very different. A large proportion of South Asian, Black African and Arab parents are in the Abstainer's group, a group also characterised by its socio-economic

disadvantage (for example, by higher rates of unemployment and economic inactivity and middle to lower incomes).

A shared lifestyle was also evident among partners and mothers in the Drinkers and ex-smokers lifestyle group and 9% of couples fell into this group (Table 9.3). Of the 18% of mothers in this group, about half (47%) lived with a partner who was also a Drinker and ex-smoker. If not partnered by Drinkers and ex-smokers, those in this group tended to be partnered with Never-smoked drinkers. Similar to the Never-smoked drinkers group, parents in the Drinkers and ex-smokers group were more likely to be white or higher educated than other groups.

Table 9.3 Lifestyle groups (latent classes) of mothers and their partners (UKHLS 2010/11)

	N=2402	Mothers' lifestyle group (latent class)					total
		Never-smoked drinkers	Abstainers	Unhealthy Low freq drinkers	Unhealthiest	Drinkers & ex-smokers	
Partners' lifestyle group (latent class)	Never-smoked, drinkers	15.1%	6.1%	1.9%	1.5%	5.5%	30.2%
	Abstainers	2.0%	9.6%	3.0%	0.5%	1.0%	16.1%
	Unhealthy LFD	1.7%	4.8%	6.6%	1.3%	1.4%	15.8%
	Unhealthiest	1.6%	1.1%	3.3%	4.1%	1.8%	11.9%
	Drinkers & ex-smokers	7.2%	3.2%	3.6%	3.3%	8.7%	26.0%
	Total	27.5%	24.8%	18.4%	10.8%	18.4%	100%

p<0.001

45% of couples have the same latent class

LFD = low frequency drinkers

9.5 Summary

There was a high degree of concordance in the health behaviours of mothers and their partners; the proportion of couples with the same behaviour were significantly higher than expected than if their behaviours were independent of each other. Concordance was highest for smoking, where over 80% of couples shared the same smoking status. In 70% of couples, both were non-smokers; however, in 13% of families, children were living in households where both parents were smokers.

Concordance was also common for the other three health behaviours. Over 70% of couples shared the same alcohol risk status. In 13% of couples, both the mother and her partner reported binge drinking in previous 7 days. In over 70% of two-parent families, neither parent met the recommendations for F&V intake; in around 60% of families, neither parent met the physical activity recommendation.

Mothers and partners tended to belong to the same lifestyle group. Nearly half (45%) of couples shared the same group. Around half of the Never-smoked drinkers were partnered by a Never-smoked drinker and this group made up 15% of couples. Among Abstainers, 4 in 10 (39%) of the mothers who were Abstainers lived with a partner who was also an Abstainer and 60% of Abstainers partners lived with an Abstainer mother.

10 HOUSEHOLD ASSOCIATIONS IN HEALTH BEHAVIOURS: MOTHERS AND CHILDREN AND YOUNG PEOPLE

10.1 Introduction

Section 10 continues to investigate within-household associations in the four health behaviours (objective 3 of the project). This section focuses on CYP and their mothers. It looks at similarities in lifestyles with respect to single risk behaviours, number of risk behaviours and lifestyle groups (latent classes). It should be noted that government recommendations for two of the behaviours (alcohol and physical activity) are different for women and CYP (see Box 1); different risk thresholds for these two behaviours are therefore used in the analyses below.

10.2 Single risk behaviours

Table 10.1 describes the patterns of health behaviour within child-mother dyads. As it suggests, there were statistically significant associations between children and their mothers for three of the single risk behaviours: smoking, alcohol intake and F&V intake.

Table 10.1 Single risk behaviours of mothers and their CYP (UKHLS 2010/2011)				
Behaviours		UKHLS Mothers		Totals
		No Risk	Risk	
Smoking		Non-smoker	Smoker	
CYP	Non-smoker	77%	21%	97%
	smoked	1%	1%	3%
<i>Weighted N=2658</i>		Total		100%
Alcohol intakeⁱ		Within guidelines	Above guidelines	
CYP	Within guidelines	62%	16%	78%
	Above guidelines	16%	7%	22%
<i>Weighted N=2498</i>		Total		100%
Fruit and vegetable portions per day		5 or more a day	Less than 5 a day	
CYP	5 or more a day	5%	8%	13%
	Less than 5 a day	14%	73%	87%
<i>Weighted N=2657</i>		Total		100%
Physical activityⁱ		High physical activity	Low physical activity	
CYP	High PA	4%	12%	17%
	Low PA	20%	64%	83%
<i>Weighted N=2657</i>		Total		100%

p=0.4 for physical activity and p<0.001 for others; percentages adding to less or more than 100% is due to rounding

78% of mothers and CYP are in the same category for smoking

69% of mothers and CYP are in the same category for alcohol intake

78% of mothers and CYP are in the same category for fruit and vegetable intake

68% of mothers and CYP are in the same category for physical activity (PA)

ⁱ Recommendations for adults and CYP are different; see Box 1

The similarity of lifestyle was most evident for the two behaviours where government recommendations are the same for adults and children: smoking and F&V intake. In 78% of the

dyads, the young person and their mother had the same smoking status (and in 77% of dyads, both were non-smokers). Similarly in 78% of dyads, the young person and their mother shared the same risk status with respect to F&V intake (and, in 73% of child-mother dyads, both failed to meet the recommendations). With respect to alcohol consumption, 67% of CYP and their mothers shared the same risk status. In most dyads (62%), both the young person and the mother met the recommendations.

With respect to physical activity, the majority of CYP and their mothers (68%) also shared the same risk status. However, the associations were not statistically significant. In 64% of dyads, neither met the recommendations.

10.3 The number of risk behaviours

Table 10.2 focuses on associations between the number of risk behaviours reported by CYP and their mothers. In around four in ten (37%) child-mother dyads, both the child and the mother had the same number of risk behaviours. In the majority of these, both had two risk behaviours (29% of all dyads). When the boundaries were extended to include having one more/less risk behaviour, the proportion of dyads with the same or a similar number of risk behaviours increased to 83% (the extended grey area in table 10.2).

Table 10.2 Number of mothers' and CYP's risk behaviours (UKHLS 2010/11)							
N=		Mothers' number of risks					total
		None	1	2	3	4	
Children's number of risks	0	0%	1%	1%	0%	0%	3%
	1	1%	4%	8%	4%	1%	18%
	2	3%	13%	29%	14%	2%	61%
	3	0%	4%	7%	4%	1%	16%
	4	0%	0%	1%	1%	0%	2%
Total		5%	21%	46%	23%	4%	100%

p<0.001

37% of dyads had the same number of risks (83% of couples were one number different or the same).

10.4 Lifestyle groups (latent classes)

The latent class analyses for mothers and their partners generated a similar set of lifestyle groups (latent classes) for both groups. For CYP and mothers, only two of the lifestyle groups were similar: the Abstainers and the Unhealthiest groups. The potential for similar lifestyles was therefore limited to these two groups. The majority (69%) of CYP were Abstainers and less than one in ten (7%) were in the Unhealthiest group (see section 7).

Of the child-mother dyads, 15% were both allocated to the Abstainer group (Table 10.3). In the logistic regression analyses, a CYP Abstainer was significantly more likely to have an Abstainer mother than a mother in another lifestyle group using the HSE data, but this was not found in the UKHLS analyses (see section 8.4 and Table J.6 and J.7 in Appendix J).

CYP in the Unhealthiest lifestyle group were significantly more likely to have mothers who were also in the Unhealthiest group in both the HSE and UKHLS logistic regression analyses (see section 8.4 and

Table J.6 and J.7 in Appendix J). They also appear to be very unlikely to have mothers who were Unhealthy but low frequency drinkers in the HSE analyses (J.6 in Appendix J).

Table 10.3 Lifestyle groups (latent classes) of CYP and their mothers (UKHLS 2010/11)

	N=2428	Mothers' LCA class					total
		Never-smoked, drinkers	Abstainers	Unhealthy Low freq drinkers	Unhealthiest	Drinkers & ex-smokers	
Children's LCA class	Abstainers	19.3% (28.2%)	15.3% (22.4%)	14.6% (21.3%)	10.0% (14.7%)	9.2% (13.5%)	68.5% (100%)
	Healthiest	7.6% (31.2%)	5.6% (23.1%)	3.8% (15.9%)	2.5% (10.3%)	4.7% (19.5%)	24.3% (100%)
	Unhealthiest	1.6% (22.7%)	0.8% (11.7%)	1.6% (22.3%)	1.9% (26.3%)	1.2% (17.0%)	7.2% (100%)
	Total	28.5%	21.8%	20.0%	14.5%	15.2%	100%

p<0.001

10.5 Summary

We found significant associations between CYP and their mothers for three of the single risk behaviours: smoking, alcohol intake and F&V intake. Of the three, similarity of lifestyle was most evident for the two behaviours where government recommendations are the same for children and adults: smoking and F&V intake.

A mother's lifestyle group was also a strong predictor of the lifestyle group of their child. Young people who were in the Unhealthiest group tended to have mothers from an unhealthy lifestyle group. Conversely, young people who were Abstainers were likely to have mothers who were Abstainers.

11 CONTRIBUTION TO CONSORTIUM THEMES

The project's main contribution is to the PHRC's risk behaviours theme (http://phrc.lshtm.ac.uk/projects_by_theme.html). It advances this theme in two ways.

Firstly, we provide the first evidence on multiple health behaviours in families (mothers, co-resident partners and CYP) in England. A recent review of studies undertaken by the PHRC (Meader et al, 2015) found only five recent UK studies that specifically examined the clustering or co-occurrence of the four health behaviours that contribute most to premature morbidity and mortality. None were focused on families: four were of adults (Poortinga, 2007; Lawder et al, 2010; Buck and Frosini, 2012; Sabia et al, 2009) and one of students (Dodd et al, 2010). One reported on adult health behaviours in Scotland (Lawder et al, 2010).

The evidence from our study therefore fills an important gap. The gap it fills is constrained by the questions on health behaviours available in the large-scale nationally representative surveys employed here, and particularly the UKHLS questions on physical activity and alcohol consumption. This meant that we could derive measures that approximated to current guidelines, rather than matched them exactly.

Nonetheless, our analyses shed light on the lifestyles of mothers, partners and CYP; they also point to similarities in the lifestyles of family members. For example in two-parent families, we found that mothers and partners often had risk behaviours in common; CYP were therefore growing up in families where both parents were failing to meet the same recommendation. In addition, a substantial proportion of parent couples had the same number of risk behaviours (41%) or was in the same lifestyle group (45%). In the HSE, the mothers' lifestyle group (latent class) was a predictor of membership of all the CYP's lifestyle groups; in the UKHLS, children in the Unhealthiest lifestyle group were likely to have a mother who was also allocated to the Unhealthiest group.

Our study explores associations between multiple health behaviours and a wide range of social factors, including socioeconomic circumstances and ethnicity. Only six UK studies have investigated associations with socioeconomic position (Buck and Frosini, 2012; Lawder et al, 2010; Poortinga, 2007; Sabia et al, 2009; Shanker et al, 2010; Jackson et al, 2012) and only four (Poortinga, 2007; Lawder et al, 2010; Buck and Frosini, 2012; Sabia et al, 2009) included all four health behaviours. None of these studies focus on parents or CYP.

There is even less UK evidence on ethnicity and multiple risk behaviours. The two studies by Lawder (Lawder et al, 2010) and Dodds (Dodds et al 2010) report healthier behaviours among minority ethnic groups among adults and students respectively. We have added to these findings through a more in-depth analysis of ethnicity and lifestyle. In both the UKHLS and HSE analysis, mothers, partners and CYP from ethnic minority groups were less likely than white majority parents to be in the Unhealthiest lifestyle group and more likely to be in the Abstainers group. While Abstainers had low rates of smoking and alcohol intake, they had average levels of F&V intake; in addition, more Abstainers than average did not meet the physical activity recommendations.

Secondly, we contribute to methodological development. The analysis of multiple health behaviours demands statistical methods capable of illuminating the often-complex associations between different components of an individual's lifestyle. Because different methods have different strengths

and limitations, we used a range of approaches, including simple counts of the number of risk behaviours, observed-expected (O-E) ratios and latent class analyses.

Counting up risk behaviours has limitations; it simply sums the numbers of risk behaviours and does not detail the behaviours that generate the score or whether they are clustered (i.e. are associated). The last decade has therefore seen increasing international interest in more advanced statistical techniques, including observed-expected ratios and latent class analysis (McAloney et al, 2013). However, the recent review of multiple health behaviours (Meader et al, 2015) found only two UK studies using O-E ratios to examine all four key health behaviours (Poortinga, 2007; Lawder et al, 2010) and only one study (Dodd et al, 2010) that used other advanced cluster techniques (two-step cluster analysis). Our current study appears to be the first in the UK to analyse clustering of multiple health behaviours in the UK population using latent class analysis. Like O-E ratios, latent class analysis sheds light on associations between behaviours which co-occur; in addition, it moves beyond the binary risk variables used in analyses of observed and expected prevalences by incorporating a wider range of health behaviour categories.

Across this range of statistical methods, we found consistencies between the HSE and UKHLS for mothers and between mother and partners, despite some differences in the data collection method and the health behaviour questions. This consistency lends confidence to the results. However as noted earlier, there was less consistency between the two studies in the lifestyle groups (latent classes) and their social patterning among CYP. This may be a result of the more detailed health behaviour questions in the HSE, including the extra behavioural variables available e.g. age first started smoking and drinking, and time spent actively playing. In consequence, analyses of the HSE produced more distinctive lifestyle groups among CYP and ones more likely to be associated with the mothers' lifestyle groups.

Like other advanced techniques, latent class analysis is not without its limitations. The allocation of individuals to latent classes is based on the highest probability of being in a class for their given behaviour profile, but the behaviours of those allocated to the same class can vary between individuals. Additionally, De Vries et al (2008) note that cluster analyses are difficult to compare because they are highly dependent on the set of variables included; in consequence, different studies of the same population can generate different lifestyle groups (latent classes).

As this suggests, latent class analysis is best employed alongside other statistical methods in order to provide insight into people's lifestyles. To enrich the evidence base on multiple health behaviours in England, we would encourage continued development and use of such methods.

12 CONCLUSIONS

Promoting healthier lifestyles is central to England's public health strategy. Indicators to measure progress on this ambition are built into the Public Health Outcomes Framework. As far as we are aware, this report presents the first evidence for parents and CYP in England on the co-occurrence and clustering of four key health behaviours: smoking, binge drinking, low F&V intake and physical inactivity.

Our project points to the importance of viewing lifestyles through a wide-angled lens. This is one with three distinctive features. It looks at health behaviours together rather than separately, it looks beyond basic measures of social advantage and disadvantage to understand the social patterning of health behaviours and it takes account of the family units to which adults and CYP belong.

Looking at health behaviours together, we found that the majority of mothers, partners and CYP have two or more risk behaviours; the majority do not meet recommendations for F&V intake and physical activity. All lifestyle groups produced by the latent class analyses had low F&V intake and physical activity. We also found that different health behaviours 'go together': distinctive lifestyle groups can be identified among mothers, partners and CYP.

Looking at multiple dimensions of social position and living conditions, we found that different health behaviours are associated in different ways with socioeconomic circumstances and ethnicity. Although minority ethnic groups, particularly Indians, Pakistanis, Bangladeshis and black Africans, were unlikely to meet the F&V and physical activity recommendations, they were unlikely to smoke or to drink. Non-smoking and frequent drinking, together with binge drinking for a sizeable minority, was associated with being white, older, higher educated and with a higher income. A large proportion of this Never smoked drinkers group did not meet the recommendations for F&V intake and physical activity but the proportions were lower than among the Abstainers.

Parents who smoked tended to have three (excluding unhealthy drinking) or four unhealthy behaviours and tended to be white, younger, non-married or not have a degree; mothers in these groups tended to have poorer health as measured by limiting long-standing illness. As this suggests, mothers who smoke are at disproportionately greater risk of other unhealthy behaviours as well as a range of other material and social stressors.

Looking at household contexts, we found a high degree of concordance in the risk behaviours of mothers and their partners. In over 70% of two-parent families, CYP were being brought up by parents who both had low F&V intake; and in nearly 60% of two-parent families, both parents had low levels of physical activity. While most parents did not binge drink, in a sizeable minority (13%) of two-parent families both parents reported exceeding this threshold at least once in the previous week. In 13% of two-parent families, both parents smoked.

Taking these three insights together, our study points to the potential for policies that focus explicitly on family public health. This could include approaches aimed at all families, for example around increasing F&V intake and physical activity (given the low levels across the population of parents and CYP). It could combine these population-wide approaches with more targeted strategies. Targeted approaches could include, for example, ones focused on frequent and binge drinking among parents in advantaged circumstances and on the disadvantaged lives of mothers with multiple risk behaviours.

Strengths of our project are its use of large and nationally representative studies and the range of social and behavioural measures they include. This has increased confidence that findings can be generalised to mothers, partners and CYP in England as a whole. We have used cross-sectional data only; in consequence, our results cannot shed light on the drivers of change in health behaviours. There is very little longitudinal evidence on multiple health behaviours, and we would identify this as a research priority.

13 DISSEMINATION/OUTPUTS

Articles published

- McAloney K, Graham H, Law C, Platt L. (2013). *A scoping review of statistical approaches to the analysis of multiple health-related behaviours*. Preventive Medicine, 56(6), 365-371.
- McAloney K, Graham H, Law C, Platt L, Wardle H, Hall J. (2014). *Fruit and vegetable consumption and sports participation among UK Youth*. International Journal of Public Health, 59 (1), 117-121.
- McAloney K, Graham H, Law C, Platt L, Wardle H. (2104). *Inter-generational concordance of smoking status between mothers and young people aged 10-15 in the UK*. Public Health, 128 (9), 831-833

Reports

- Graham H, Hall J, Law C, McAloney K, Platt L, Wardle H. *Physical Activity and fruit and vegetable consumption among 10-15 year olds in England: an initial analysis of the UK Household Longitudinal Study*. Briefing report to the Department of Health, August 2012.
- Wardle H, Hall J, Byron C, Hutchinson J, Graham H, Law C, Platt L. *Multiple health behaviours among mothers and among children and young people in England*. Briefing report to the Department of Health, May 2014.
- Graham H and Hutchinson J (2015) *Multiple risk behaviours among adults in England, 2010-11*. Briefing report to the Department of Health, Health Improvement Team, Jan 2015.

Presentations given

- McAloney K. *Methodological strategies in analysis of multiple risk behaviours* at joint Northern Ireland Branch British Psychological Society, Division of Health and Psychological Society of Ireland, Division of Health, annual conference on Psychology, Health and Medicine. April 2012.
- McAloney K. *Physical activity and dietary patterns among UK youth* at Society for Social Medicine Annual Scientific Meeting, London. September 2012.
- McAloney K. *Latent class analysis of 4 health risk behaviours among UK youth* at the EU Society for Prevention Research, Krakow. December 2012.
- Wardle H. *The health behaviours of mothers in England: a latent class analysis*. Presentation at Society for Social Medicine Annual Scientific Meeting. September 2013.

Manuscripts planned

- Concordance of multiple health-related behaviours of English mothers and their partners
- Social patterning of multiple health behaviours in English mothers: an analysis of the UK Household Longitudinal Study
- Multiple health behaviours among mothers and their dependent children: an analysis of the Health Survey for England

14 REFERENCES

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Appendix A: Method details

HSE

Annual surveys for the Health Survey for England (HSE) have been carried out since 1994, which currently incorporate about 10000 individuals from about 5000 English households. More information about the HSE is available at <http://www.natcen.ac.uk/our-research/research/health-survey-for-england/>

UKHLS

Understanding Society: the UK Household Longitudinal Study (UKHLS) has conducted annual surveys since 2009 of participants from a representative sample of around 28,000 UK households and an ethnic minority boost sample of around 4,000 households who are followed over time. Health behaviour data were gathered in the second wave (2010/11) from 51,000 adults and 5000 children in UK households (33,000 adults and 3,300 children in English households). More information about the UKHLS is available at <https://www.understandingsociety.ac.uk/>

Analysis groups

Mothers were defined as all adult women (aged 16 years and over) who had a child under the age of 16 living with them at the time of the interview that they reported to be their natural, step, foster, or adoptive child. This definition incorporated more than one mother in the household if they were mothers to different children, or they were a lesbian couple who both reported being the mother of the same child. This group included mothers with partners and lone mothers. Adult females (aged 16 or over) who did not have a child under the age of 16 living with them at the time of the interview were excluded from the mothers' analyses, even if they were a mother to a child under the age of 16 who was currently not living with them. Pregnant women were also excluded as pregnancy is associated with distinctive patterns of health behaviour and behaviour change (Crozier et al, 2009; Olson, 2005).

Mothers with partners were those mothers who were married or cohabiting. Partners were defined as all adult individuals (aged 16 years and over) who reported being in a partnership relationship with a women identified as a mother (defined as above) and residing in the household with the mother and any children, at the time of survey participation. The partner did not need to report being the father of the child (natural, step, foster or adoptive).

In the HSE, 4218 mothers completed the interviews and were include in the analysis. In the UKHLS, there were 4787 mothers who returned both the self-completion questionnaire and completed the Computer Assisted Personal Interviewing (CAPI) questionnaire which together contained the questions relating to the four health behaviours. The analysis excluded 914 (16%) UKHLS mothers who had completed the CAPI questionnaire but did not return the self-completion questionnaire. The UKHLS latent class analyses used to produce the lifestyle groups included 3165 partnered mothers and 2571 partners; all partnered mothers and all partners who answered the behaviour questions were included whether or not the partners answered the questions. However, tables and figures that present both the UKHLS mothers' and their partners' results (i.e. single HBs, co-occurrence, O/E ratios and lifestyle groups) include only partners and co-resident mothers who both answered the behaviour questions. There were 2623 couples in the UKHLS where both the mother and their co-resident partner returned the self-completion questionnaire and completed the CAPI

questionnaire; 540 (17%) couples were excluded where one or both adults did not return the self-completion questionnaire.

Children and young people (CYP) were defined for the analyses as individuals aged between 10 and 15 years resident in a household in which their mother was recorded as being present at the time of survey participation. Children with mothers who were pregnant were excluded. The analyses included multiple children in the same household; UKHLS makes a self-report questionnaire available to all children 10 years and older in the household, and HSE interviews up to two children per household. HSE interviews younger children but only a small proportion of children under the age of 10 has ever smoked or drank alcohol, therefore children of this age were not included in the analysis.

In the HSE, 2667 children were included in the main children's analysis; (227 (8%) children did not have a mother present or had a mother who did not respond. In the UKHLS, 2916 children were included in the main children's analysis.

Health behaviour measures

We used government recommendations for the four health behaviours (Box 1) to categorise responses to the health behaviour questions. The measures are therefore simple binary ones (meeting/not meeting the relevant recommendation); we classified 'not meeting the recommendation' as a risk behaviour (Box 2). These binary measures were used in sections 4 and 5 in the analyses of prevalence and co-occurrence (the latter examining both the number and combinations of risk behaviours). The measures were also used in section 6 to examine clustering of health behaviours using observed-expected ratios. To produce the lifestyle groups in the latent class analyses, we used a wider range of categories (e.g. never smoked, ex-smoker, current smoker) to produce distinct groupings (i.e. clusters) of health behaviours. Details about the health behaviour questions and how they were collected are given below.

Adults

HSE data on the four health behaviours in adults were collected by CAPI questionnaire using the most recent HSE surveys (2006 and 2008) that included all relevant data including detailed physical activity data. The HSE offers the most detailed national information on the four health behaviours. For UKHLS adults, smoking, fruit and vegetable consumption and physical activity participation were collected by a main CAPI questionnaire, whereas alcohol consumption was collected by a separate confidential self-completion questionnaire. Data from the second wave were used because no data on adult health-related behaviours were collected in the first wave of the UKHLS.

The health behaviours questions asked of HSE adults were more detailed than the UKHLS questions. This is likely to be the reason why higher values for fruit and vegetable intake and physical activity were observed in the HSE than in the UKHLS.

Fruit and vegetable intake

The HSE interview specifically asked questions about a range of individual fruit and vegetable items (e.g., pulses, salads, fresh fruit, dry fruit) consumed the previous day (24 hours from midnight to midnight). This included a specific question on fruit juice in addition to questions on total tablespoons of vegetables and type and quantity of fruit consumed. Fruit juice drunk was counted as a portion.

The UKHS interview questions asked for the total number of portions and the number of days that fruit and vegetables were consumed; it did not specifically mention fruit juice:

- 1) *On a day when you eat fruit or vegetables, how many portions of fruit and vegetables in total do you usually eat? The showcard has some pictures that may give you an idea of what a portion looks like.*
- 2) *Including tinned, frozen, dried and fresh fruit, on how many days in a usual week do you eat fruit?*

Individuals who did not report consuming five portions of fruit and vegetables for seven days in a usual week in the UKHLS or five portions in the previous 24 hours in the HSE were classed as not meeting government recommendations (DoH, 2003) i.e. as having a risk behaviour. Four categories of intake were used to produce the lifestyle groups in the latent class analyses; these can be found in Tables H.1 and H.2.

Physical activity:

In the HSE, questions about physical activity included a range of formal and informal activities, ranging from walking, doing housework, gardening and DIY to occupational activity and sporting activities. Where respondents had engaged in an activity for 10 minutes or more, they were asked to report how long (in minutes) they spent doing each activity. This was also combined with a measure of intensity to assess the total number of days engaging in 30 or more minutes of moderate or high physical activity over the previous four weeks. Individuals who engaged in 30 or more minutes of moderate or high physical activity for five or more days a week on average (150 minutes) were classed as meeting government recommendations (DoH, 2011a). Individuals who did not engage in this amount of activity were classed as having a risk behaviour in terms of physical activity.

In the UKHLS, questions on duration and intensity were asked in relation to walking, but not for other physical activities. Data were gathered on how many days individuals had walked fast or briskly for 30 or more minutes in the last four weeks. Walking briskly, which can cause adults to get warmer, breathe harder and their hearts to beat faster, can be classed as moderate activity (DoH 2011a); therefore minutes of walking fast or briskly were used to estimate whether adults had done at least the recommended 150 minutes of moderate intensity exercise per week. Questions on other physical activity and its duration were limited; only questions on sporting activity were asked and the highest category asked in relation to frequency was three or more days a week. Therefore an approximation to meeting government guidelines had to be used for the UKHLS risk analyses as follows:

- 30 minutes or more of brisk or fast walking 20 times in the past four weeks, or 3 days or more a week moderate to vigorous sporting activity, or 1 day a week moderate to vigorous sporting activity and 4 days a week brisk or fast walking for 30 minutes or more.

To produce the lifestyle groups from the HSE and UKHLS latent class analyses, seven categories were used for number of days walking briskly or fast paced in the past 4 weeks. Additionally, seven categories for frequency of participation in moderate to vigorous sporting activities over the last 12 months were used in the UKHLS analysis, and seven categories for number of sporting occasions in the past 4 weeks were used in the HSE analysis. These are listed in tables H.1 and H.2.

The UKHLS questions on moderate to vigorous intensity sports activities were as follows:

Here is a list of sporting activities. Please tell me which ones, if any, you have done in the last 12 months? Health, fitness, gym or conditioning activities; gymnastics; swimming or diving; cycling, BMX or mountain biking; football; rugby; track and field athletics; jogging, cross-country, road-running; hill trekking, backpacking, climbing or mountaineering; golf; boxing; martial arts; water sports (including sailing types); horse riding; nothing of this kind.

And have you done any of these sporting activities in the last 12 months? Please include ALL sports activities you have done. If there are any other sport activities you want to mention, just let me know which ones. Basketball; netball; volleyball; cricket; hockey; baseball, softball or rounders; racquet sports; ice-skating; skiing; motor sports; angling or fishing; archery (64 < only); yoga or pilates (64 < only); bowls (64 < only); croquet (64 < only); Other sporting activity such as triathlon, fencing, lacrosse, orienteering, curling, Gaelic sports, skate boarding, parachuting, scuba diving; nothing of this kind.

How often in the last 12 months have you done this/these sport(s)? If there is a 'peak season' for some of these sports then please bear this in mind when thinking of your answer.

Three or more times a week;

at least once a week but less than 3 times;

less than once a week but at least once a month;

less than once a month but at least 3 or 4 times a year;

twice in the last 12 months;

once in the last 12 months.

The UKHLS questions relating to walking were as follows:

I'd like you to think about all the walking you have done in the past four weeks either locally or away from home. Please include any country walks, walking to and from work or college and any other walks that you have done.

On how many days in the last four weeks did you spend 30 minutes or more walking? This could be made up of more than one walk.

Which of the following best describes your usual walking pace?

A slow pace; a steady average pace; a fairly brisk pace; a fast pace – at least 4 miles per hour; Spontaneous (eg. None of these).

Smoking

The questions relating to smoking that were used to create variables for the analyses were similar in the UKHLS and HSE. No cotinine readings were used for adults in the HSE and UKHLS. Smoking one or more cigarettes per day was classes as not meeting government guidelines and was categorised as a risk behaviour (DoH, 2013a).

The UKHLS questions are as follows:

Have you ever smoked a cigarette, a cigar or a pipe?

Yes/No. If Yes:

Do you smoke cigarettes at all nowadays?

Yes/No. If Yes to both:

Approximately how many cigarettes a day do you usually smoke, including those you roll yourself?

(If less than 1 per day on average, zero is entered)

If Yes to first question and No to second:

Have you ever smoked cigarettes regularly, that is at least one cigarette a day, or did you smoke them only occasionally?

Smoked regularly, at least one per day; smoke them only occasionally; Spontaneous (e.g. never really smoked, just tried them once or twice).

Six categories for smoking status, including non-smoker, ex-regular smoker & average current daily cigarette consumption, and five categories for age started smoking were used to produce the lifestyle groups in the latent class analyses; these can be found in tables H.1 and H.2.

Alcohol intake

In the UKHLS, adults were asked separate questions for different groups of alcohol consumed:

‘...in the last seven days, on the day you drank the most, how many....’

- 1) *pints of beer, lager, stout or cider*
- 2) *measures of spirits or liqueurs, such as gin, whisky, rum, brandy, vodka or cocktails*
- 3) *glass of wine including sherry, port*
- 4) *alcopops*

For the UKHLS analyses, these were converted into units of alcohol intake using values of 2 units per pint (based on normal strength beer, lager, stout and cider); 1 unit per single spirit measure; 2 units per glass of wine (assuming an average glass size of 175ml); and 1.5 units per alcopop. Although previous research on the General Household Survey 2005 data (Goddard, 2007) has shown that men are more likely to drink strong beers and lagers than women (which are about 6%+ alcohol by volume and on average equivalent to 3 units per pint), these accounted for a very small proportion of total alcohol consumed (6% of total units for men and 2% for women (Goddard, 2007)). Therefore, even though we did not know the proportion of strong beers and lagers consumed in the UKHLS, the underestimation of the total units drank by UKHLS men due to this is likely to be modest.

The HSE had more detailed questions which were used to calculate the units of alcohol drank on the heaviest day of intake in the previous week. For instance respondents were asked about the glass sizes in which they consumed wine. Separate questions asked about their intake of different strengths of beer, lager or cider, and also the make of these drinks and whether they were consumed in bottles, small or larger cans or in pints.

Individuals who drank more than twice the daily recommended units of alcohol on their heaviest drinking day in the past week (for women more than 6 units and for men more than 8 units) were classed as binge drinkers in both the UKHLS and HSE analyses (see Box 2). Drinking below this level was one of the government guidelines shown in Box 1. Lower-risk guidelines for alcohol state that men should not regularly drink more than 3 to 4 units per day and women should not regularly drink more than 2 to 3 units per day (Box 1). ‘Regularly’ means drinking most days or every day (2013b). For our analyses, we chose the binge drinking cut-off to identify a ‘risk behaviour’ because evidence of its health effects is stronger than for the lower guidelines (DoH, 2005).

The UKHLS alcohol data were gathered by self-completion questionnaire, whereas the HSE data were gathered by interviewer led questionnaire. Although alcohol questions were less detailed in the UKHLS, their mode of delivery appeared to have a greater influence, producing higher reported amounts consumed in the UKHLS than for the HSE. Interview-led questionnaires are more likely to produce socially desirable answers; for alcohol intake lower consumption is more likely to be reported than in self-completed questionnaires. This is supported by evidence from Tipping et al. (2010) who reported 44% of women in a self-completion sample who had drunk alcohol in the previous week had exceeded the thresholds for binge drinking, compared with 33% of women in an interviewer led sample.

A high proportion of respondents from ethnic minority groups did not answer these self-completion questions. For instance 41% of Indian mothers (and 28% of partners), and 71% of Pakistani mothers (and 62% of partners) and 73% of Bangladeshi mothers (70% of partners) did not answer questions on the amount they drank, and the majority of these were Muslim, Sikh or Hindu. For the UKHLS analyses, values for units drank on the heaviest day of alcohol consumption were assigned to ethnic minorities with missing responses; these were based on median values for others in their ethnic group who had completed the alcohol questions. These median values were further sub-grouped by religion (Muslim, Sikh or Hindu; or not), and whether or not they were born in the UK, and for mothers, whether they were partnered or single mothers. For mothers in particular, the majority of the relevant sub-groups had median values of zero, resulting in 98% of values assigned to mothers with missing responses being zero. Eighty five percent of values assigned to partners with missing responses were zero. The assignment of zero values is in-line with findings from the 2004 HSE survey by Becker et al (2006) who reported very high abstinence rates for Pakistani men and Pakistani women (85% and 95%) and Bangladeshi men and women (97% and 98%), and reported over 70% of Indian and black African women not drinking in the previous 7 days. The median values assigned for missing responses were used in the analyses of risk of binge drinking (i.e. consuming over 6 units of alcohol for women and over 8 for men).

In addition, most of these UKHLS women also did not answer the self-completion question on frequency of alcohol consumption used in the latent class analyses. A separate category for missing responses was created; this variable was only used in the UKHLS latent class analyses.

The differences in the prevalence of the single behaviours between the HSE and UKHLS are discussed in appendix C.

The full set of HSE questions for adults used in the 2008 and 2006 survey can be found in Craig, Mindell & Hirani (2010) and Craig & Mindell (2008b).

Children

HSE CYP data on and fruit and vegetable intake and physical activity were collected by computer assisted telephone interviewing. CYP reported their smoking and drinking status in a confidential self-completion booklet. UKHLS CYP reported all four health behaviours in a confidential self-completion booklet.

Fruit and vegetables

The government guidelines for CYP in relation to fruit and vegetable intake are the same as for adults: eat at least five portions of fruit and vegetables a day (DoH, 2003). There was some difference relating to the fruit and vegetable questions between the two studies. For the HSE analysis, five fruit and vegetables consumed over a specific 24 hour period was used to determine whether CYP met government recommendations, as detailed above for adults; however for the UKHLS analysis, the reported consumption of five portions on a typical day was used as the cut off.

The UKHLS CYP were asked:

'How many portions of fresh fruit or vegetables do you eat on a typical day? One portion is one piece of fruit or one serving of a vegetable or salad item?'
'5 or more portions; 3-4 portions; 1-2 portions; none.'

Physical activity

The government guidelines for CYP in relation to physical activity are to engage in at least 60 minutes moderate to vigorous activity every day (DoH, 2011b). Whether or not this recommendation was met could be determined more accurately in the HSE than in the UKHLS.

The UKHLS CYP were asked:

*'How many days in a usual week do you play sports, do aerobics or do some other keep fit activity?'
'Every day; 5-6 days; 3-4 days; 1-2 days; less often than once a week; never or hardly ever.'*

However the amount of days engaging in other physical activity was not gathered for the UKHLS. The HSE variable covered more general physical activity, and included the time spent walking, actively playing, and undertaking housework and gardening, in addition to time spent engaging in sports activities. The 2006 and 2008 HSE used different questions on CYP's physical activity. We therefore analysed the two years' data separately. So, for example, the proportions meeting the recommendation for physical activity were assessed independently and then combined.

Smoking

The government guidelines for CYP in relation to smoking are the same as for adults: do not smoke at all (DoH, 2013a).

In the HSE analyses, we have included those children who had a cotinine reading of 15ng/ml or more regardless of whether they reported smoking cigarettes or not, as a reading of this amount indicates that they had smoked a cigarette in the past 24 hours. However, a cotinine reading does not necessarily mean that the child is a regular smoker; they may have smoked for the first time in the day prior to interview. Therefore, some misclassification may be evident.

No cotinine readings were taken for the UKHLS; smoking was determined by responses to self-completion questionnaire:

'Do you ever smoke cigarettes at all?'

Alcohol intake

The government guideline for alcohol for CYPs is do not drink at all (DoH, 2009).

In the UKHLS, CYP were asked:

'How many times in the last four weeks have you had an alcoholic drink?'

If they reported they had had a drink in this period, they were classed as not meeting the guidelines. A similar question was asked in the HSE.

The full set of HSE questions for children used in the 2008 and 2006 survey can be found in Craig, Mindell & Hirani (2010) and Craig & Mindell (2008b).

The categories for each health behaviour that were used to produce the lifestyle groups in the latent class analyses for CYP can be found in Tables H.5 and H.6. Fewer measures and fewer categories were available for use for the UKHLS latent class analyses than for the HSE; for instance, unlike the UKHLS, the HSE analyses includes variables on age first started drinking and age first started smoking. Additionally, more variables were used for physical activity in the HSE latent analyses.

Analysis Techniques

Weighting

The separate HSE and UKHLS cross-sectional analyses were adjusted for the complex survey design of their surveys and all values presented in the tables were weighted for this unless otherwise indicated. Weighting took into account non-responses and over sampling to produce nationally representative results. The UKHLS differs somewhat from the HSE as it collects data from all four countries within the UK, and additionally it oversamples individuals from ethnic minority groups who are resident in areas of high ethnic density. The UKHLS general population sample from Great Britain (England, Scotland and Wales) is an equal probability clustered sample drawn from the Postcode Address File. The ethnic minority boost sample specifically targeted areas of high ethnic density to recruit ethnic minority individuals, and in particular to achieve a sample of 1,000 each of Indian, Pakistani, Bangladeshi, Caribbean and African individuals. Given this, the data were weighted to reflect the population in England using weights provided by the Understanding Society team (Understanding Society, 2012). Additionally, the UKHLS differs from the HSE in that one of the health behaviours was gathered by self-completion questionnaire; fewer respondents answered this than the UKHLS interviewer-led questionnaire. Therefore, UKHLS weights were used in the multiple health behaviour analyses which weighted the data based on those who returned the self-completion.

Weighting of the concordance analyses, which included both mothers and their partners, used the complex survey design weight allocated to the partners since there were few partners than partnered mothers. Where percentages in tables and graphs add up to 99% or 101% instead of 100%, this is due to rounding.

Single behaviours

Differences in the prevalence of the four individual behaviours were produced using two or more categories for each behaviour. Adjusted Wald F tests, which took account of clustered and stratified sample design, were used in bivariate analyses to determine significant associations between single health behaviours and categories of socio-demographic factors (at $p < 0.05$). This test was also used to determine significant associations in single health behaviours between household members.

Risk indices

The risk indices were a summated index of the individual risks of not meeting government recommendations for the health behaviours. This involves a simple count of the number of risks a person is 'at risk'. So for our four risk behaviours, an index ranging from 0 to 4 was created, and prevalence information was provided on each number of risks. For the analysis of couples, the concordance in the numbers of risk behaviours between mothers and their partners was tabulated, and the prevalence of the total number of risk behaviours per couple was presented, totalling between 0 to 8 risks. Adjusted Wald F tests were also used to determine significant associations in numbers of risks between household members.

Observed expected ratios

Observed-expected ratios allowed us to identify the presence or otherwise of clustering of behaviours (co-occurrence of behaviours in the same individual greater than would be expected by chance). A cluster occurs when the prevalence of multiple behaviours exceeds that expected based on the individual prevalence of each behaviour if each behaviour were independent. This was calculated in the form of a ratio using the observed prevalence (O) of each combination of the four behaviours and the expected prevalence (E), based on the absolute prevalence of the behaviour in the sample. Thus for four risk behaviours we have:

$$\text{Ratio} = \frac{O_{\text{behaviour1}} \times O_{\text{behaviour2}} \times O_{\text{behaviour3}} \times O_{\text{behaviour4}}}{E_{\text{behaviour1}} \times E_{\text{behaviour2}} \times E_{\text{behaviour3}} \times E_{\text{behaviour4}}}$$

This ratio was calculated for various combinations of the behaviours, for example not meeting recommendations for fruit and vegetable intake and for physical activity, but meeting them in relation to smoking or alcohol intake. Values over one for this ratio indicate a prevalence greater than that expected if the behaviours were independent; values under one indicate a prevalence lower than expected if the behaviours were independent. Significance of this clustering was determined by normal approximation 95% confidence intervals.

For example, if the prevalence of current smokers is 25% and the prevalence of those who drank more than twice the daily recommended units of alcohol is 20%, then by the laws of probability the expected joint prevalence of smoking and drinking is 5%. If the observed prevalence exceeds the expected prevalence, clustering is said to occur.

Latent Class analysis (LCA) to produced lifestyle groups

Latent Class Analysis (LCA) was the third method in this report that we used to group individuals based on the four dimensions of health behaviours. Rather than focusing solely on the risk of not meeting recommendations, LCA exploits the full range of response categories for each behaviour to produce distinct patterns of the multiple health behaviours. It is also able to accommodate multiple variables addressing different aspects of the same behaviour, such as frequency of smoking and age of initiation. Respondents with similar characteristics were grouped into classes (i.e. lifestyle groups) based on their behaviour profile. Additionally LCA served as a data reduction technique, so while the previous observed-expected ratio method resulted in 16 possible combinations arising from four behaviours, the LCA technique consolidated these combinations into salient classes or typologies which reflected overall trends in the data. LCA has advantages over traditional clustering methods, allowing for membership of classes to be assigned on the basis of statistical probabilities. The process of classification also allowed the research team to identify those categories of behaviours which clustered together, and to label the classes in a manner which was meaningful and interpretable.

A key question in exploratory LCA is how many classes the sample should be divided into. However, there is no definitive method of determining the optimal number of classes. The statistical checks used to help determine the models are described in Appendix B. Furthermore, the resulting classes had to be interpreted; for the purposes of this analysis the most important factor in deciding the number of classes was placed on interpretability. We used latentGOLD software version 4.5 to undertake the analyses (Vermunt & Magidson, 2008).

In this report we present a LCA that includes all children aged 10-15. The LCAs were initially conducted separately for children aged 10-12 and children aged 13-15 to investigate whether

children would cluster together in different ways in the two age groups, because risk factors such as smoking and drinking were highly correlated with age group among young people. The results were broadly similar for both groups and although there were some differences in the classification, the resulting classes (especially for the 10-12 age group) were too small for subsequent analysis. Where percentages in tables and graphs add up to 99% or 101% instead of 100%, this is due to rounding.

Social patterning of multiple risk behaviours

The social patterning of multiple risk behaviours within each LCA class (i.e. Life Style group) was then determined using logistic regression models. In these models LCA class membership was used as the dependent variable and socio-demographic variables were used as predictor variables. To aid comparisons between studies, socio-demographic variables common to both the HSE and UKHLS surveys were selected which included one or two variables from the following categories: age; domestic relationships; socioeconomic circumstances; employment status; cultural back ground; health status. The variables selected were significantly associated with most of the health behaviours. Whilst the binary variable 'white/non-white' was used for adjustment in the HSE analyses, rich data on ethnicity was used in the UKHLS analysis (Appendix E provides the UKHLS bivariate analyses for ethnicity). Although a large number of variables relating to social status were available for use, to avoid over adjustment only two of these were applied in the main logistic analyses: education and equivalised household income (net income was available from the HSE and gross income was available from the UKHLS). To determine the socio-demographic patterning of the children's LCAs, adjustments were made for child's age, gender and mother's LCA class in the children's logistic regression analyses, in addition to adjustments for the socio-demographic variables mentioned above.

The final logistic regression models for each LCA were performed in STATA version 12 within the survey module (svy) which takes into account the complex sample and weighting structure of the HSE and UKHLS surveys. First, stepwise logistic regression was undertaken to determine the socio-demographic predictors for the final models. Because stepwise regression is not available in STATA's survey module, the stepwise procedure for each model considered was simulated in STATA using the following steps:

- A. A forward stepwise logistic regression with all independent variables was initially run outside the svy module.
- B. The variables identified as significant (at the 95% significance level) were then included in an "svy logit" regression to test whether they remained significant.
- C. If one variable was found to be not significant ($p > 0.05$), it was removed from the model, and the model with the remaining variables was re-run and re-checked.
- D. If more than one variable were found to be not significant, the one with the largest p-value was removed and the model with the remaining variables was re-run and re-checked.
- E. When no more variables could be removed (i.e. when all were $p < 0.05$), all other variables not in the model were added back one-by-one.
- F. If none of the additional variables were significant, the procedure stopped and the initial model from step E was the final model.
- G. If one of the additional variables was significant, then the variables already in the model were checked for removal. Variables were removed one at a time (the variable with the largest p-value was removed first), until no more variables could be removed.

H. If more than one additional variable was significant, the one with the smallest p-value entered the model and the remaining variables were checked for removal in the same way as in step G. The remaining significant variables were then entered, one at a time, based on their p-value (variables with the smallest p-value taking precedent) and after each entry the model was re-checked for variable removals.

I. If at this step the current model was different from the one described in step E, the algorithm continued and steps E to H were repeated. The procedure stopped when there were no changes to the model (in terms of the significant variables included) between iterations.

Once the socio-demographic predictors for each LCA (i.e. lifestyle group) were finalised, then the predicted probabilities of being in an LCA for each socio-demographic factors were ran in STATA. This calculated the probability of being in a lifestyle group based on the category an individual is in for each socio-demographic predictor, holding the other predictors at their average values. These predicted probabilities were added to figures 8.1 and 8.2, and were described in Appendix J.

Appendix B: Determining optimal solutions in Latent Class Analysis (LCA)

A key question in exploratory LCA is how many classes the sample should be divided into. However, there is no definitive method of determining the optimal number of classes. Because models with different numbers of latent classes are not nested, this precludes the use of a difference likelihood-ratio test. Therefore we must rely on measures of fit such as Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

For each LCA (i.e. lifestyle group for mothers, partners, mothers with partners and CYP), we produced seven solutions (ranging from two to eight classes) and used the following five ways to check these and decide on the optimal solution:

- (a) We looked at measures of fit such as Akaike's Information Criterion (AIC and AIC3) and the Bayesian Information Criterion (BIC). In comparing different models with the same set of data, models with lower values of these information criteria were preferred.
- (b) We looked at the misclassification rate. The expected misclassification error for a class solution was computed by cross-classifying the modal classes by the actual probabilistic classes. The sum of individuals in the diagonal of this cross-classification corresponds to the number of correct classifications achieved by the modal assignment of class probabilities. The following formula was then applied: $\text{error} = 100 - (100 * \text{correct classifications} / \text{all individuals})$. Models with lower misclassification rates were preferred. For mothers and partners misclassification rates were low; they were between 7.0 and 8.6% for the final class solutions which are shaded grey in table B.1. Misclassification rates were somewhat higher for CYP final class solutions, especially UKHLS CYP: 12.0% for HSE and 18.5% for UKHLS. The latter may reflect the limited variables and categories that were available for use for assigning CYP into classes.

Table B.1 Misclassification error rates% when comparing assigned modal classes with probabilistic classes

	Misclassification error rates %						
	2-class	3-class	4-class	5-class	6-class	7-class	8-class
HSE Mothers	0.1	3.4	1.9	6.7	8.6	15.6	15.8
UKHLS Mothers	0.0	1.6	3.9	7.8	11.2	13.5	16.9
UKHLS partnered mothers	0.0	1.3	3.4	7.0	11.0	13.5	14.1
UKHLS partners	0.0	1.4	3.3	7.5	9.6	12.7	13.3
HSE CYP	1.8	5.7	12.0	12.8	12.7	19.2	23.9
UKHLS CYP	2.2	18.5	20.3	33.1	27.8		

- (c) We looked at the percentage of cases in each class with a low probability of class membership. We chose solutions where the vast majority of individuals in a class exhibited a high probability of belonging to the class i.e. above 0.6. For adults, there were less than 5% of cases with a lower probability than 60% of class membership for the majority of classes; though the 'Unhealthiest' class for mothers and partners had between 11.1 and 13.7% of cases with less than 60% probability of class membership. Only one class had a noticeably high percentage (22.1%) of cases with less than 60% probability of class membership; this was the 'Healthiest' class in the final HSE CYP 4-class solution.

- (d) We chose solutions where the resulting classes were stable. For example, when moving from a three to a four class solution, one of the classes from the three-class solution should split to form two classes in the four-class option with the remaining classes remaining largely unchanged. Class stability was investigated by cross-classifying successive class solutions.
- (e) The resulting classes have to be interpreted. For the purposes of this analysis the main importance in deciding the number of classes was placed on interpretability.

Concordance in latent classes between within household members

Adjusted Walds F tests, which took account of clustered and stratified sample design, were used in bivariate analyses to determine significant associations between the latent classes (i.e. lifestyle groups) of household members in section 9.4.

Appendix C: Summary of differences between prevalence of single behaviours in HSE and UKHLS

Despite both the HSE and UKHLS studies being designed to be representative of the English population, there were some differences between the results of the four separate health behaviours for the HSE and the UKHLS mothers' analyses (see table E.1 in Appendix E). These variances may be due to differences in the questions asked, as in the case of fruit and vegetable intake and physical activity, or may be mainly due to the differences in the method of gathering the data as in the case of alcohol consumption (see the Health behaviour measures section of Appendix A).

The proportion of mothers consuming five or more fruit and vegetables was higher in the HSE (30%) than in the UKHLS (19%); HSE respondents may have been more likely to include fruit juice consumed as a portion, in addition to fruit and vegetables consumed.

HSE mothers were more likely to report engaging in exercise of at least moderate intensity for 30 minutes or more on average five days a week, than UKHLS women who reported exercise; 36% of HSE mothers did so compared to 23% of UKHLS mothers. The HSE questions on exercise were more detailed and, unlike the UKHLS, included questions on housework, gardening, DIY and occupational activity. This meant adherence to government recommendations could be determined more closely in the HSE than for the UKHLS.

Conversely, reported alcohol consumption was higher for UKHLS mothers than HSE mothers. In terms of binge drinking, 22% of UKHLS mothers reported they consumed over 6 units of alcohol on their heaviest day, compared with 15% of mothers in the HSE. Although the alcohol questions were less detailed in the UKHLS, their mode of delivery appeared to have a greater influence (Tipping et al, 2010); in the UKHLS self-completion of alcohol responses was likely to have produced less socially desirable answers and therefore high units of alcohol consumed compared to the HSE interview-led responses.

In both the UKHLS and the HSE 25% of mothers were current smokers this may be due to similarity of the questions; however 29% of mothers in the UKHLS reported they were ex-regular smokers compared with 19% in the HSE.

In the CYP results (Table E.5 and Table E.6) smoking was more prevalent in the HSE than in the UKHLS (5% compared to 2%). Cotinine levels as well as self-reports were used to assess CYP smoking in the HSE whereas only self-reports were gathered for the UKHLS; this likely to be reason for the difference in smoking rates. Although a cotinine reading indicated that the CYP had smoked in the last 24 hour it did not necessarily mean that the CYP was a regular smoker; they may have smoked for the first time in the day prior to interview. Therefore, some misclassification may be evident. However, we also know that self-report smoking behaviour are typically under-reported by this age group when data are collected in a household setting.

Estimates of meeting physical activity recommendations for CYP were higher in the HSE than the UKHLS (42% compared to 17%). In addition to time spent engaging in structured sports activities, the HSE asked more questions about general physical activity; unlike the UKHLS, the HSE questions included amount of time spent actively playing and walking.

Appendix D: Summary of strengths and limitations of the analysis

The main strength of this project was its focus on a gap in research on multiple health behaviours of English mothers, partners and their children. Other strengths include the use of two nationally representative surveys and the consistency of results found between the dual analyses of these two surveys. Additionally, we used a number of methods to examine multiple health behaviours, including cluster analysis which is an expanding area of research (McAloney et al, 2013). A particular strength of using the HSE was its detailed questions on health behaviours, and the strength of using the UKHLS was the larger samples gathered from minority ethnic groups. The total sample sizes of the both studies are very large; however it should be noted that the numbers available for our analysis of families were of modest size and power.

Like the majority of previous research on multiple health behaviours, the analyses in this report rely on self-reporting of behaviours; these are generally less reliable than objective measures which require large resources to employ. In addition, the adult responses to questions in the two surveys were given to interviewers (except for alcohol intake in the UKHLS); interview-led questions are more susceptible to response bias, producing an increased reporting of healthier behaviours and a decreased reporting of unhealthy behaviours (Tipping et al, 2010). In contrast, the alcohol intake by UKHLS adults given on the confidential self-completion questionnaire was on average higher than the HSE interview-led responses; the UKHLS answers were possibly more honest. However, a higher proportion of UKHLS individuals omitted to answer these alcohol questions despite answering most of the other questions on the questionnaire. The majority of adults who did not complete these alcohol questions were of ethnic minority origin, specifically Indian, Pakistani, Bangladeshi, black Africans and Arabs, and of Muslim, Sikh or Hindu religion or who were born outside the UK. Simple imputed alcohol units were used in the analyses for these non-white individuals using median values of those who did respond, divided into sub-groups based on ethnic, religious, marital status and country of birth; as mentioned in Appendix A the majority of these median values were zero. The assignment of zero values is in-line with findings from the 2004 HSE survey by Becker et al (2006). No imputed values for missing alcohol responses were used in the children's analyses.

Another weakness is the cross-sectional design of the analyses; the results, therefore, cannot provide evidence of causation of the multiple health behaviours. Little research has been undertaken using longitudinal data and there is a need for future research on the longitudinal analysis of multiple health behaviours.

Appendix E: Tables of single behaviours and description of socioeconomic factors associated with single behaviours

Table E.1 Single behaviours of HSE (2006 & 2008) and UKHLS mothers (20010/11)		
Behaviours	% UKHLS	% HSE
Cigarette smoking status		
Current cigarette smoker	25	25
Ex-regular cigarette smoker	29	19
Never regular cigarette smoker	46	55
<i>Unweighted Base</i>	<i>4785</i>	<i>4208</i>
<i>Weighted Base</i>	<i>4312</i>	<i>3797</i>
Units of alcohol drunk on heaviest day in last 7		
None	41	40
<=3	13	28
>3 and <=6	23	17
>6	22	15
<i>Unweighted Base</i>	<i>4722</i>	<i>4203</i>
<i>Weighted Base</i>	<i>4236</i>	<i>3793</i>
Alcohol free days in last 7		
2 or more	88	92
1 or none	5	8
Didn't answer question	7	-
<i>Unweighted Base</i>	<i>4787</i>	<i>4208</i>
<i>Weighted Base</i>	<i>4313</i>	<i>3797</i>
Fruit and vegetable consumption		
Less than 5 a day	81	70
5 plus a day	19	30
<i>Unweighted Base</i>	<i>4786</i>	<i>4218</i>
<i>Weighted Base</i>	<i>4313</i>	<i>3807</i>
Frequency of moderate+ sporting activities		
None	28	-
>0 and <once a week	39	-
≥once a week and < 3 times a week	20	-
≥3 times a week	13	-
Brisk/ fast walking ≥5 days/week or moderate+ sports ≥3 days/week (or walking 4 d/w & moderate+ sports 1 d/w)		
No	77	-
Yes	23	-
<i>Unweighted Base</i>	<i>4785</i>	-
<i>Weighted Bases</i>	<i>4312</i>	-
No of times did 30+mins of moderate+ sports activity in last 4 wks		
None	-	58
1-9	-	28
10-19	-	9
20+	-	5
<i>Unweighted Base</i>	-	<i>4218</i>
<i>Weighted Base</i>	-	<i>3807</i>

Table E.1 Single behaviours of HSE (2006 & 2008) and UKHLS mothers (20010/11)		
Behaviours	% UKHLS	% HSE
No of times did 30+mins of moderate+ physical activity in last 4 wks		
None	-	14
1-9	-	32
10-19	-	18
20+	-	36
<i>Unweighted Base</i>	-	<i>4212</i>
<i>Weighted Base</i>	-	<i>3800</i>

See Box1 for government recommendations

Table E.2 Single behaviours of UKHLS mothers (2010/11) by ethnicity							
Behaviours	White	Mixed	Indian	Pakist/ Banglid	Black African	Black other	Other
	%	%	%	%	%	%	%
Cigarette smoking status	<i>p</i> <0.001						
Current cigarette smoker	28	21	3	4	4	27	9
Ex-regular cigarette smoker	31	35	7	3	5	14	17
Never regular cigarette smoker	41	44	90	93	91	59	74
<i>Unweighted Base</i>	3549	104	231	329	209	147	214
<i>Weighted Base</i>	3720	58	133	115	100	57	128
Units of alcohol drunk on heaviest day in last 7	<i>p</i> <0.001						
None	36	43	87	99	85	52	67
<=3	14	22	4	0	4	18	11
>3 and <=6	25	12	6		8	18	12
>6	25	24	3	1	3	12	9
<i>Unweighted Base</i>	3485	104	231	329	210	147	214
<i>Weighted Base</i>	3644	58	133	115	100	57	128
Alcohol free days in last 7	<i>p</i> <0.001						
2 or more	92	88	59	28	67	86	67
1 or none	5	2			1	4	2
Not answered	3	10	41	72	32	9	31
<i>Unweighted Base</i>	3550	104	231	329	210	147	214
<i>Weighted Base</i>	3722	58	133	115	100	57	128
Fruit and vegetable consumption	<i>p</i> <0.001						
Less than 5 a day	80	87	90	91	91	87	75
5 plus a day	20	13	10	9	9	13	25
<i>Unweighted Base</i>	3550	104	231	329	210	147	213
<i>Weighted Base</i>	3722	58	133	115	100	57	127
Frequency of moderate+ sporting activities	<i>p</i> <0.001						
None	25	27	60	70	56	45	41
>0 and <once a week	42	38	13	12	17	30	31
Once or twice a week	20	19	17	12	17	16	16
≥3 times a week	13	17	11	6	10	9	13
<i>Unweighted Base</i>	3549	104	230	329	210	147	214
<i>Weighted Base</i>	3721	58	132	115	100	57	128
Brisk/ fast walking ≥5 d/wk or moderate+ sports ≥3 d/wk (or walking 4 d/wk & moderate+ sports 1 d/w)	<i>p</i> <0.001						
No	76	65	81	88	83	85	77
Yes	24	35	19	12	17	15	23
<i>Unweighted Base</i>	3549	104	230	329	210	147	214
<i>Weighted Base</i>	3721	58	132	115	100	57	128

See Box1 for government recommendations

Table E.3 Single behaviours of UKHLS mothers (2010/11) by religion

Behaviours	Atheist	Christian	Muslim/ Sikhs	Hindu	Other/ missing
	%	%	%	%	%
Cigarette smoking status	<i>p</i> <0.001				
Current cigarette smoker	39	23	7	3	19
Ex-regular cigarette smoker	30	31	7	7	31
Never regular cigarette smoker	30	46	86	90	50
<i>Unweighted Base</i>	821	3016	581	121	248
<i>Weighted Base</i>	878	2890	261	70	213
Units of alcohol drunk on heaviest day in last 7	<i>p</i> <0.001				
None	42	35	93	85	44
<=3	12	15	2	5	16
>3 and <=6	19	26	2	8	22
>6	27	24	2	3	18
<i>Unweighted Base</i>	805	2978	577	121	241
<i>Weighted Base</i>	858	2848	257	70	203
Alcohol free days in last 7	<i>p</i> <0.001				
2 or more	93	91	45	61	84
1 or none	4	5	0		4
Not answered	3	3	55	39	11
<i>Unweighted Base</i>	821	3016	581	121	248
<i>Weighted Base</i>	878	2891	261	70	213
Fruit and vegetable consumption	<i>p</i> <0.001				
Less than 5 a day	84	79	88	84	79
5 plus a day	16	21	12	16	21
<i>Unweighted Base</i>	821	3014	581	121	248
<i>Weighted Base</i>	878	2891	261	70	213
Frequency of moderate+ sporting activities	<i>p</i> <0.001				
None	30	24	61	60	30
>0 and <once a week	41	41	17	13	38
Once or twice a week	17	21	13	17	17
≥3 times a week	11	14	9	10	14
<i>Unweighted Base</i>	821	3015	580	121	248
<i>Weighted Base</i>	878	2890	261	70	213
Brisk/ fast walking ≥5 d/wk or moderate+ sports ≥3 d/wk (or walking 4 d/wk & moderate+ sports 1 d/w)	<i>p</i> =0.02				
No	77	76	84	79	77
Yes	23	24	16	21	23
<i>Unweighted Base</i>	821	3015	581	121	248
<i>Weighted Base</i>	813	2974	573	120	246

See Box1 for government recommendations

Table E.4 Single behaviours of UKHLS mothers and their partners (2010/11)		
Behaviours	Mothers with Partners	Partners
	%	%
Cigarette smoking status		
Current daily cigarette smoker	19	24
Ex cigarette smoker	29	30
Never regular cigarette smoker	52	46
<i>Unweighted Bases</i>	2623	2623
<i>Weighted Bases</i>	2630	2630
Units of alcohol drunk on heaviest day in last 7^a		
None	40	28
Up to lower recommendations	15	19
Between recommended and binge drinking levels	24	22
Binge drinking	22	32
<i>Unweighted Bases</i>	2547	2594
<i>Weighted Bases</i>	2585	2598
Alcohol free days in last 7		
Two or more	88	85
One or none	5	10
Didn't answer question	7	5
<i>Unweighted Bases</i>	2623	2623
<i>Weighted Bases</i>	2631	2630
Fruit and vegetable consumption		
Less than 5 a day	80	86
5 plus a day	20	14
<i>Unweighted Bases</i>	2623	2623
<i>Weighted Bases</i>	2630	2628
No of days 30+min brisk/fast walking in last 4 wks		
None	67	59
1-9	15	21
10-19	7	7
20+	12	13
Frequency of moderate+ sporting activities		
None	28	20
>0 and <once a week	39	40
≥once a week and < 3 times a week	19	23
≥3 times a week	14	17
Brisk/ fast walking ≥5 days/week or moderate+ sports ≥3 days/week (or walking 4 d/w & moderate+ sports 1 d/w)		
No	77	73
Yes	23	27
<i>Walking and moderate+ sports</i>		
<i>Unweighted Base</i>	2623	2622
<i>Weighted Bases</i>	2630	2629

^aThe government recommendations for women are on most days do not drink more than 2-3 units of alcohol a day and on no days drink more than 6 units; for men on most days do not drink more than 3-4 units of alcohol a day and on no days drink more than 8 units. Consumption above the upper recommendations is classed as binge drinking.

Table E.5 Single behaviours of HSE children by age group (2006 & 2008)

Behaviours	10-11	12-13	14-15	All children
	%	%	%	%
Cigarette smoking status	<i>P=0.003</i>			
Smoked less than one cigarette a week AND had a cotinine reading of less than 15ng/ml	100	97	88	95
Smoked 1 or more cigarettes a week OR had a cotinine reading of 15+ ng/ml	0	3	12	5
<i>Unweighted Base</i>	801	812	815	2428
<i>Weighted Base</i>	760	809	859	2429
Had an alcoholic drink in the last 4 weeks	<i>P<0.001</i>			
No	97	85	65	82
Yes	3	15	35	18
<i>Unweighted Base</i>	800	805	807	2412
<i>Weighted Base</i>	758	805	853	2416
Fruit and vegetable consumption	<i>P=0.137</i>			
Less than 5 a day	84	82	80	82
5 plus a day	16	18	20	18
<i>Unweighted Base</i>	900	890	877	2667
<i>Weighted Base</i>	863	896	931	2689
Physical activity 7 days in week	<i>P=0.018</i>			
No	55	57	61	58
Yes – 60+ minutes of physical activity on all 7 days	45	43	39	42
<i>Unweighted Base</i>	896	886	866	2648
<i>Weighted Base</i>	859	892	920	2670

See Box1 for government recommendations

Table E.6 Single behaviours of UKHLS children by age group (2010/11)

Behaviours	10 to 11	12 to 13	14 to 15	All
	%	%	%	%
Cigarette smoking status	<i>p<0.001</i>			
Smoked less than one cigarette a week	100	99	94	98
Smoked 1 or more cigarettes a week	0	1	6	2
Had an alcoholic drink in the last 4 weeks	<i>p<0.001</i>			
No	97	84	50	78
Yes	3	16	50	22
Fruit and vegetable consumption	<i>p<0.001</i>			
Less than 5 a day	82	90	89	87
5 plus a day	15	10	11	13
Physical activity 7 days in week	<i>p<0.001</i>			
No	81	82	88	83
Yes –sport/ physical activity on all 7 days	19	18	12	17
<i>Unweighted Bases</i>	986	1006	924	2916
<i>Weighted Bases</i>	977	982	887	2847

See Box1 for government recommendations

Socioeconomic factors associated with single behaviours in UKHLS mothers

In UKHLS mother, higher levels of engagement in three unhealthy behaviours (smoking, low fruit and vegetable intake and low physical activity) was associated with being younger, having lower educational qualifications, being economically inactive, having a limiting illness and not being married. Conversely, higher levels of drinking were associated with higher education and higher income (tables not shown).

One of the strengths of the UKHLS is its larger samples of ethnic minorities. UKHLS mothers of Indian, Pakistani, Bangladeshi and Black African origin were less likely to be current smokers and to consume five fruit and vegetables a day (Table E.2). They were less likely to report binge drinking (>6 units in one day), but were more likely to not answer the alcohol questions than other groups. Compared to these mothers, white mothers had healthier behaviours, except for drinking behaviour. Mothers of mixed origin engaged in the highest physical activity, being most likely to meet the government recommendations shown in Box 1 in the main report. Although only a small proportion of Muslims, Sikhs and Hindus currently smoked or binge drank, Muslims and Sikhs also had the lowest levels of participation in physical activity and consumption of 5-a-day fruit and vegetables and were the most likely not to answer the alcohol questions on the self-completion questionnaire (Table E.3). Hindus, however, had similar levels of physical activity to others.

Socioeconomic factors associated with single behaviours in HSE mothers

Overall, lower levels of engagement in healthier behaviours was associated with being white, being younger, with lower educational qualifications, being unemployed or having a limiting illness.

Socioeconomic factors associated with single behaviours in CYP

The proportion of boys and girls not meeting recommendations were similar except for physical activity; boys were much more likely than girls to meet the physical activity recommendations. Three risk behaviours increased with age in both studies. The risk of not meeting recommendations for smoking and physical activity increased substantially at ages 14-15, and alcohol intake increased substantially in both the 12-13 and 14-15 age groups. Fruit and vegetable intake decreased in the UKHLS but increased with age in the HSE. Children's health behaviours by age group for both the HSE and UKHLS are tabled in E.5 and E.6.

In both the UKHLS and HSE, children who smoked one or more cigarettes a week were more likely to be older, white, in worse health, to have a mother with lower educational qualifications, or a mother with a limiting long-standing illnesses, or were living in a lower income households (tables not shown). In the UKHLS smoking was also associated with households with fewer children or where the youngest child was 10 years or older, or where the mother was not married or was economically inactive. In both surveys, drinking alcoholic in the past 4 weeks was associated with being older, white, living in smaller households or having an older mother in employment. In the UKHLS, drinking was also associated with households where the youngest child was 10 years or older. In the HSE, drinking was also associated with living in medium-income households. In both surveys, not meeting the fruit and vegetable recommendations was associated with being in worse health, living in lower income households with lower qualifications. In the HSE, it was also associated with being white, or having a younger mother, and in the UKHLS with household with fewer children. In both surveys, children who did not meet physical activity recommendations were more likely to be girls, older, in worse health or living with an older mother. In the HSE it was also associated with being non-white, living in higher income households or having a mother in employment or one with above A-level qualifications. In the UKHLS it was also associated with households with fewer children.

Appendix F: Tables of risk indices

Table F.1 Risk indices of UKHLS (2010/11) and HSE mothers (2006 & 2008)		
Number of risk behaviours	UKHLS Mothers %	HSE Mothers %
0	4.2	9.3
1	20.5	29.1
2	47.5	42.3
3	22.6	16.0
4	5.2	3.2
<i>Unweighted Base</i>	<i>4717</i>	<i>4195</i>
<i>Weighted Base</i>	<i>4232</i>	<i>3785</i>

Table F.2 Risk Indices for UKHLS mothers and their partners (2010/11)		
Number of risk behaviours	Mothers %	Partners %
0	4.5	2.9
1	21.8	19.6
2	49.2	44.8
3	20.8	25.8
4	3.7	7.0
<i>Unweighted Bases</i>	<i>2522</i>	<i>2522</i>
<i>Weighted Bases</i>	<i>2553</i>	<i>2553</i>

Table F.3 Risk indices of HSE (2006 & 2008) and UKHLS (2010/11) children & young people		
Number of risk behaviours	HSE CYP %	UKHLS CYP %
0	7.0	3.3
1	34.7	18.0
2	47.2	61.0
3	9.6	15.7
4	1.5	1.9
<i>Unweighted Base</i>	<i>2388</i>	<i>2916</i>
<i>Weighted Base</i>	<i>2389</i>	<i>2847</i>

Appendix G: Clustering of risk behaviours: observed-expected ratios

Mothers

This section examines observed-expected ratios of the four risk behaviours for mothers. The variables used to compute the ratios were the same dichotomous variables as in the previous section. There are 16 possible behavioural patterns of the four risk behaviours. If the observed prevalence exceeded the expected prevalence then clustering was said to occur.

The most common combinations of risk behaviours

In terms of observed prevalence, the most common combinations of risk behaviours were:

- both fruit and vegetable and physical activity risks but no risks for the other two behaviours (38% of UKHLS mothers and 30% of HSE)
- fruit and vegetable risk only (10% UKHLS and 13% HSE)
- physical activity risk only (9% UKHLS and 13% HSE)
- fruit and vegetable, physical activity and smoking risks (12% UKHLS and 9% HSE)
- fruit and vegetable, physical activity and drinking risks (9% UKHLS and 4% HSE)

None of these risk patterns, however, were clustered in the mothers (apart from a borderline significance in the HSE for fruit and vegetable intake and physical activity risk combination).

Clustering of health behaviours found in both studies

As observed in table G.1, there were two behavioural patterns with an observed-expected ratio of greater than one in both the UKHLS and HSE with significant 95% confidence intervals (CI), which indicated clustering of the behaviours. These were:

- No risky behaviours (about 60% higher UKHLS and 40% higher in the HSE than would be expected)
- All four risk behaviours (about 60% higher in the UKHLS and 80% higher in the HSE than would be expected)

Another combination showed significant evidence of clustering in the HSE but had borderline significance in the UKHLS:

- Fruit and vegetable, smoking, and drinking risky behaviours (110% higher in the HSE and 30% higher than would be expected in the UKHLS but with borderline significance)

Other clusters found in either the UKHLS and HSE were:

- Physical activity and drinking risk behaviours (about 80% higher in the HSE than would be expected)
- Fruit and vegetable and physical activity risk behaviours (10% higher in the HSE than would be expected but with borderline significance)
- Fruit and vegetable, smoking and drinking risks (about 30% higher in the UKHLS)
- Drinking risk only (about 60% higher in the UKHLS than would be expected)

There were a number of behavioural patterns in both the UKHLS and HSE that occurred with a prevalence less than that expected if the behaviours were independent. These were:

- Smoking risk only (about 20% less than expected in both UKHLS and HSE)
- Physical activity and smoking risk (about 50% less than expected in both)
- Fruit and vegetable, physical activity and drinking risk (about 20% less than expected in both)

Table G.1 Observed-expected ratios of UKHLS (2010/1) & HSE (2006 & 2008) mothers						
Risk Patterns	UKHLS Mothers			HSE Mothers		
	Observed	Expected	O/E (95%CI)	Observed	Expected	O/E (95%CI)
	%	%		%	%	
No risk	4.2	2.6	1.6 (1.4, 1.8)	9.3	6.9	1.4 (1.2, 1.5)
F&V only	9.8	11.0	0.9 (0.8, 1.0)	12.8	15.9	0.8 (0.7, 0.9)
Physical activity risk only	8.9	8.7	1.0 (0.9, 1.1)	13.1	12.1	1.1 (0.9, 1.2)
Smoking risk only	0.5	0.8	0.7 (0.4, 0.9)	1.8	2.3	0.8 (0.6, 0.9)
Drinking risk only	1.2	0.8	1.6 (1.1, 2.0)	1.4	1.3	1.1 (0.8, 1.4)
F&V and physical activity risk	38.2	36.6	1.0 (1.0, 1.1)	30.3	28.1	1.1 (1.0, 1.1)
F&V and smoking risk	2.6	3.5	0.7 (0.6, 0.9)	5.8	5.4	1.1 (0.9, 1.2)
F&V and drinking risk	3.2	3.2	1.0 (0.8, 1.2)	2.2	2.9	0.8 (0.6, 0.9)
Physical activity and smoking risk	1.2	2.7	0.5 (0.3, 0.6)	2.0	4.1	0.5 (0.4, 0.6)
Physical activity and drinking risk	2.0	2.5	0.8 (0.6, 1.0)	1.4	2.2	0.6 (0.5, 0.8)
Smoking and drinking risk	0.4	0.2	1.5 (0.8, 2.3)	0.6	0.4	1.4 (0.9, 2.1)
F&V, physical activity and smoking risk	12.1	11.6	1.0 (1.0, 1.1)	9.4	9.6	1.0 (0.9, 1.1)
F&V, physical activity and drinking risk	8.5	10.6	0.8 (0.7, 0.9)	3.9	5.1	0.8 (0.7, 0.9)
F&V, smoking and drinking risk	1.3	1.0	1.3 (1.0, 1.6)	2.1	1.0	2.1 (1.7, 2.6)
Physical activity, smoking and drinking risk	0.7	0.8	0.9 (0.6, 1.2)	0.5	0.8	0.7 (0.4, 1.0)
All four risk behaviours	5.2	3.4	1.6 (1.3, 1.8)	3.2	1.8	1.8 (1.5, 2.2)
Unweighted Bases	4717			4195		
Weighted Bases	4232			3785		

F&V = fruit and vegetables

UKHLS mothers and partners

The most common combination of risk behaviours was not meeting both fruit and vegetable and physical activity recommendations, which was found in 41% of mothers and 34% of partners (Table G.2). The next four most common combinations in both mothers and partners were:

- fruit and vegetable risk only (10% of mothers and 12% of partners, and 2% of couples both had this combination)
- physical activity risk only (10% of mothers and 6% of partners, and 2% of couples both had this combination)
- fruit and vegetable, physical activity and smoking risks (10% of mothers and 10% of partners, and 3% of couples both had this combination)
- fruit and vegetable, physical activity and drinking risks (9% of mothers and 13% of partners, and 0.2% of couples both had this combination).

None of these risk patterns were clustered more than expected in the mothers or partners, but the fruit and vegetable, physical activity and drinking risks combination occurred 20% less than expected in mothers (O/E = 0.8, 95%CI 0.7, 0.9) and in partners (O/E = 0.8, 95%CI 0.8, 0.9).

There were three risk behaviour combinations where there was evidence of clustering for both mothers and partners (observed-expected ratio significantly greater than one). These were:

- No risky behaviours (about 50% and 40% higher in mothers and partners respectively than would be expected)
- All four risk behaviours (about 50% higher in both than would be expected)
- Drinking risk only (about 80% and 100% higher in mothers and partners respectively than would be expected)

There were four risk behaviour combinations that were less likely to occur together than expected for both mothers and partner. These were:

- Smoking risk only (60% less than expect in both; prevalence extremely low)
- Fruit and vegetable and smoking risk (40% and 30% less than expected in mothers and partners respectively)
- Physical activity and smoking risk (60% less than expected in both)
- Fruit and vegetable, physical activity and drinking risk (20% less than expected in both)

The prevalence of all of these was low, particularly the first.

A concordance analysis for section 9 was not undertaken for all these behaviour combinations because this would have been a large 16 x 16 table. However, we calculate that in 20% of couples both of them had the two most common risk combinations (i.e. not meeting recommendations for fruit and vegetables and for physical activity). This occurred more than expected (concordance χ^2 $p < 0.001$).

Table G.2 Observed-expected ratios of UKHLS mothers and their partners (2010/11)						
Risk Patterns	Mothers			Partners		
	Observed	Expected	O/E (95%CI)	Observed	Expected	O/E (95%CI)
	%	%		%	%	
No risk	4.5	2.9	1.5 (1.2, 1.8)	2.9	2.0	1.4 (1.1, 1.8)
F&V only	10.3	11.6	0.9 (0.8, 1.0)	11.7	12.4	1.0 (0.8, 1.1)
Physical activity risk only	9.8	9.9	1.0 (0.9, 1.1)	5.8	5.2	1.1 (0.9, 1.3)
Smoking risk only	0.3	0.7	0.4 (0.1, 0.7)	0.2	0.6	0.4 (0.1, 0.7)
Drinking risk only	1.5	0.8	1.8 (1.3, 2.4)	1.9	0.9	2.0 (1.4, 2.6)
F&V and physical activity risk	40.7	39.3	1.0 (1.0, 1.1)	33.7	32.3	1.0 (1.0, 1.1)
F&V and smoking risk	1.7	2.7	0.6 (0.4, 0.8)	2.7	3.9	0.7 (0.5, 0.9)
F&V and drinking risk	3.4	3.2	1.1 (0.8, 1.3)	5.6	5.8	1.0 (0.8, 1.1)
Physical activity and smoking risk	1.0	2.3	0.4 (0.3, 0.6)	0.7	1.6	0.4 (0.2, 0.6)
Physical activity and drinking risk	2.4	2.7	0.9 (0.7, 1.1)	1.9	2.4	0.8 (0.6, 1.0)
Smoking and drinking risk	0.2	0.2	0.9 (0.1, 1.8)	0.3	0.3	0.9 (0.2, 1.6)
F&V, physical activity and smoking risk	10.3	9.1	1.1 (1.0, 1.3)	10.4	10.1	1.0 (0.9, 1.1)
F&V, physical activity and drinking risk	8.8	10.8	0.8 (0.7, 0.9)	12.8	15.2	0.8 (0.8, 0.9)
F&V, smoking and drinking risk	1.0	0.7	1.3 (0.8, 1.8)	2.4	1.8	1.3 (1.0, 1.7)
Physical activity, smoking and drinking risk	0.7	0.6	1.1 (0.6, 1.6)	0.2	0.8	0.3 (0.0, 0.5)
All four risk behaviours	3.7	2.5	1.5 (1.2, 1.8)	7.0	4.7	1.5 (1.2, 1.7)
Unweighted Bases	2522			2555		
Weighted Bases	2553			2553		

F&V = fruit and vegetables

CYP

Table G.3 shows the 16 possible behavioural patterns and associated observed-expected ratios for all CYP, along with the observed and expected percentages and 95% confidence intervals. The most prevalent combination of risk behaviours was not meeting both fruit and vegetable and physical activity recommendations; this was found in 39% of HSE and 57% of UKHLS CYP. The next three most common patterns of risk behaviours were:

- fruit and vegetable risk only (26% of HSE and 10% of UKHLS CYP)
- physical activity risk only (8% of HSE and 7% of UKHLS CYP)
- fruit and vegetable, physical activity and drinking risks (7% of HSE and 15% of UKHLS CYP)

These four risk behaviour patterns were among the most common risk behaviour patterns found in HSE and UKHLS mothers (G.1). None of these risk patterns were clustered in UKHLS children, HSE children or UKHLS mothers (clustering of low fruit and vegetable intake and low physical activity was only marginally significant in the HSE). The high prevalence of these derives simply from the high prevalence of the individual behaviours.

There were two risk behaviour combinations with observed-expected ratios of significantly greater than one for CYP in both the HSE and the UKHLS, indicating clustering of these behaviours. These were:

- No risky behaviours (about 20% and 100% higher than would be expected in the HSE and UKHLS respectively)
- All four risk behaviours (about 220% and 390% higher than would be expected in the HSE and UKHLS respectively)

Note that the observed-expected ratios were based on a very small proportion of CYP engaging in all four risk behaviours, so these estimates are imprecise.

There were three additional behavioural patterns with an observed-expected ratio significantly greater than one in the HSE analysis, indicating clustering of the behaviours. These were:

- Physical activity and drinking risky behaviours
- Smoking and drinking risky behaviours
- Fruit and vegetable, smoking, and drinking risky behaviours

Again only a small proportion of CYP engaged in these behaviours so the estimates shown in Table 6.3 for these are very imprecise; no clustering was observed in the UKHLS.

Table G.3 Observed-expected ratios of HSE (2006 & 2008) and UKHLS (2010/11) children and young people

Risk Patterns	HSE CYP			UKHLS CYP		
	Observed	Expected	O/E (95%CI)	Observed	Expected	O/E (95%CI)
	%	%		%	%	
No risk	7.0	5.8	1.2 (1.0, 1.4)	3.3	1.7	2.0 (1.6, 2.4)
F&V only	25.7	26.5	1.0 (0.9, 1.1)	10.2	11.0	0.9 (0.8, 1.0)
Physical activity risk only	8.1	8.1	1.0 (0.9, 1.1)	7.3	8.3	0.9 (0.8, 1.0)
Smoking risk only	0.0	0.3	0.1 (0.0, 0.7)	0.0	0.0	-
Drinking risk only	0.8	1.3	0.6 (0.4, 1.0)	0.4	0.5	0.9 (0.4, 1.5)
F&V and physical activity risk	39.0	36.8	1.1 (1.0, 1.1)	56.6	55.0	1.0 (1.0, 1.1)
F&V and smoking risk	0.9	1.5	0.6 (0.4, 0.9)	0.0	0.3	-
F&V and drinking risk	5.4	6.0	0.9 (0.8, 1.1)	2.5	3.1	0.8 (0.6, 1.0)
Physical activity and smoking risk	0.1	0.5	0.2 (0.0, 0.7)	0.0	0.2	-
Physical activity and drinking risk	1.3	0.1	12.6 (8.2, 17)	1.8	2.4	0.8 (0.5, 1.0)
Smoking and drinking risk	0.4	0.1	5.9 (2.9, 10.6)	0.1	0.0	-
F&V, physical activity and smoking risk	0.8	2.1	0.4 (0.2, 0.6)	0.2	1.4	0.2 (0.0, 0.3)
F&V, physical activity and drinking risk	7.2	8.3	0.9 (0.7, 1.0)	15.4	15.7	1.0 (0.9, 1.1)
F&V, smoking and drinking risk	1.5	0.3	4.3 (2.9, 5.7)	0.0	0.1	-
Physical activity, smoking and drinking risk	0.2	0.1	1.7 (0.5, 4.3)	0.1	0.1	1.4 (-0.4, 3.2)
All four risk behaviours	1.5	0.5	3.2 (2.1, 4.2)	1.9	0.4	4.9 (3.6, 6.2)
Unweighted Bases	2384			2916		
Weighted Bases	2385			2847		

F&V = fruit and vegetables

Appendix H: Latent Class (lifestyle group) tables and summaries

Table H.1 Latent classes for UKHLS mothers (2010/11)						
Behaviours	Classes					
	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers & ex-smokers	Unhealthy low frequency drinkers	All
	%	%	%	%	%	%
Group size	25	23	16	16	22	100
Smoking status						
non-smoker	89	94				43
past experimenters	11	6				4
Ex-regular smoker			27	87	44	27
Current smoker - light			24	11	16	9
Current smoker - moderate			35	2	27	12
current smoker – heavy			14		13	5
Age started smoking						
Never smoked/not regular smoker	100	100				47
Under 16			57	26	48	23
16-18			31	48	36	20
19-24			9	22	14	8
25+			3	4	3	2
Drinking frequency						
Almost everyday	5	0	9	7		4
5/6 days per week	7		5	10		4
3/4 days per week	19		19	26	0	12
Once or twice a week	42	4	43	38	4	25
Once or twice a month	20	14	15	15	22	17
Every couple of months	6	15	5	3	27	12
Once or twice a year	1	21	3	0	29	12
Havent had a drink in last year		9			7	4
Didn't answer question		37	0	0	11	11
Number of units on heaviest drinking day						
Did not drink in past week	2	96	0	3	90	42
Up to and including 2	24	3	2	13	8	11
Over 2 and up to (& including) 3	5	0	4	2	1	2
Over 3 and up to (& including) 4	23	0	8	25	1	11
Over 4 and up to (& including) 5	3	0	6	1		2
Over 5 and up to (& including) 6	17		18	19		10
Over 6 and up to (& including) 8	12		18	15		8
Over 8	15	1	43	23		14
Fruit and Vegetable portions per day						
5 or more portions	23	18	7	35	13	19
3 or 4 portions	42	35	19	41	23	32
1 or 2 portions	8	16	16	7	13	12
none	27	32	57	17	50	36

Table H.1 Latent classes for UKHLS mothers (2010/11)

Behaviours	Classes					
	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers & ex-smokers	Unhealthy low frequency drinkers	All
	%	%	%	%	%	%
Not meeting fruit and vegetable recommendations	77.4	82.1	92.6	64.6	86.6	80.8
Number of days brisk or fast paced walking in past 4 weeks						
None	60	74	78	50	73	67
1-4 days	10	5	7	12	8	9
5-9 days	7	5	3	10	4	6
10-14 days	6	4	3	8	3	4
15 to 19 days	2	1	1	3	1	2
20 to 24 days	6	5	4	4	5	5
25 to 29 days	9	6	5	14	6	8
Frequency of participation in moderate+ sporting activity						
no moderate activities	14	43	37	6	40	29
three or more times a week	16	12	7	24	8	13
at least once a week	26	16	13	27	14	19
at least once a month	20	11	13	22	15	16
at least 3 or 4 times a year	16	12	19	13	15	15
twice in last 12 months	4	3	8	5	5	5
once in last 12 months	3	2	4	3	3	3
Not meeting physical activity recommendations	72.7	80.3	84.5	64.5	82.9	77.1
<i>Unweighted Bases</i>	1057	1367	618	642	855	4539
<i>Weighted Bases</i>	1022	926	641	640	885	4114

Table H.2 Latent classes for HSE mothers (2006 & 2008)

Behaviours	Classes						
	Never-smoked drinkers	Abstainers	Unhealthiest	Drinker& ex-smokers	Unhealthy low frequency drinkers	Attempters	All
	%	%	%	%	%	%	%
Group size	31	25	16	13	7	9	100
Smoking status							
Non-smoker	87	94	0	0	0	0	50
Ex-occasional smoker	12	5	0	0	0	0	5
Ex-regular smoker	0	0	24	76	14	52	19
Current smoker - light	1	0	18	19	13	29	9
Current smoker - moderate	0	0	37	5	43	14	11
current smoker – heavy	0	0	20	0	29	6	6
Age started smoking							
Never smoked/not regular smoker	100	100	0	0	0	0	56
Under 16	0	0	59	26	59	36	20
16-18	0	0	36	45	37	38	17
19-24	0	0	5	25	4	19	6
25+	0	0	1	4	0	7	1
Drinking frequency							
Almost everyday	9	0	11	17	0	0	7
5/6 days per week	7	0	5	10	0	0	4
3/4 days per week	21	0	17	28	0	2	13
Once or twice a week	41	6	42	36	6	11	27
Once or twice a month	15	15	18	7	18	20	15
Every couple of months	5	14	6	2	23	25	10
Once or twice a year	2	14	1	0	26	22	8
Never drinks, never has	0	41	0	0	7	8	11
Used to drink, but never drinks now	0	7	0	0	16	8	4
Drinks very occasionally but not in past year	0	3	0	0	3	3	1
Number of units on heaviest drinking day							
Did not drink in past week	0	100	1	0	96	92	40
Up to and including 2	37	0	19	23	4	8	18
Over 2 and up to (& including) 3	7	0	7	7	0	0	4
Over 3 and up to (& including) 4	18	0	11	15	0	0	9
Over 4 and up to (& including) 5	4	0	6	4	0	0	3
Over 5 and up to (& including) 6	12	0	10	15	0	0	7
Over 6 and up to (& including) 8	8	0	12	9	0	0	6
Over 8	14	0	35	25	0	0	13
Vegetable consumption							
none or less than 1 portion	22	24	41	14	62	15	27
1-2 portions	60	58	53	63	36	65	58
3-4 portions	15	15	5	21	2	14	13
5+ portions	3	3	1	3	0	6	3
(continued)							

Table H.2 Latent classes for HSE mothers (2006 & 2008)

Behaviours	Classes						
	Never-smoked drinkers	Abstainers	Unhealthiest	Drinker& ex-smokers	Unhealthy low frequency drinkers	Attempters	All
	%	%	%	%	%	%	%
Fruit consumption							
none or less than 1 portion	15	15	47	6	61	6	21
1-2 portions	46	45	45	46	37	47	45
3-4 portions	29	29	6	33	1	33	25
5+ portions	11	11	2	15	0	14	10
Not meeting fruit and vegetable recommendations	65.4	65.7	93.1	54.3	99.2	56.8	69.9
Number of days walking in past 4 weeks							
None	63	76	76	53	81	68	69
1-4days	6	5	5	5	3	4	5
5-9 days	7	2	4	7	3	5	5
10-14 days	5	3	4	6	1	7	4
15 to 19 days	3	1	2	4	1	1	2
20 to 24 days	5	5	4	8	5	8	6
25 to 29 days	11	8	6	17	7	7	10
Number of sporting occasions in past 4 weeks							
None	47	69	67	36	86	56	58
1 to 4	22	14	21	20	9	17	18
5 to 9	13	6	6	17	3	11	10
10 to 14	8	5	4	9	1	7	6
15 to 19	4	1	1	7	1	3	3
20 to 24	2	2	0	5	0	3	2
25+	4	2	1	7	0	3	3
Not meeting physical activity recommendations	63.5	70.5	67.5	47.5	87.6	60.8	63.9
<i>Unweighted Bases</i>	1312	1004	680	542	293	387	4218
<i>Weighted Bases</i>	1171	949	599	484	255	349	3807

Mothers lifestyle groups: similarities between UKHLS and HSE

Never-smoked drinkers

This was the largest class in both the HSE and UKHLS. They had never regularly smoked, and were about average in relation to physical activity and fruit and vegetables intake compared to other mothers in their study. They frequently consumed alcohol but binge drank less than other classes who engaged in binge drinking.

UKHLS mothers (25%)

- *no current smokers*
- *27% had drank over 6 units on their heaviest drinking day & 31% drank more than twice a week*
- *73% did not meet physical activity recommendations*
- *77% did not consume 5+ fruit and vegetables on average per day*

HSE mothers (31%)

- *no current smokers*
- *22% had drank over 6 units on their heaviest drinking days & 37 % drank more than twice a week*
- *64% did not meet physical activity recommendations*
- *65% did not consume 5+ fruit and vegetables on average per day*

Abstainers

Like the 'Never-smoked drinkers', the mothers were all non-smokers. But while the large majority of Never-smoked drinkers drank regularly, almost all the Abstainers were occasional or non-drinkers. The Abstainers had about average F&V intake and engaged in below average physical activity.

UKLHS mothers (23%)

- *no current smokers*
- *1% had drank over 6 unit on their heaviest drinking days & none drank more than twice a week, but 37% did not answer these questions*
- *80% did not meet physical activity recommendations*
- *82% did not consume 5+ fruit and vegetables each day*

HSE mothers (25%)

- *no current smokers*
- *none had drank over 6 unit on their heaviest drinking days & none drank more than twice a week*
- *71% did not meet physical activity recommendations*
- *66% did not consume 5+ fruit and vegetables on average per day*

Unhealthiest behaviour group

This group had a high proportion of current smokers, the remainder being ex-smokers. Many started smoking under the age of 16. The group also had the highest prevalence of binge drinking, although they did not drink more frequently than other classes who drank. They had low fruit and vegetable intake, with a high percentage consuming less than one portion of vegetables or fruit per day in the past week, and had low participation in physical activity compared to average.

UKHLS mothers (16%)

- *73% current smokers with 14% being heavy smokers*
- *61% had drank over 6 units on their heaviest drinking day & 33% drank more than twice a week*
- *93% did not consume 5+ fruit and vegetables each day*
- *85% did not meet physical activity recommendations*

HSE mothers (16%)

- *75% current smokers with 20% being heavy smokers*
- *47% had drank over 6 units on their heaviest drinking day & 33 % drank more than twice a week*
- *93% did not consume 5+ fruit and vegetables on average per day*
- *68% did not meet physical activity recommendations*

Drinkers, ex-smokers but healthier physical activity and fruit and vegetable consumers

This group consisted mainly of ex-regular smokers along with some current light or moderate smokers, and had a lower proportion that started smoking under 16 than the other groups with current or ex-smokers. This group had the highest proportion who drank more than twice a week. Conversely this group had the highest intake of fruit and vegetables and the most frequent participation in physical activity.

UKHLS Mothers (16%)

- 13% current light or moderate smokers, 87% ex-smokers
- 38% had drank over 6 units on their heaviest drinking day & 43% drank more than twice a week
- 65% did not consume 5+ fruit and vegetables each day
- 65% did not meet physical activity recommendations

HSE Mothers (13%)

- 24% current light or moderate smokers, 76% ex-smokers
- 34% had drank over 6 units on their heaviest drinking day & 55% drank more than twice a week
- 54% did not consume 5+ fruit and vegetables on average per day
- 48% did not meet physical activity recommendations

Unhealthy low frequency drinkers

Although this group consisting of occasional or non-drinkers, they were unhealthy with respect to the other three health behaviours. The majority in this group were current smokers, with many in the HSE being heavy smokers. They were low fruit and vegetable consumers and low participators in physical activity, with a high proportion in the HSE eating less than one portion a week or doing no physical activity.

UKHLS Mothers (22%)

- 56% current smokers, 14% heavy smokers
- none had drank over 6 units on their heaviest drinking day & none drank more than twice a week
- 87% did not consume 5+ fruit and vegetables each day
- 83% did not meet physical activity recommendations

HSE Mothers (7%)

- 85% current smokers, 29% heavy smokers
- none had drank over 6 units on their heaviest drinking day & none drank more than twice a week
- 99% did not consume 5+ fruit and vegetables on average per day
- 88% did not meet physical activity recommendations

Attempters

‘Attempters’ were a group that appeared to be trying to be healthy. This group was made up mainly of ex-regular or current light smokers, infrequent drinkers, the second highest fruit and vegetable consumers and average participators in walking and sport.

UKHLS Mothers (0%)

There was no corresponding class in the UKHLS and none appeared similar to HSE ‘Attempters’ when a UKHLS 6-class solution was tried.

HSE Mothers (9%)

- 49% current smokers, 52% ex-smokers
- none had drank over 6 units on their heaviest drinking day & 2% drank more than twice a week
- 57% did not consume 5+ fruit and vegetables on average per day
- 61% did not meet physical activity recommendations

Table H.3 Latent classes for all UKHLS partnered mothers (2010/11)

Behaviours	Classes					
	Never-smoked drinkers	Abstainers	Unhealthy low frequency drinkers	Unhealthiest	Drinkers & ex-smokers	All
	%	%	%	%	%	%
Group size	28	25	18	11	19	100
Smoking status						
non-smoker	88	94				48
past experimenters	12	6				5
Ex-regular smoker			51	33	82	28
Current smoker - light			14	12	15	7
Current smoker - moderate			23	41	2	9
current smoker – heavy			12	15	0	4
Age started smoking						
Never smoked/not regular smoker	100	100				53
Under 16			45	56	29	20
16-18			39	34	46	19
19-24			13	8	21	7
25+			3	1	4	1
Drinking frequency						
Almost everyday	5	0		10	7	4
5/6 days per week	7			5	10	4
3/4 days per week	20			17	28	13
Once or twice a week	42	5	4	45	32	24
Once or twice a month	19	13	20	17	16	17
Every couple of months	6	15	27	5	3	12
Once or twice a year	0	20	31	1	2	11
Havent had a drink in last year		9	7			4
Didn't answer question		37	10		1	11
Number of units on heaviest drinking day						
Did not drink in past week	1	96	91	1	2	41
Up to and including 2	24	3	7	5	13	12
Over 2 and up to (& including) 3	5		1	3	2	2
Over 3 and up to (& including) 4	24		1	14	21	12
Over 4 and up to (& including) 5	3	1		6	1	2
Over 5 and up to (& including) 6	18			18	18	10
Over 6 and up to (& including) 8	12			19	16	9
Over 8	13			34	27	12
Fruit and Vegetable portions per day						
5 or more portions	24	19	13	6	34	21
3 or 4 portions	43	35	26	16	39	34
1 or 2 portions	8	15	13	19	7	12
none	24	31	48	59	20	33

Table H.3 Latent classes for all UKHLS partnered mothers (2010/11)

Behaviours	Classes					
	Never-smoked drinkers	Abstainers	Unhealthy low frequency drinkers	Unhealthiest	Drinkers & ex- smokers	All
	%	%	%	%	%	%
<i>Not meeting fruit and vegetable recommendations</i>	75.8	81.3	86.6	94.1	66.1	79.2
Number of days brisk or fast paced walking in past 4 weeks						
None	59	74	74	85	51	67
1-4days	11	6	9	5	12	9
5-9 days	7	5	4	3	9	6
10-14 days	6	3	3	2	8	5
15 to 19 days	3	1	1		3	2
20 to 24 days	6	6	4	3	4	5
25 to 29 days	9	5	5	2	13	7
Frequency of participation in moderate activity						
no moderate activities	13	43	40	42	6	27
three or more times a week	17	12	8	4	24	13
at least once a week	27	15	13	6	28	18
at least once a month	20	12	16	13	21	16
at least 3 or 4 times a year	16	12	14	22	12	15
twice in last 12 months	5	4	5	10	5	6
once in last 12 months	3	3	3	3	4	3
<i>Not meeting physical activity recommendations</i>	71.3	80.4	84.6	90.7	65.1	76.7
<i>Unweighted Bases</i>	880	1118	531	301	567	3397
<i>Weighted Bases</i>	867	771	565	330	582	3115

Table H.4 Latent classes for all UKHLS partners (2010/11)

Behaviour	Classes					
	Never-smoked, drinkers	Abstainers	Unhealthy low frequency drinkers	Unhealthiest	Drinkers & ex-smokers	All
	%	%	%	%	%	%
Group size	29	17	16	12	26	100
Smoking status						
non-smoker	83	92				39
past experimenters	17	8				6
Ex-regular smoker			45	14	73	28
Current smoker - light			14	1	21	8
Current smoker - moderate			25	43	6	11
current smoker – heavy			17	42		8
Age started smoking						
Never smoked/not regular smoker	100	100				46
Under 16			44	60	30	22
16-18			35	33	44	21
19-24			14	7	20	8
25+			7		5	2
Drinking frequency						
Almost everyday	8			26	11	9
5/6 days per week	7		3	7	12	7
3/4 days per week	29			18	29	18
Once or twice a week	45	8	9	34	33	29
Once or twice a month	10	21	27	10	13	15
Every couple of months	1	20	21	4	1	8
Once or twice a year	0	15	18	1		5
Haven't had a drink in last year		7	7			2
Didn't answer question		29	15	0		7
Number of units on heaviest drinking day						
Did not drink in past week	1	86	86		0	28
Up to and including 2	11	8	10		8	8
Over 2 and up to (& including) 3	1	1	0	0	1	1
Over 3 and up to (& including) 4	17	3	2	5	13	10
Over 4 and up to (& including) 5	2		0		1	1
Over 5 and up to (& including) 6	16	1	1	10	12	9
Over 6 and up to (& including) 8	16			15	17	11
Over 8	37	1		69	47	32
Fruit and Vegetable portions per day						
5 or more portions	20	12	8	2	17	14
3 or 4 portions	30	27	17	14	29	25
1 or 2 portions	12	16	18	12	16	15
none	38	45	57	73	38	46
Not meeting physical activity recommendations	79.9	88.0	91.6	97.9	83.0	86.0

Table H.4 Latent classes for all UKHLS partners (2010/11)

Behaviour	Classes					
	Never-smoked, drinkers	Abstainers	Unhealthy low frequency drinkers	Unhealthiest	Drinkers & ex-smokers	All
	%	%	%	%	%	%
Number of days brisk or fast paced walking in past 4 weeks						
None	51	70	63	67	54	59
1-4days	16	11	12	12	14	14
5-9 days	11	4	8	4	6	7
10-14 days	6	4	4	3	6	5
15 to 19 days	3	1	1	3	3	2
20 to 24 days	5	4	1	5	6	5
25 to 29 days	9	7	10	5	10	8
Frequency of participation in moderate+ sporting activity						
no moderate activities	11	33	32	39	6	20
three or more times a week	19	14	13	9	25	17
at least once a week	27	19	17	15	25	22
at least once a month	20	16	14	10	23	18
at least 3 or 4 times a year	16	12	17	16	16	16
twice in last 12 months	4	3	5	7	3	4
once in last 12 months	2	2	2	4	3	3
<i>Not meeting physical activity recommendations</i>	70.5	75.9	79.3	81.3	65.1	72.6
<i>Unweighted Bases</i>	706	531	435	265	617	2554
<i>Weighted Bases</i>	750	425	405	313	677	2570

We also conducted latent class analyses for HSE mothers with partners to determine lifestyle groups. A six-class solution was identified as optimal and the classes were very similar to the six classes produced for all mothers (not tabled). As with the UKHLS, a larger proportion of partners than mothers in the 'unhealthiest behaviour' group did not meet recommendations, particularly for smoking and drinking. Additionally, partners in the 'drinker, ex-smokers and healthier physical activity and fruit and vegetable consumers' were more frequent drinkers than mothers.

Table H.5 Latent classes for HSE children and young people (2006 & 2008)

Behaviours	Classes				
	Abstainers	Healthiest	Unhealthiest	Drink Attempters	All
	%	%	%	%	%
Group size	53	10	18	20	100
Smoking status					
Never smoked	100	100	1	100	81
Only smoked once or twice, or used to smoke sometimes but now never does	0	0	70	0	13
Smokes 1+ cigarettes a week OR had a cotinine reading of 15+ng/ml	0	0	29	0	5
Age when first had a cigarette					
Never had a cigarette	100	100	4	100	82
First had a cigarette when aged under 10	0	0	11	0	2
First had a cigarette when aged 10-13	0	0	67	0	12
First had a cigarette when aged 14-15	0	0	18	0	3
Age of first alcoholic drink					
Never had an alcoholic drink	100	67	16	0	60
Had first drink when aged under 10	0	7	7	6	3
Had first drink when aged 10-13	0	24	62	73	29
Had first drink when aged 14-15	0	2	15	21	8
Drinking frequency					
Almost every day	0	0	1	0	0
About twice a week	0	0	4	1	1
About once a week or once a fortnight or once a month	0	0	37	28	13
Only a few times a year or never	100	100	57	71	86
Vegetable consumption					
None or less than 1 portion	43	26	50	43	43
1-2 portions	52	52	42	53	50
3-4 portions	5	20	6	4	6
5+ portions	0	2	1	0	1
Fruit consumption					
None or less than 1 portion	19	6	33	20	20
1-2 portions	54	41	44	58	52
3-4 portions	23	37	18	17	22
5+ portions	5	16	6	5	6
<i>Not meeting fruit and vegetable recommendations</i>	<i>83.9</i>	<i>58.1</i>	<i>85.0</i>	<i>86.7</i>	<i>82.0</i>
Time spent walking in last 7 days					
No time	30	6	14	17	22
Some, less than 1 hr	19	9	9	16	16
less than 3 hrs	32	38	33	32	33
less than 5hrs	11	3	9	10	10
less than 7hrs	5	26	12	11	9
7 hrs or more	4	17	22	13	10
Time spent doing sport last week					

Table H.5 Latent classes for HSE children and young people (2006 & 2008)

Behaviours	Classes				
	Abstainers	Healthiest	Unhealthiest	Drink Attempters	All
	%	%	%	%	%
No time	45	3	46	45	41
Some, less than 1 hr	8	0	8	5	7
less than 3 hrs	27	8	19	22	22
less than 5hrs	13	21	10	13	13
less than 7hrs	6	13	4	8	7
7 hrs or more	2	55	13	7	10
Time spent actively playing last week					
No time	21	0	23	24	20
Some, less than 1 hr	12	0	12	12	11
less than 3 hrs	24	2	18	25	21
less than 5hrs	14	19	14	13	15
less than 7hrs	8	17	8	7	9
7 hrs or more	21	63	25	18	25
<i>Not meeting physical activity recommendations</i>	67.7	10.4	51.3	60.9	57.6
<i>Unweighted Bases</i>	1397	276	466	529	2668
<i>Weighted Bases</i>	1413	271	481	526	2690

Table H.6 Latent classes for UKHLS children and young people (2010/11)

Behaviours	Classes			
	Abstainers	Healthiest	Unhealthiest	All
	%	%	%	%
Group Size	69	24	7	100
Smoking				
never smoked	98	98	9	91
experimented with 1 or 2 in lifetime	1	0	36	4
ex-smoker	1	1	15	2
occasional - not every week	0	1	10	1
1 - 6 a week	0	0	11	1
more than 6 a week	0	1	18	2
Drinking				
never drank	74	85	0	71
drank most days	0	0	3	0
drank 1 or 2 a week	0	3	26	3
drank 2 or 3 a month	6	7	42	9
once a month	12	2	27	11
None in month	8	3	2	7
Fruit and vegetable portions				
5	3	42	10	13
3 - 4	42	58	34	45
1 - 2	50	0	45	38
0	4	0	10	4
Not meeting fruit and vegetable recommendations	96.6	58.1	89.9	87
Physical activity				
every day	8	44	9	17
5 - 6 days	11	44	13	19
3 - 4 days	37	12	31	30
1 - 2 days	34	0	29	26
less than 1 week	7	0	10	6
hardly ever	3	0	8	3
Not meeting physical activity recommendations	92.2	55.6	90.9	83
<i>Unweighted Bases</i>	1998	712	187	2897
<i>Weighted Bases</i>	1957	682	208	2847

Appendix J: Description of predicted probabilities of the socio-demographic characteristics

Here we provide textual descriptions of the predicted probabilities of the socio-demographic characteristics of being in a latent class (i.e. a lifestyle group) for UKHLS mothers. The predicted probabilities and their confidence intervals are given in table J.2; these were generated after producing the estimated odds ratios of belonging to a class (Table J.1) for socio-demographic variables that remained significant predictors. The predicted probabilities are presented in diagram format in Figure 8.1.

Never-smoked drinkers group: On average, the probability of being in the Never-smoked drinkers group for UKHLS individuals was 25%, but whilst holding other predictors at their average value the probability of being in the group increased to 31% if the mothers were 45 years old or over, or to 31% if they had a degree, to 29% if they were in the top fifth of household income, to 28% if there were married, or to 27% if they were working or were white or did not have a limiting long-standing illness (figure 8.1). Conversely, the probability of being in this group decreased to about 7% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, to 19% if they were aged below 25 or had no qualifications, or to 20% if they were in the bottom fifth of household income or economically inactive or had a limiting long-standing illness.

Abstainers group: On average, the probability of being in the Abstainers group was 23%, but this increased to about 83% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, to 52% if they were mixed race, to 26% if they were married or were in the second to bottom fifth of household income or to 24% if they were economically inactive (figure 8.1). Conversely, the probability of being in this group decreased to 15% if they were white, to 17% if they were single or previously married or to 19% if they were cohabiting.

Unhealthiest group: On average, the probability of being in the Unhealthiest group for UKHLS individuals was 16%, but this increased to 23% if the mothers were single or previous married, to 19% if they were 25-34 years of age or had no qualifications or had up O-levels, or to 17% if they were white (figure 8.1). Conversely, the probability of being in this group decreased to 14-15% if they were 35 years old or over, to 11% if there were married, to 7% if they had a degree or to about 2% if they were Indian, Pakistani, Bangladeshi, Black African or Arab.

Drinkers an ex-smokers: On average, the probability of being in the Drinkers and ex-smokers group for UKHLS individuals was 16%, but this increased to 21% if they had a degree, to 22% if they were mixed race, or to 17% if they were white or 35 years old or over or in the top fifth of household income (figure 8.1). Conversely, the probability of being in this group decreased to about 6% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, to 9% if they were aged below 25, to 11% if they had no qualifications, or had a limiting long-standing illness, or to 12% if they were in the bottom fifth of household income.

Unhealthy low frequency drinkers: On average, the probability of being in the Unhealthy low frequency drinkers group for UKHLS individuals was 22%, but this increased to 31% if they were below 25 years of age, to 29% if they had a limiting long-standing illness, to 27% if they were cohabiting, to 26% if they were in the bottom fifth of household income or they had no qualifications, to 25% if they were single or previous married, to 24% if they were white or

economically inactive (figure 8.1). Conversely, the probability of being in this group decreased to 6% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, 13% if they had a degree, to 15% if they were in the top fifth of household income, 18% if they were married.

Textual descriptions of predicted probabilities of the socio-demographic characteristics of being in a latent class (i.e. a lifestyle group) for **UKHLS partners**. These are presented in diagram format in Figure 8.2. The predicted probabilities and their confidence intervals can be observed in table J.5.

Never-smoked drinkers group: On average, the probability of being in the Never-smoked drinkers group for UKHLS individuals was 29%, but of being in whilst holding other predictors at their average value the probability of being in the group increased to 34% if these partners were 45 years old or over, or to 35% if they had a degree or were in the top fifth of household income, to 32% if they were white, to 31% if they were married, or to 30-31% if their youngest child was under 10 years of age (figure 8.2). Conversely, the probability of being in this group decreased to about 12% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, to 18% if they were economically inactive, to 20% if they were cohabiting, 22% if they were aged below 35 or had no qualifications, to 23% if they were in the bottom fifth of household income or to 25% if their youngest child was over 10 years of age.

Abstainers group: On average, the probability of being in the Abstainers group was 17%, but this increased to about 53% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, to 24% if they were mixed race, or 40% if they were other non-white or to 20% if they were in the middle fifth of household income (figure 8.2). Conversely, the probability of being in this group decreased to 12% if they were white or to 11% if they were in the top fifth of household income.

Unhealthiest group: On average, the probability of being in the Unhealthiest group for UKHLS individuals was 17%, but this increased to 18% if these partners had no qualifications, to 16 % if they were cohabiting or below the age of 35 years of age, or to 13% if they were white (figure 8.2). Conversely, the probability of being in this group decreased to 10-11% if they were 35 years old or over, to 11% if they were married, to 7% if they had a degree or to 3% if they were Indian, Pakistani, Bangladeshi, Black African or Arab.

Drinkers and ex-smokers: On average, the probability of being in the Drinkers and ex-smokers group for UKHLS individuals was 26%, but this increased to 29-30% if they were in the top two fifth of household income; to 29% if they had a degree, to 32% if they were mixed race, or to 28% if they were white, or to 27-29% if they had less than three children (figure 8.2). Conversely, the probability of being in this group decreased to 10% if they were Indian, Pakistani, Bangladeshi, Black African or Arab, to 18% if they had three or more children, to 19% if they were in the bottom fifth of household income or to 22% if they had no qualifications.

Unhealthy low frequency drinkers: On average, the probability of being in the Unhealthy low frequency drinkers group for UKHLS partners was 16%, but this increased to 23% if they were in the bottom fifth of household income, to 22% if they had a limiting long-standing illness or to 19% if they had no qualifications (figure 8.2). Conversely, the probability of being in this group decreased to 9% if they were in the top fifth of household income, to 12% if they had a degree or to 15% if they had no limiting long-standing illness.

Table J.1 Socio-demographic patterning of UKHLS (2010/11) mothers' latent classes: estimated odds ratios of belonging to a class

Socio-demographic and health characteristics	Never-smoked drinkers OR (95% CI)	Abstainers OR (95% CI)	Unhealthiest OR (95% CI)	Drinkers, ex-smokers OR (95% CI)	Unhealthy low freq drinkers OR (95% CI)	n
Age group (p-values derived from Wald tests)	(p<0.001)		(p=0.009)	(p=0.001)	(p<0.001)	
16-24	1		1	1	1	255
25-34	1.03 (0.63, 1.68)		1.56 (1.03, 2.37)	1.49 (0.84, 2.66)	0.70 (0.50, 0.96)	1206
35-44	1.52 (0.94, 2.46)		1.16 (0.77, 1.75)	2.20 (1.23, 3.93)	0.51 (0.37, 0.71)	1877
45-74	1.98 (1.19, 3.28)		1.06 (0.68, 1.65)	2.07 (1.14, 3.75)	0.45 (0.31, 0.66)	776
Marital status	(p<0.001)	(p<0.001)	(p<0.001)		(p<0.001)	
Single or previously married	1	1	1		1	998
Married or civil partnership	1.81 (1.45, 2.25)	2.18 (1.71, 2.61)	0.39 (0.31, 0.50)		0.64 (0.51, 0.79)	2420
Cohabitees	1.04 (0.77, 1.38)	1.24 (0.90, 1.58)	0.82 (0.64, 1.06)		1.14 (0.90, 1.46)	697
Highest educational qualification	(p<0.001)		(p<0.001)	(p<0.001)	(p<0.001)	
Degree or higher (or equivalent)	1		1	1	1	1022
Higher education or A level equivalent	0.88 (0.71, 1.08)		2.26 (1.59, 3.21)	0.71 (0.55, 0.92)	1.68 (1.23, 2.28)	939
O-level or equivalent	0.57 (0.46, 0.70)		3.29 (2.38, 4.55)	0.57 (0.43, 0.74)	2.39 (1.75, 3.25)	1324
Other or none	0.49 (0.38, 0.64)		3.20 (2.23, 4.60)	0.43 (0.31, 0.60)	2.56 (1.85, 3.54)	829
Equivalised income quintiles (monthly)	(p<0.001)	(p=0.010)		(p=0.04)	(p=0.001)	
Top Quintile (>=£2675)	1	1		1	1	763
2nd Quintile (>=£1767<£2675)	0.95 (0.77, 1.18)	1.16 (0.86, 1.54)		0.93 (0.72, 1.20)	1.34 (0.96, 1.85)	873
3rd Quintile (>=£1266<£1767)	0.65 (0.50, 0.82)	1.41 (1.07, 1.88)		0.99 (0.75, 1.31)	1.74 (1.26, 2.42)	912
4th Quintile (>=£884<£1266)	0.64 (0.49, 0.83)	1.62 (1.21, 2.23)		0.72 (0.52, 1.00)	1.66 (1.18, 2.33)	872
Bottom Quintile (<£884)	0.57 (0.41, 0.79)	1.19 (0.85, 1.75)		0.64 (0.44, 0.91)	2.09 (1.45, 3.02)	695
Economic activity	(p<0.001)	(p=0.050)			(p<0.030)	
In employment, self emp or govt training	1	1			1	2673
Unemployed or economically inactive	0.66 (0.54, 0.81)	1.22 (1.00, 1.49)			1.25 (1.02, 1.52)	1441
Ethnic group	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)	
White	1	1	1	1	1	3538
Mixed	0.61 (0.33, 1.11)	2.77 (1.61, 4.79)	0.49 (0.24, 0.99)	1.41 (0.81, 2.45)	0.76 (0.46, 1.27)	54
Indian, Pakistani, Bangladeshi, black African, Arab	0.19 (0.13, 0.28)	30.4 (23.2, 39.9)	0.08 (0.04, 0.16)	0.03 (0.01, 0.09)	0.21 (0.14, 0.30)	353
Other	0.53 (0.37, 0.76)	6.36 (4.86, 8.33)	0.40 (0.25, 0.63)	0.46 (0.28, 0.73)	0.59 (0.41, 0.86)	167
Limiting long-standing illness	(p=0.004)			(p=0.002)	(p<0.001)	
Limiting LI	1			1	1	573
Non limiting LI, or no LI	1.44 (1.12, 1.84)			1.62 (1.20, 2.19)	0.58 (0.46, 0.72)	3541

Table J.2 The probability of UKHLS (2010/11) mothers being in a lifestyle group varying with socio-demographic characteristics						
Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	n
Overall probability % (95% CI)	24.8 (23.6, 26.1)	22.5 (21.3, 23.7)	15.6 (14.4, 16.7)	15.5 (14.4, 16.6)	21.5 (20.2, 22.9)	4114
Age group						
16-24	19.2 (12.6, 25.9)		13.1 (9.1, 17.0)	9.0 (4.6, 13.5)	30.7 (25.0, 36.3)	255
25-34	19.6 (17.3, 22.0)		18.5 (16.3, 20.7)	12.8 (10.8, 14.7)	24.3 (21.7, 26.9)	1206
35-44	25.8 (24.0, 27.7)		14.8 (13.1, 16.4)	17.5 (15.7, 19.3)	19.4 (17.5, 21.3)	1877
45-74	30.6 (27.4, 33.7)		13.7 (11.0, 16.4)	16.7 (14.0, 19.3)	17.8 (14.8, 20.8)	776
Marital status						
Single or previously married	18.7 (16.0, 21.4)	16.6 (14.5, 18.7)	22.6 (19.9, 25.3)		24.6 (21.8, 27.3)	998
Married or civil partnership	28.3 (26.6, 30.1)	26.2 (24.5, 28.0)	10.6 (9.2, 12.1)		17.8 (16.0, 19.6)	2420
Cohabitees	19.1 (16.0, 22.4)	18.9 (15.9, 21.8)	19.5 (16.6, 22.5)		26.9 (23.5, 30.3)	697
Highest educational qualification						
Degree or higher (or equivalent)	30.5 (27.7, 33.3)		7.1 (5.3, 8.9)	21.1 (18.3, 23.9)	12.8 (10.0, 15.7)	1022
Higher education or A level equivalent	28.0 (25.3, 30.8)		14.4 (11.9, 16.8)	16.1 (13.8, 18.6)	19.3 (16.7, 21.9)	939
O-level or equivalent	20.7 (18.4, 23.0)		19.3 (17.2, 21.5)	13.4 (11.3, 15.5)	24.8 (22.4, 27.2)	1324
Other or none	18.7 (15.7, 21.6)		18.9 (16.0, 21.9)	10.5 (8.1, 13.0)	26.0 (22.9, 29.1)	829
Equivalised income quintiles (monthly)						
Top Quintile (>=£2675)	29.3 (26.2, 32.4)	19.6 (17.0, 22.1)		17.3 (14.5, 20.0)	15.1 (11.8, 18.4)	763
2nd Quintile (>=£1767<£2675)	28.4 (25.5, 31.3)	21.4 (18.8, 24.0)		16.3 (13.8, 18.7)	18.9 (15.8, 22.0)	873
3rd Quintile (>=£1266<£1767)	21.7 (19.0, 24.4)	23.9 (21.5, 26.2)		17.1 (14.6, 19.7)	22.9 (20.2, 25.7)	912
4th Quintile (>=£884<£1266)	21.5 (18.5, 24.6)	25.8 (23.0, 28.6)		13.2 (10.6, 15.9)	22.2 (19.4, 24.9)	872
Bottom Quintile (<£884)	20.0 (15.9, 23.7)	21.7 (18.7, 24.6)		11.9 (9.0, 14.8)	26.0 (22.3, 29.7)	695
Economic activity						
In employment, self emp or govt training	26.7 (25.1, 28.3)	21.6 (20.2, 23.1)			20.2 (18.5, 21.9)	2673
Unemployed or economically inactive	20.0 (17.5, 22.5)	24.2 (22.0, 26.4)			23.6 (21.1, 26.0)	1441
Ethnic group						
White	27.0 (25.6, 28.4)	14.9 (13.6, 16.3)	17.1 (15.8, 18.4)	17.2 (16.0, 18.5)	23.2 (21.7, 24.8)	3538
Mixed	19.0 (10.5, 27.4)	32.3 (20.9, 43.7)	9.4 (3.5, 15.3)	22.5 (13.3, 31.6)	19.2 (12.1, 26.2)	54
Indian, Pakistani, Bangladeshi, black African, Arab	7.3 (4.9, 9.7)	83.1 (79.6, 86.5)	1.7 (0.5, 2.8)	0.6 (0.0, 1.3)	6.5 (4.4, 8.6)	353
Other	17.2 (12.6, 21.9)	51.6 (45.6, 57.7)	7.9 (4.7, 11.0)	8.8 (5.1, 12.5)	15.8 (11.3, 20.2)	167
Limiting longstanding illness						
Limiting LI	19.9 (16.6, 23.1)			10.9 (8.2, 13.5)	29.1 (25.5, 32.8)	573
Non limiting LI, or no LI	25.6 (24.2, 26.9)			16.2 (15.0, 17.5)	20.2 (18.8, 21.6)	3541

Table J.3 Socio-demographic patterning of HSE (2006 & 2008) mothers' latent class: estimated odds ratios of belonging to a class

Socio-demographic and health characteristics	Never-smoked drinkers OR (95% CI)	Abstainers OR (95% CI)	Unhealthiest OR (95% CI)	Drinkers, ex-smokers OR (95% CI)	Unhealthy low freq drinkers OR (95% CI)	Attempters OR (95% CI)	<i>n</i>
Age group (p-values derived from Wald tests)	(p<0.001)		(p<0.001)		(p=0.009)	(p=0.048)	
16-24	1		1		1	1	275
25-34	1.09 (0.73, 1.62)		1.09 (0.78, 1.51)		0.71 (0.47, 1.07)	0.96 (0.64, 1.43)	1260
35-44	1.66 (1.13, 2.44)		0.80 (0.57, 1.13)		0.57 (0.38, 0.85)	0.93 (0.63, 1.38)	2003
45-74	1.86 (1.23, 2.81)		0.61 (0.41, 0.92)		0.46 (0.28, 0.76)	0.58 (0.36, 0.93)	680
Marital status	(p<0.001)	(p<0.001)	(p<0.001)			(p<0.001)	
Single or previously married	1	1	1			1	1061
Married or civil partnership	1.43 (1.17, 1.75)	2.24 (1.77, 2.83)	0.45 (0.36, 0.55)			0.62 (0.47, 0.83)	2532
Cohabitees	0.88 (0.67, 1.16)	1.73 (1.26, 2.37)	0.68 (0.53, 0.88)			1.12 (0.83, 1.51)	625
Highest educational qualification	(p<0.001)		(p<0.001)	(p<0.001)	(p<0.001)		
Degree or higher (or equivalent)	1		1	1	1		945
Higher education or A level equivalent	0.94 (0.78, 1.15)		1.82 (1.30, 2.55)	0.89 (0.69, 1.15)	3.64 (1.56, 8.48)		1143
O-level or equivalent	0.72 (0.59, 0.89)		2.81 (2.02, 3.89)	0.59 (0.44, 0.79)	6.92 (3.07, 15.6)		1250
Other or none	0.39 (0.30, 0.50)		2.96 (2.08, 4.23)	0.45 (0.32, 0.65)	12.7 (5.64, 28.8)		880
Equivalised income quintiles (yearly)	(p<0.001)	(p<0.001)	(p<0.001)	(p=0.009)	(p<0.001)	(p=0.002)	
Top Quintile (>=£49400)	1	1	1	1	1	1	576
2nd Quintile (>=£29939 < £49400)	0.70 (0.56, 0.88)	1.27 (0.91, 1.77)	2.83 (1.75, 4.57)	0.89 (0.66, 1.20)	1.42 (0.63, 3.23)	1.08 (0.65, 1.79)	780
3rd Quintile (>=£19204 < £29939)	0.55 (0.43, 0.71)	1.57 (1.13, 2.18)	2.75 (1.68, 4.50)	0.81 (0.59, 1.11)	2.41 (1.16, 5.01)	1.60 (0.99, 2.59)	740
4th Quintile (>=£13057 < £19204)	0.38 (0.29, 0.50)	1.57 (1.12, 2.20)	3.78 (2.34, 6.12)	0.88 (0.62, 1.23)	2.54 (1.18, 5.47)	1.81 (1.12, 2.94)	740
Bottom Quintile (< £13057)	0.24 (0.18, 0.33)	2.03 (1.43, 2.87)	3.34 (1.99, 5.61)	0.49 (0.33, 0.74)	4.67 (2.12, 9.85)	2.19 (1.34, 3.59)	797
Not answered	0.48 (0.36, 0.63)	2.29 (1.65, 3.20)	2.23 (1.32, 3.76)	0.64 (0.44, 0.94)	2.08 (0.94, 4.57)	2.13 (1.29, 3.50)	585
Economic activity		(p=0.006)	(p=0.006)				
In employment, self emp or govt training		1	1				2693
Unemployed or economically inactive		1.27 (1.07, 1.51)	0.74 (0.60, 0.92)				1525
Ethnic group	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)	
White	1	1	1	1	1	1	3615
Non-white	0.30 (0.23, 0.40)	12.6 (10.2, 15.5)	0.17 (0.11, 0.26)	0.31 (0.20, 0.47)	0.08 (0.03, 0.19)	0.54 (0.37, 0.77)	603
Limiting long-standing illness	(p=0.001)		(p=0.045)		(p<0.001)		
Limiting LI	1		1		1		658
Non limiting LI, or no LI	1.48 (1.19, 1.85)		0.79 (0.63, 1.00)		0.54 (0.40, 0.74)		3560

Table J.4 Socio-demographic patterning UKHLS (2010/11) partners' latent class: estimated odds ratios of belonging to a class						
Socio-demographic and health characteristics	Never-smoked drinkers OR (95% CI)	Abstainers OR (95% CI)	Unhealthiest OR (95% CI)	Drinkers, ex-smokers OR (95% CI)	Unhealthy low freq drinkers OR (95% CI)	n
Age group^a (p-values derived from Wald tests)	(p=0.001)		(p=0.007)			
16-34	1		1			689
35-44	1.61 (1.22, 2.14)		0.63 (0.45, 0.88)			1123
45-74	1.96 (1.39, 2.75)		0.59 (0.40, 0.86)			757
Marital status^b	(p<0.001)		(p=0.001)			
Cohabitees	1		1			570
Married or civil partnership	1.86 (1.38, 2.51)		0.62 (0.46, 0.83)			2000
Highest educational qualification	(p=0.001)		(p<0.001)	(p=0.039)	(p=0.039)	
Degree or higher (or equivalent)	1		1	1	1	739
Higher education or A level equivalent	0.89 (0.66, 1.18)		3.03 (1.64, 5.62)	0.81 (0.60, 1.07)	1.44 (0.99, 2.09)	456
O-level or equivalent	0.67 (0.51, 0.88)		4.57 (2.64, 7.89)	0.86 (0.66, 1.14)	1.29 (0.89, 1.86)	758
Other or none	0.51 (0.37, 0.70)		6.52 (3.85, 11.0)	0.64 (0.47, 0.87)	1.69 (1.17, 2.44)	615
Equivalised income quintiles (monthly)	(p=0.001)	(p=0.001)		(p=0.007)	(p<0.001)	
Top Quintile (>=£2675)	1	1		1	1	525
2nd Quintile (>=£1767<£2675)	0.87 (0.67, 1.13)	1.31 (0.88, 1.96)		1.07 (0.80, 1.43)	1.40 (0.87, 2.24)	643
3rd Quintile (>=£1266<£1767)	0.57 (0.42, 0.77)	2.04 (1.36, 3.05)		0.89 (0.66, 1.21)	2.26 (1.42, 3.60)	608
4th Quintile (>=£884<£1266)	0.64 (0.46, 0.90)	1.96 (1.29, 2.99)		0.67 (0.47, 0.95)	2.90 (1.81, 4.64)	491
Bottom Quintile (<£884)	0.55 (0.35, 0.86)	1.95 (0.96, 3.16)		0.57 (0.37, 0.88)	3.18 (1.94, 5.23)	303
Economic activity	(p=0.001)		(p=0.001)			
In employment, self emp or govt training	1		1			2248
Unemployed or economically inactive	0.49 (0.33, 0.73)		1.83 (1.29, 2.60)			322
Ethnic group	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)		
White	1	1	1	1		2239
Mixed	0.60 (0.27, 1.36)	2.35 (0.96, 5.75)	0.13 (0.01, 1.14)	1.19 (0.50, 2.84)		29
Indian, Pakistani, Bangladeshi, black African, Arab	0.27 (0.18, 0.40)	8.86 (6.77, 11.6)	0.20 (0.09, 0.42)	0.26 (0.17, 0.40)		231
Other	0.35 (0.20, 0.60)	5.07 (3.19, 8.07)	0.38 (0.14, 0.97)	0.66 (0.39, 1.13)		70
Limiting long-standing illness					(p=0.002)	
Limiting LI					1	302
Non limiting LI, or no LI					0.60 (0.43, 0.83)	2268
Age of Youngest Child	(p=0.04)					
Under 5	1					1091
5-10	0.97 (0.75, 1.24)					1038
Over 10 years of age	0.71 (0.53, 0.95)					433
Children				(p=0.001)		
1				1		1278
2				1.10 (0.89, 1.36)		695
3+				0.60 (0.42, 0.84)		590

^aUnlike the mothers analyses, no separate aged 16-24 category for partners was used since less than 2% partners were aged below 25 and ^bthere was no single category for marital status

Table J.5 The probability of UKHLS (2010/11) partners being in a lifestyle group varying with socio-demographic characteristics

Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	n
Overall probability % (95% CI)	29.2 (27.3, 31.0)	16.6 (15.1, 17.9)	12.2 (10.8, 13.6)	26.4 (24.5, 28.3)	15.8 (14.2, 17.3)	2570
Age group						
16-34	21.7 (17.9, 25.4)		15.7 (12.7, 18.7)			689
35-44	30.1 (27.5, 32.8)		10.8 (8.8, 12.9)			1123
45-74	33.9 (29.8, 38.1)		10.3 (7.9, 12.7)			757
Marital status						
Cohabitees	20.4 (16.3, 24.6)		15.7 (12.8, 18.6)			570
Married or civil partnership	31.4 (29.2, 33.5)		10.7 (9.1, 12.2)			2000
Highest educational qualification						
Degree or higher (or equivalent)	34.6 (30.7, 38.5)		3.6 (1.9, 5.3)	29.9 (26.1, 33.8)	12.2 (9.4, 15.1)	739
Higher education or A level equivalent	32.1 (27.6, 36.7)		10.0 (6.8, 13.1)	25.7 (21.6, 29.9)	16.6 (13.0, 20.1)	456
O-level or equivalent	26.7 (23.2, 30.2)		14.1 (11.4, 16.8)	27.1 (23.5, 30.6)	15.2 (12.4, 18.0)	758
Other or none	22.1 (18.2, 26.0)		18.7 (15.4, 22.1)	21.7 (17.8, 25.5)	18.9 (15.6, 22.2)	615
Equivalised income quintiles (monthly)						
Top Quintile (>=£2675)	34.9 (30.7, 39.1)	11.5 (8.6, 14.4)		28.9 (24.4, 33.4)	8.5 (5.5, 11.6)	525
2nd Quintile (>=£1767<£2675)	32.1 (28.4, 35.8)	14.2 (11.6, 16.8)		30.3 (26.4, 34.1)	11.5 (8.8, 14.2)	643
3rd Quintile (>=£1266<£1767)	24.1 (20.3, 27.8)	19.6 (16.3, 22.8)		26.6 (22.8, 30.4)	17.3 (14.1, 20.5)	608
4th Quintile (>=£884<£1266)	26.3 (21.8, 30.9)	19.1 (15.6, 22.6)		21.6 (17.4, 25.8)	21.1 (17.3, 24.9)	491
Bottom Quintile (<£884)	23.5 (16.9, 30.0)	19.1 (14.3, 23.9)		19.1 (13.6, 24.5)	22.7 (17.7, 27.7)	303
Economic activity						
In employment, self emp or govt training	30.3 (28.3, 32.2)		11.1 (9.6, 12.6)			2248
Unemployed or economically inactive	18.3 (12.8, 23.7)		17.8 (13.8, 21.9)			322
Ethnic group						
White	31.6 (29.5, 33.7)	11.8 (10.3, 13.3)	13.1 (11.6, 14.7)	28.1 (26.0, 30.2)		2239
Mixed	22.5 (9.5, 35.4)	23.7 (8.0, 39.5)	2.0 (-2.3, 6.3)	31.7 (13.6, 49.7)		29
Indian, Pakistani, Bangladeshi, black African, Arab	11.9 (8.2, 15.7)	53.4 (47.9, 58.9)	3.0 (1.0, 5.3)	9.6 (6.0, 13.1)		231
Other	14.7 (8.5, 21.0)	39.9 (30.0, 50.2)	5.7 (0.9, 10.5)	20.8 (12.6, 29.1)		70
Limiting longstanding illness						
Limiting LI					22.1 (17.2, 27.2)	302
Non limiting LI, or no LI					14.8 (13.2, 16.4)	2268

continued

Table J.5 The probability of UKHLS (2010/11) partners being in a lifestyle group varying with socio-demographic characteristics

Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	<i>n</i>
<i>continued</i>						
Age of youngest child in household						
<5	31.0 (27.8, 34.0)					1091
≥5≤10	30.3 (26.9, 33.7)					1038
>10 years of age	24.7 (21.1, 28.4)					433
Age of youngest child in household						
1				27.0 (24.1, 30.0)		1278
2				28.9 (25.9, 31.8)		695
3+				18.3 (14.0, 22.6)		590

Table J.6 Socio-demographic patterning of HSE (2006 & 2008) children's latent class: estimated odds ratios of belonging to a class

Socio-demographic and health characteristics	Abstainers OR (95% CI)	Healthiest OR (95% CI)	Unhealthiest OR (95% CI)	Drink attempters OR (95% CI)	n
Age group	(p<0.001)	(p<0.001)	(p<0.001)	(p<0.001)	
10-11	1	1	1	1	838
12-13	0.40 (0.32, 0.50)	0.79 (0.59, 1.06)	4.13 (2.76, 6.18)	2.64 (1.95, 3.57)	815
14-15	0.12 (0.10, 0.16)	0.45 (0.31, 0.65)	14.6 (9.85, 21.7)	4.55 (3.38, 6.14)	788
Gender		(p<0.001)	(p=0.015)		
Boy		1	1		1207
Girl		0.48 (0.36, 0.64)	1.35 (1.06, 1.73)		1234
Ethnic group	(p<0.001)		(p<0.001)	(p<0.001)	
White	1		1	1	2069
Non-white	2.11 (1.49, 2.99)		0.36 (0.22, 0.60)	0.43 (0.27, 0.68)	372
Mother's LCA class	(p<0.001)	(p=0.001)	(p<0.001)	(p=0.006)	
Never-smoked drinkers	1	1	1	1	789
Abstainers	1.70 (1.24, 2.35)	0.86 (0.56, 1.31)	1.10 (0.71, 1.69)	0.51 (0.35, 0.75)	557
Unhealthiest	0.54 (0.40, 0.72)	0.51 (0.31, 0.83)	3.32 (2.30, 4.79)	1.02 (0.74, 1.42)	418
Drinkers & ex-smokers, healthier PA & F&V	0.63 (0.46, 0.87)	1.66 (1.10, 2.49)	1.30 (0.83, 2.06)	1.00 (0.72, 1.39)	302
Attempters	0.48 (0.33, 0.71)	1.24 (0.74, 2.09)	3.19 (1.98, 5.15)	0.80 (0.51, 1.25)	214
Unhealthy but low frequency drinkers	0.45 (0.30, 0.67)	0.86 (0.47, 1.55)	5.23 (3.16, 8.66)	0.63 (0.36, 1.13)	161
Number of Children in household	(p=0.027)			(p=0.045)	
1	1			1	752
2	1.34 (1.08, 1.67)			0.77 (0.61, 0.98)	1104
3+	1.09 (0.84, 1.43)			0.73 (0.54, 0.99)	585
Equivalised income quintiles	(p=0.002)			(p=0.018)	
Top Quintile (>=£49400)	1			1	296
2nd Quintile (>=£29939 < £49400)	0.94 (0.66, 1.35)			1.23 (0.82, 1.84)	410
3rd Quintile (>=£19204 < £29939)	0.57 (0.39, 0.83)			1.87 (1.23, 2.83)	438
4th Quintile (>=£13057 < £19204)	0.68 (0.48, 0.96)			1.69 (1.11, 2.57)	453
Bottom Quintile (< £13057)	0.58 (0.40, 0.85)			1.55 (0.99, 2.43)	500
Not answered	0.92 (0.60, 1.38)			1.11 (0.69, 1.77)	344

continued

Table J.6 Socio-demographic patterning of HSE (2006 & 2008) children's latent class: estimated odds ratios of belonging to a class

<i>continued</i>	Abstainers OR (95% CI)	Healthiest OR (95% CI)	Unhealthiest OR (95% CI)	Drink attempters OR (95% CI)	<i>n</i>
Mother's Marital status			(p=0.010)		
Single or previously married			1		648
Married or civil partnership			0.67 (0.50, 0.90)		1519
Cohabitees			1.08 (0.72, 1.62)		274
Mother's Economic activity	(p<0.001)			(p=0.006)	
In employment, self emp or govt training	1			1	1658
Unemployed or economically inactive	1.48 (1.16, 1.89)			0.68 (0.52, 0.90)	783
Mother's Limiting long-standing illness			(p=0.029)		
Limiting LI			1		434
Non limiting LI, or no LI			0.71 (0.52, 0.97)		2007

(p-values derived from Wald's tests)

Table J.7 Socio-demographic patterning of UKHLS (2010/11) children's latent class: estimated odds ratios of belonging to a class				
Socio-demographic and health characteristics	Abstainers OR (95% CI)	Healthiest OR (95% CI)	Unhealthiest OR (95% CI)	n
Age group	p=0.008	(p<0.001)	(p<0.001)	
10-11	1	1	1	841
12-13	1.32 (1.04, 1.66)	0.66 (0.53, 0.83)	23.1 (4.85, 109)	828
14-15	0.91 (0.73, 1.15)	0.38 (0.30, 0.50)	180 (39.2, 827)	759
Mother's Ethnic group	(p=0.012)	(p=0.030)	(p=0.047)	
White	1	1	1	2109
Mixed	0.39 (0.19, 0.83)	3.31 (1.46, 7.33)	0.38 (0.07, 1.96)	22
Indian, Pakistani, Bangladeshi, black African, Arab	1.30 (0.97, 1.73)	1.12 (0.83, 1.50)	0.28 (0.10, 0.80)	205
Other	1.34 (0.87, 2.07)	1.00 (0.64, 1.55)	0.44 (0.16, 1.16)	93
Mother's LCA class			(p=0.014)	
Never-smoked drinkers			1	693
Abstainers			0.98 (0.48, 1.98)	529
Unhealthy but low frequency drinkers			1.60 (0.92, 2.78)	487
Unhealthiest			2.80 (1.52, 5.18)	351
Drinkers & ex-smokers, healthier PA & F&V			1.47 (0.79, 2.72)	368
Number of Children in household		(p=0.004)	(p=0.032)	
1		1	1	740
2		0.94 (0.74, 1.20)	0.70 (0.43, 1.13)	1001
3+		1.41 (1.08, 1.85)	0.36 (0.17, 0.77)	688
Age of Youngest child in household			(p=0.009)	
<5			1	358
>=5<10			0.41 (0.18, 0.95)	577
>=10			0.28 (0.12, 0.63)	1494
Equalised income quintiles (monthly)	(p<0.001)	(p<0.001)		
Top Quintile (>=£2675)	1	1		472
2nd Quintile (>=£1767<£2675)	1.37 (1.00, 1.85)	0.67 (0.49, 0.92)		452
3rd Quintile (>=£1266<£1767)	2.08 (1.56, 2.77)	0.49 (0.36, 0.67)		549
4th Quintile (>=£884<£1266)	1.89 (1.39, 2.58)	0.47 (0.33, 0.66)		541
Bottom Quintile (<£884)	1.36 (0.99, 1.88)	0.65 (0.46, 0.93)		414

continued

Table J.7 Socio-demographic patterning of UKHLS (2010/11) children's latent class: estimated odds ratios of belonging to a class

Socio-demographic and health characteristics	Abstainers OR (95% CI)	Healthiest OR (95% CI)	Unhealthiest OR (95% CI)	<i>n</i>
<i>continued</i>				
Mother's education		(p=0.001)		
Degree or higher (or equivalent)		1		535
Higher education or A level equivalent		0.87 (0.66, 1.16)		578
O-level or equivalent		0.80 (0.60, 1.08)		722
Other or none		0.57 (0.41, 0.79)		594
Mother's age group			(p=0.007)	
25-34			1	301
35-44			0.48 (0.23, 0.99)	1372
45-74			0.86 (0.40, 1.86)	755

(p-values derived from Wald tests)

Table J.8 Percentage of UKHLS (2010/11) mothers in each lifestyle group by all socio-demographic characteristics

Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	
Overall %	24.8%	22.5%	15.6%	15.6%	21.5%	100%
Age group						
16-24	11.1%	16.3%	20.9%	7.5%	44.2%	100%
25-34	17.4%	25.3%	19.4%	12.0%	25.8%	100%
35-44	27.5%	22.7%	13.8%	18.0%	18.1%	100%
45-74	34.4%	19.8%	12.2%	17.8%	15.6%	100%
Marital status						
Single or previously married	14.8%	16.2%	24.7%	13.5%	30.8%	100%
Married or civil partnership	31.1%	27.8%	9.5%	17.1%	14.4%	100%
Cohabitees	17.2%	13.3%	23.7%	13.0%	32.9%	100%
Highest educational qualification						
Degree or higher (or equivalent)	36.6%	26.2%	5.7%	22.8%	8.7%	100%
Higher education or A level equivalent	29.2%	22.5%	13.7%	16.4%	18.2%	100%
O-level or equivalent	18.9%	16.9%	22.0%	13.3%	29.0%	100%
Other or none	15.0%	27.0%	19.5%	9.3%	29.1%	100%
Equivalised income quintiles (monthly)						
Top Quintile (>=£2675)	39.7%	19.1%	9.3%	22.3%	9.7%	100%
2nd Quintile (>=£1767<£2675)	34.4%	20.3%	11.6%	18.5%	15.2%	100%
3rd Quintile (>=£1266<£1767)	21.0%	23.2%	16.1%	16.3%	23.3%	100%
4th Quintile (>=£884<£1266)	16.8%	25.4%	20.0%	11.3%	26.5%	100%
Bottom Quintile (<£884)	11.6%	24.4%	21.2%	8.8%	33.9%	100%
Economic activity						
Unemployed or economically inactive	14.5%	26.9%	18.5%	11.0%	29.1%	100%
In employment, self emp or govt training	30.4%	20.2%	14.0%	18.0%	17.4%	100%
Ethnic group						
White	27.1%	14.7%	17.5%	17.2%	23.4%	100%
Mixed	16.0%	30.0%	10.7%	21.2%	22.1%	100%
Indian, Pakistani, Bangladeshi, black African, Arab	6.9%	85.4%	1.3%	0.6%	5.8%	100%
Other	17.4%	52.4%	7.2%	9.1%	13.9%	100%
Limiting longstanding illness						
Limiting LI	17.2%	22.1%	18.0%	10.2%	32.5%	100%
Non limiting LI, or no LI	26.1%	22.6%	15.2%	16.4%	19.7%	100%

Table J.8 Percentage of UKHLS (2010/11) mothers in each lifestyle group by all socio-demographic characteristics

Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	
<i>continued</i>						
Number of Children in the household						
1	25.3%	20.1%	16.9%	15.2%	22.4%	100%
2	25.5%	22.6%	14.1%	18.0%	19.8%	100%
3+	21.9%	28.9%	15.3%	10.8%	23.1%	100%
Age of youngest child in household						
<5	20.6%	25.6%	15.5%	14.8%	23.4%	100%
≥5≤10	28.2%	20.8%	14.7%	17.2%	19.1%	100%
>10 years of age	28.3%	19.4%	16.4%	15.25	20.7%	100%

Table J.9 Percentage of UKHLS (2010/11) partners in each lifestyle group by all socio-demographic characteristics

Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	
Overall %	29.2%	16.5%	12.2%	26.3%	15.8%	100%
Age group						
16-24	3.8%	20.6%	33.2%	16.3%	26.2%	100%
25-34	20.8%	18.0%	17.5%	24.7%	19.0%	100%
35-44	32.0%	17.2%	9.8%	26.6%	14.4%	100%
45-74	33.8%	14.0%	9.7%	28.1%	14.4%	100%
Marital status						
Cohabitees	17.2%	13.3%	22.4%	28.0%	19.0%	100%
Married or civil partnership	32.6%	17.5%	9.2%	25.9%	14.8%	100%
Highest educational qualification						
Degree or higher (or equivalent)	39.9%	17.4%	2.7%	30.5%	9.5%	100%
Higher education or A level equivalent	32.9%	15.5%	9.2%	26.7%	15.7%	100%
O-level or equivalent	25.3%	14.9%	16.2%	27.4%	16.3%	100%
Other or none	18.4%	18.2%	20.8%	19.8%	22.7%	100%
Equivalised income quintiles (monthly)						
Top Quintile (>=£2675)	43.8%	10.2%	6.8%	31.9%	7.3%	100%
2nd Quintile (>=£1767<£2675)	35.6%	12.9%	8.4%	32.0%	11.0%	100%
3rd Quintile (>=£1266<£1767)	23.8%	19.1%	12.9%	26.6%	17.6%	100%
4th Quintile (>=£884<£1266)	21.6%	20.3%	15.6%	19.7%	22.8%	100%
Bottom Quintile (<£884)	13.2%	23.8%	22.5%	15.2%	25.4%	100%
Economic activity						
In employment, self emp or govt training	31.7%	16.0%	10.4%	27.8%	14.1%	100%
Unemployed or economically inactive	11.7%	20.2%	24.6%	16.2%	27.2%	100%
Ethnic group						
White	31.4%	11.7%	13.6%	28.3%	15.1%	100%
Mixed	24.2%	24.9%	1.8%	30.3%	18.9%	100%
Indian, Pakistani, Bangladeshi, black African, Arab	12.1%	55.5%	2.2%	8.6%	21.6%	100%
Other	15.9%	40.4%	4.4%	21.7%	17.6%	100%
Limiting longstanding illness						
Limiting LI	21.1%	18.5%	15.1%	19.4%	25.8%	100%
Non limiting LI, or no LI	30.3%	16.3%	11.8%	27.3%	14.4%	100%

continued

Table J.9 Percentage of UKHLS (2010/11) partners in each lifestyle group by all socio-demographic characteristics

Socio-demographic and health characteristics	Never-smoked drinkers	Abstainers	Unhealthiest	Drinkers, ex-smokers	Unhealthy low freq drinkers	
<i>continued</i>						
Number of Children in the household						
1	27.9%	14.8%	13.4%	27.6%	16.2%	100%
2	31.0%	16.1%	9.8%	29.3%	13.8%	100%
3+	27.9%	22.0%	14.8%	16.6%	18.8%	100%
Age of youngest child in household						
<5	27.3%	18.1%	12.7%	25.8%	16.2%	100%
≥5≤10	32.8%	15.5%	11.4%	25.6%	14.7%	100%
>10 years of age	29.1%	14.5%	12.0%	28.8%	15.6%	100%

Table J.10 Percentage of UKHLS (2010/11) children in each lifestyle group by all socio-demographic characteristics				
Socio-demographic and health characteristics	Abstainers	Healthiest	Unhealthiest	
Overall	68.7%	24.0%	7.3%	
Age group				
10-11	67.9%	32.0%	0.1%	100%
12-13	72.7%	23.9%	3.4%	100%
14-15	65.3%	15.2%	19.5%	100%
Gender				
Male	66.8%	26.1%	7.1%	100%
Female	70.6%	21.9%	7.5%	100%
Mother's Ethnic group				
White	68.0%	23.8%	8.2%	100%
Mixed	47.9%	49.1%	2.9%	100%
Indian, Pakistani, Bangladeshi, black African, Arab	73.6%	24.8%	1.6%	100%
Other	74.8%	21.6%	3.6%	100%
Mother's lifestyle group				
Never-smoked drinkers	67.8%	26.5%	5.7%	100%
Abstainers	70.3%	25.8%	3.9%	100%
Unhealthy but low frequency drinkers	72.7%	19.2%	8.1%	100%
Unhealthiest	69.5%	17.4%	13.2%	100%
Drinkers & ex-smokers, healthier PA & F&V	60.7%	31.2%	8.1%	100%
Mother's marital status				
Single or previously married	70.7%	19.7%	9.5%	100%
Married or civil partnership	67.4%	26.7%	5.8%	100%
Cohabitees	70.6%	18.5%	10.9%	100%
Mother's economic status				
In employment, self emp or govt training	68.8%	23.8%	7.4%	100%
Unemployed or economically inactive	68.4%	24.4%	7.2%	100%
Mother's Long term Limiting Disability				
Yes	68.6%	21.1%	10.3%	100%
No	68.7%	24.6%	6.8%	100%

Table J.10 Percentage of UKHLS (2010/11) children in each lifestyle group by all socio-demographic characteristics				
Socio-demographic and health characteristics	Abstainers	Healthiest	Unhealthiest	
<i>continued</i>				
Equivalised income quintiles				
Top Quintile (>=£4)	58.2%	34.5%	7.3%	100%
2nd Quintile (>=£)	68.0%	25.1%	7.0%	100%
3rd Quintile (>=£)	74.2%	19.4%	6.5%	100%
4th Quintile (>=£)	73.2%	18.5%	8.3%	100%
Bottom Quintile (< £)Not answered	67.6%	24.6%	7.8%	100%
Mother's education				
Degree or higher (or equivalent)	61.4%	31.4%	7.2%	100%
Higher education or A level equivalent	67.1%	25.8%	7.1%	100%
O-level or equivalent	70.2%	23.2%	6.6%	100%
Other or none	74.6%	16.7%	8.6%	100%
Mother's age group				
25-34	68.2%	25.5%	6.3%	100%
35-44	70.9%	23.8%	5.4%	100%
45-74	64.8%	23.8%	11.5%	100%
Number of Children in household				
1	67.1%	21.1%	11.8%	100%
2	71.8%	22.5%	5.7%	100%
3+	66.0%	29.2%	4.8%	100%
Age of Youngest child in household				
<5	68.1%	24.7%	7.2%	100%
>=5<10	67.1%	29.3%	3.6%	100%
>=10	69.4%	21.8%	8.9%	100%

Appendix K: Single behaviours of mothers and partners

AS expected, the percentage of couples in the same behaviour categories was much lower using finer grained categories than in the analysis of binary risk behaviours observed in section 7.1. (However, still significantly associated). Out of three categories for smoking, 58% were in the same category, with 32% of mothers and their partners both never regular smokers and 13% both ex-smokers (table K.1). For alcohol consumption, 46% were in the same four categories with 20% not reporting drinking in the previous week (table K.2). Out of four fruit and vegetable consumption categories, 45% of couples were in the same category as their partner, with 24% of mothers and their partners both not consuming fruit and vegetables every day of the week (table K.3).

Table K.1 Concordance between UKHLS mothers and partners (2010/11) for smoking by categories

		Mothers			Total
Weighted N=2631		Never regular	Ex-smoker	Current	
Partners	Never regular	32%	11%	3%	46%
	Ex-smoker	14%	13%	13%	30%
	Current	6%	5%	13%	24%
	Total	52%	29%	19%	100%

p<0.001,
58% of individuals are in the same categories as partner

Table K.2 Concordance between UKHLS mothers and partners (2010/11) for alcohol intake by categories

		Mothers				Total
Weighted N=2557		none	Less than recommended	Less than twice recommended	Binge drinking	
Partners	none	20%	3%	2%	2%	27%
	Less than recommended	7%	4%	5%	2%	19%
	Less than twice recommended	5%	4%	9%	4%	22%
	Binge drinking	7%	4%	8%	13%	32%
	Total	40%	15%	24%	22%	100%

p<0.001
46% of individuals are in the same categories as the partner

The government recommendations for alcohol intake for women are on most days do not drink more than 2-3 units of alcohol a day and on no days drink more than 6 units; for men on most days do not drink more than 3-4 units of alcohol a day and on no days drink more than 8 units. Consumption above the upper recommendations is classed as binge drinking.

Table K.3 Concordance between UKHLS mothers and partners (2010/11) for fruit and vegetable portions per day by categories

		Mothers				Total
Weighted N=2629		5 or more a day	3 or 4 portions	1 or 2 portions	none/ not every day	
Partners	5 or more	6%	5%	1%	2%	14%
	3 or 4	7%	12%	2%	5%	25%
	1 or 2	2%	6%	3%	4%	15%
	none	5%	12%	5%	24%	46%
	Total	20%	35%	11%	34%	100%

p<0.001
45% of individuals are in the same category as their partner