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Project Final Report

Health behaviour and health behaviour change among adults in England

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Contents

List of boxes **4**
List of figures **4**
List of tables in the main report **6**
Abbreviations and glossary of key terms **7**
Preface: What the project adds to knowledge **8**
1 EXECUTIVE SUMMARY **10**
2 BACKGROUND, AIMS AND OBJECTIVES **14**
2.1 Introduction 14
2.2 Evidence on health behaviours 15
2.3 Evidence on health behaviour change 16
2.4 Project aim and objectives 17
3 DESIGN AND METHODS **18**
3.1 Data sets 18
3.2 Data on health behaviour 19
3.3 Health behaviour measures and government recommendations 19
3.4 Socio-demographic and socio-economic measures 21
3.5 Life transitions 22
3.6 Data on life transitions 23
3.7 Analysis techniques 24
4 HEALTH BEHAVIOURS IN 2013/14: PREVALENCE AND SOCIAL PATTERNING **27**
4.1 Introduction 27
4.2 Prevalence of each health behaviour among all adults 27
4.3 Social patterning of the health behaviours 28
4.3.1 Health behaviours by socio-demographic factors 28
4.3.2 Health behaviours by socio-economic factors 31
4.3.3 Health behaviours by general health status 36
4.4 Summary 38
5 STABILITY AND CHANGE IN HEALTH BEHAVIOURS: 2010/11 TO 2013/14 ..... **39**
5.1 Introduction 39
5.2 Stability and change in health behaviours 40
5.2.1 Stability and change in meeting recommendations 40
5.2.2 'Improving' and 'worsening' health behaviour: persistent smoking and binge drinking 42
5.3 Social patterning of change 43
5.3.1 Health behaviour change by socio-demographic factors 44
5.3.2 Health behaviour change by socio-economic factors 50
5.3.3 Health behaviour change by general health status 53
5.3.4 'Improving' and 'worsening' health behaviour by socio-demographic, socio-economic factors and general health status 55
5.4 Summary 56

6 RELATIONSHIP BETWEEN LIFE TRANSITIONS AND CHANGES IN HEALTH BEHAVIOURS ... 58
6.1 Introduction ... 58
6.2 Rapid Evidence Assessment of life transitions and health behaviour changes ... 58
6.3 Experience of each life transition ... 64
6.4 Patterning of life transitions and changing health behaviours ... 66
6.4.1 Overview ... 66
6.4.2 Relationship transitions and health behaviour change ... 68
6.4.3 Employment transitions and health behaviour change ... 70
6.4.4 Income change and health behaviour changes ... 72
6.4.5 Adding a child to the household and health behaviour change ... 72
6.5 Summary ... 72
7 CONTRIBUTION TO CONSORTIUM THEMES ... 75
8 CONCLUSIONS ... 76
9 DISSEMINATION/OUTPUTS ... 78
10 REFERENCES ... 79
10.1 General ... 79
10.2 References for Rapid Evidence Assessment ... 83
Appendix A: Method details ... 89
Appendix B: Summary of strengths and limitations of the analysis ... 99
Appendix C: Tables for Chapter 4 – prevalence and social patterning of individual risk behaviours in 2013/14 100
Appendix D: Tables for Chapter 5 – changing and stability in health behaviours between 2010/11 and 2013/4 ... 132
Appendix E: Tables for Chapter 6 – relationship between health behaviour change and experience of life transitions between 2010/11 and 2013/4 ... 174
Appendix F: Rapid Evidence Assessment: Search protocols ... 193

List of boxes

Box 1: Government guidelines on the four health behaviours 14
Box 2: Measures of risk behaviour used in the report 17
Box 3: Objectives and the structure of the report 18
Box 4: Government recommendations and measures of risk behaviour used in the report 20
Box 5: Overview of life transitions used in analysis 23
Box 6: Analytical groups for regression models in Chapters 5 and 6 25

List of figures

Figure 4.1: Prevalence of single risk behaviours in England (UKHLS 2013/14) 28
Figure 4.2: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by age 29
Figure 4.3: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by age 29
Figure 4.4: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by ethnic group 30
Figure 4.5: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by ethnic group 31
Figure 4.6: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by educational attainment 32
Figure 4.7: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by educational attainment 32
Figure 4.8: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by equivalised household income 34
Figure 4.9: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by equivalised household income 34
Figure 4.10: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by Indices of Multiple Deprivation quintile group 35
Figure 4.11: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by Indices of Multiple Deprivation quintile group 36
Figure 4.12: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by self-reported general health 37
Figure 4.13: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by self-reported general health 37
Figure 5.1: Stability and change in health behaviours, 2010/11 to 2013/14 40
Figure 5.2a: Stability and change among those who met the recommendation in 2010/11 41
Figure 5.2b: Stability and change among those who did not meet the recommendation in 2010/11 42
Figure 5.3: Changing health behaviours among persistent smokers and binge drinkers 43
Figure 5.4a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by age group 44

Figure 5.4b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by age group ... 45
Figure 5.5a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by sex ... 46
Figure 5.5b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by sex ... 47
Figure 5.6a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by ethnic group ... 48
Figure 5.6b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by ethnic group ... 48
Figure 5.7a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by marital and cohabitation status ... 49
Figure 5.7b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by marital and cohabitation status) ... 50
Figure 5.8a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by educational attainment ... 51
Figure 5.8b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by educational attainment ... 52
Figure 5.9a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour change (not meeting recommendation in 2010/11 but meeting it in 2013/14), by economic activity ... 53
Figure 5.9b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by economic activity ... 53
Figure 5.10a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by self-reported general health ... 54
Figure 5.10b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by self-reported general health ... 55
Figure 6.1: Age profile of those who moved between employment and unemployment ... 65
Figure 6.2: Predicted prevalence (with 95% confidence intervals) of selected changes in health behaviours by relationship transition: moving out of a relationship ... 69
Figure 6.3: Predicted prevalence (with 95% confidence intervals) of selected changes in health behaviours by relationship transition: moving into a relationship ... 70
Figure 6.4: Predicted prevalence (with 95% confidence intervals) of changing smoking status, by employment transition: moved from student to employment ... 71

Figure 6.5: Predicted prevalence (with 95% confidence intervals) of health behaviour change, by employment transition: moved from student to unemployed 72

List of tables in the main report

Table 3.1: Prevalence of cigarette smoking and average marginal effects of being a current cigarette smoker: Men 24
Table 6.1 Summary of UK studies identified in REA 62
Table 6.2 Prevalence of life transition change between 2010/11 and 2013/4 64
Table 6.3: Summary AME analyses showing significant associations between life changes and positive health behaviour changes (started meeting recommendations) 67
Table 6.4: Summary AME analysis showing significant associations between life changes and negative health behaviour changes (stopped meeting recommendations) 68

Abbreviations and glossary of key terms

Abbreviations

CAPI	Computer assisted personal interview
F&V	Fruit and vegetable
PA	Physical activity
UKHLS	*Understanding Society:* the UK Household Longitudinal Study
AMEs	Average Marginal Effects
ORs	Odds ratios

Key terms used in the report

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

Average Marginal Effects: Average Marginal Effects (AMEs) are estimates derived from non-linear multivariate analysis (e.g. logistic regression) of the impact of a change in an explanatory variable on the overall predicted probability, holding other variables constant. They provide an intuitive way of illustrating the size and direction of relationships between variables of interest and the health behaviour under study. Like Odds Ratios, AMEs are evaluated relative to a reference category and show the direction of the association with the outcome variable. They additionally provide a direct estimate of the size of the association

Social patterning of risk behaviours: an association between a socio-demographic (for example, age, gender, ethnic group) or socio-economic (for example, household income) factor and the risk behaviour.

Preface: What the project adds to knowledge

This project 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 - and examines stability and change in these behaviours over time. It also explores whether life events and transitions that many people experience in the course of their adult lives are associated with changes in their health behaviours.

Analyses are based on *Understanding Society,* the UK Household Longitudinal Study (UKHKLS), a large nationally representative study of adults and children living in private households who have been surveyed every year since 2009/10. The project focuses on adults living in England and on the two waves of the UKHLS where information on health behaviours was collected: 2010/11 and 2013/14.

The report describes findings from the first analysis to have been carried out on stability and change in health behaviours in the adult population of England. It is also the first study to use a national survey of adults to examine the relationship between a range of life transitions and positive and negative changes in four key health behaviours.

The project adds to knowledge about health behaviours among adults living in England by:

- *Enriching understanding of the social patterning of health behaviours*. The project confirmed that, in broad terms, social disadvantage was associated with smoking and with levels of F&V consumption and physical activity that did not meet the recommendations, while social advantage was associated with binge drinking. However, other dimensions of people's lives and identities were also predictors of risk behaviours. These included ethnicity; those from non-white ethnic groups were less likely to smoke and binge drink but more likely to not meet F&V or physical activity recommendations.

- *Shedding light on patterns of stability and change in health behaviours*. Across the three years under study, stability was the norm. The majority of those who met the recommendations for smoking, F&V consumption and binge drinking in 2010/11 continued to do so in 2013/14 and 50% of those meeting the physical activity recommendations in 2010/11 also did so in 2013/14. Conversely, the majority of those not meeting the recommendations in 2010/11 did not do so three years later: this was true of all four health behaviours. The pattern was particularly marked for physical activity and F&V consumption: of those not meeting the recommendations in 2010/11, 84% (physical activity) and 86% (F&V consumption) failed to meet them three years later.

- *Describing the social patterning of changes in behaviour using a wide range of measures of individual circumstances and identity*. For smoking, F&V consumption and physical activity, those in more disadvantaged circumstances were less likely to make positive changes. For binge drinking, the associations were reversed. Social disadvantage was associated with stopping binge drinking and being less likely to start.

- *Providing an exploratory analysis of life transitions and health behaviour change.* We focused on a range of transitions that mark out people's adult lives: changes in relationship status, changes in employment status (including moving from full-time education to employment/unemployment and retiring from paid work), the addition of a child/ren to a

previously childless household and changes in household income. With the exception of changes in income, relatively few people experienced these transitions in the time period of our study (2010/11 to 2013/14). Some transitions (for example, moving out of a relationship) were associated with negative changes in health behaviour (starting smoking and binge drinking). However the reverse transition (i.e. forming a relationship) was not associated with positive changes. Leaving full-time education (FTE) was associated with greater risk of starting smoking, regardless of whether students moved into employment or unemployment.

1. EXECUTIVE SUMMARY

1.1 Introduction

Four behavioural risk factors - cigarette smoking, harmful alcohol intake, poor diet and physical inactivity – underlie the chronic diseases responsible for the majority of premature deaths in England. The government has recommendations in place to encourage healthy lifestyles: adults are advised not to smoke, not to consume excessive amounts of alcohol, to consume a minimum of 5 portions of fruit and vegetables (F&V) a day and take at least 150 minutes of moderate to vigorous physical activity a week (or 75 minutes of vigorous activity).

Most of the evidence on health behaviours comes from cross-sectional studies like the Health Survey for England (HSE) which tell us what is happening at population level. For example, the HSE indicates that, over the last five years, smoking prevalence has declined but there has been no improvement in the proportion of adults achieving the recommended level of physical activity. Much less is known about stability and change in health behaviours at an individual level. Even less is known about whether changes in an individual's circumstances – for example, gaining employment, entering a relationship and experiencing an increase in income – are associated with changes in health behaviour. Our project addresses these gaps.

1.2 Aims and objectives

Our aim is to strengthen the evidence base of public health policies in England by providing detailed information about stability and change in cigarette smoking, alcohol intake (binge drinking), F&V consumption and physical activity among adults in England.

Our objectives were to:

- investigate the prevalence and social patterning of the four health behaviours in 2013/14
- investigate the prevalence and social patterning of changes in the four health behaviours between 2010/11 and 2013/14
- explore whether common life transitions are associated with changes in the four health behaviours. The project focused on changes in relationship status, changes in employment status (including taking up employment, becoming unemployed and retirement), adding a child/ren to a previously childless households and changes in household income.

1.3 Methods

We used a nationally-representative longitudinal survey of the UK population, *Understanding Society*: the UK Household Longitudinal Study (UKHLS), to address the three objectives. In line with the PHRC remit, our analyses focus on adults living in England.

The UKHLS is the largest longitudinal survey of its kind. As well as a large general population sample, it includes a boost sample of ethnic minority groups to facilitate analyses that take account of ethnicity. It is a multi-topic survey which collects a wide range of information on the socio-demographic (e.g. ethnic group, age, partnership status) and socio-economic position (e.g. education, social class, income) of individuals. It is also possible to match neighbourhood level data, such as the Indices of Multiple Deprivation, to respondents based on their address. Study

participants are interviewed every year, with annual measures of core information (e.g. income, partnership status) and less frequent measures of other aspects of people's lives. UKHLS participants provided information on health behaviours (cigarette smoking, diet, physical activity and alcohol consumption) in 2010/11 and 2013/14. We derived measures of health behaviour that align as closely as possible to government recommendations for the four behaviours at the time study participants were interviewed (i.e. 2010/11 and 2013/14).

1.4 Findings

Health behaviours:

- Most adults did not smoke (less than one in five men and women) or binge drink (around 3 out of 4 men and women did not binge drink). However, the large majority of men and women did not meet recommendations for F&V or physical activity.
- Engagement in risk behaviours was related to people's socio-economic circumstances. In broad terms, social disadvantage was associated with smoking and with levels of F&V consumption and physical activity that did not meet the recommendations while social advantage was associated with binge drinking.
- However, other dimensions of people's lives and identities were also important predictors of risk behaviours. These included ethnicity; those from non-white ethnic groups were less likely to smoke and binge drink but more likely not to meet F&V or physical activity recommendations.

Stability and change in health behaviours

- Stability in adult health behaviours is the norm. Most people did not smoke or binge drink in 2010/11 and continued not to do so in 2013/14. Equally, most people did not meet the F&V or physical activity recommendations in 2010/11 and continued not to do so in 2013/4.
- While only a minority changed their behaviour, there is some evidence that change is socially patterned.
- For smoking, F&V consumption and physical activity, those in disadvantaged circumstances were less likely to make positive changes. Specifically, those with lower levels of educational attainment, who were unemployed and who were not married were less likely to stop smoking. Conversely, those who had lower levels of educational attainment, were not married and were younger were more likely to start smoking.
- With respect to F&V consumption, those less likely to start meeting recommendations had lower levels of educational qualifications, were unemployed, not married and from South Asian groups. Those with lower levels of educational attainment and those from non-White ethnic groups were also more likely to stop meeting recommendations.
- With respect to physical activity, women, older people, those from South Asian groups, in poor health and with lower levels of educational attainment were all less likely to start meeting the recommendations. Women, those in poor health, those with the lowest levels of educational attainment and with lower household incomes were also more likely to stop meeting recommendations.
- With respect to binge drinking, a markedly different social pattern emerged. Study participants most likely to stop binge drinking were women, those with the lowest levels of educational attainment and those from non-white ethnic groups. Those less likely to start binge drinking were: women, older people, those in poor health, those from non-white ethnic groups and those with the lowest household incomes.

- Taken together, our findings point to some widening of social inequalities in health behaviours over time. With the exception of binge drinking, those with lower levels of educational attainment were typically less likely to make positive improvements in behaviour and more likely to make negative changes. For binge drinking, the opposite pattern was evident; those with no/other educational qualifications were more likely to stop binge drinking than those with a degree or higher.
- It is also notable that social factors strongly associated with current behaviour, such as household income, were less important when looking at behaviour change. Thus, factors predictive of individual behaviour at a single point in time (i.e. when viewed cross-sectionally) are not necessarily associated with change in behaviour over time.

Common life transitions and changes in health behaviour

- Although we focused on life events and transitions that many people experience in the course of their adult lives, these changes were uncommon across the three-year time period of our project (2010/11 to 2013/14). The exception was changes in household income; over a third (36%) experienced an increase of 20% or more and nearly a fifth (18%) saw their household income fall by 20% or more.
- While some transitions were associated with negative changes in health behaviour, the reverse transition did not bring positive change. For example, moving out of a relationship was associated with a greater likelihood of starting smoking and binge drinking - but moving into a relationship did not reduce the likelihood of starting smoking and binge drinking. Similarly, becoming unemployed meant a greater likelihood of starting smoking but becoming employed was not associated with any changes in smoking behaviour.
- Moving from full-time education (FTE) was associated with greater risk of taking up smoking; this is regardless of whether students moved into employment or unemployment, both of which were associated with higher rates of starting smoking than remaining in FTE.
- There was very little evidence that life transitions were associat with changing F&V consumption. Of the transitions we investigated, only moving out of a relationship and becoming unemployed were associated with changes in whether people met the F&V recommendations. Study participants moving out of a relationship were more likely to stop meeting the recommendations than those remaining in a relationship and, compared to those who remained in employment, those becoming unemployed were less likely to start meeting the recommendations.

1.5 Conclusions

Our project adds to the evidence on health behaviours in England that make a major contribution to the burden of disease. They are ones central to the government's ambitions to combine improvements in health with greater improvements among those living in more deprived areas.

We add to the evidence base in two unique ways. For the adult population of England, we provide evidence on stability and change in four key behaviours and we explore the relationship between life transitions and health behaviour change.

Using measures based on government recommendations, the project confirms the stability of health behaviours over time; the majority of those not meeting the recommendations for the four behaviours in 2010/11 were not doing so three years later. In analyses that took account of a wide range of factors, it also points to the social patterning of change. In broad terms, social advantage is

associated with positive changes in health behaviour – with the exception of binge drinking. Ethnicity is also a key factor, both in the patterning of health behaviours and in stability and change over time.

Focusing on transitions many people experience in the course of their adult lives, we found limited evidence that, across the 3 year period for which we had health behaviour data, life transitions were associated with changes in health behaviours. Further, where a transition was associated with behaviour changes, it could encompass both positive and negative changes. For example, moving out of a relationship increased the likelihood of starting smoking, starting binge drinking and stopping meeting the F&V recommendations – but it also increased the likelihood of meeting the PA recommendations. While only exploratory, our study points to the scope for extending analyses of the UKHLS to examine how life course transitions impact on health behaviours over longer periods of time.

2. BACKGROUND, AIMS AND OBJECTIVES

2.1 Introduction

Cigarette smoking, harmful alcohol intake, poor diet and physical inactivity are risk behaviours which underlie the chronic diseases (cardiovascular disease, cancer, lung disease and type-2 diabetes) responsible for the majority of premature deaths in England and in other high-income countries (PHE, 2017; WHO, 2010; 2014). Governments advise the population not to smoke, not to consume excessive amounts of alcohol, to consume a minimum number of portions of fruit and vegetables (F&V) a day and to engage in a minimum amount of physical activity (PA) a week. Recommendations can change over time in line with new evidence on health risks; for this project, we used recommendations from England's Department of Health in place between 2010/11 and 2013/14 (Box 1).

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

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

*These were the alcohol guidelines at the time that survey data were collected. They have since been updated.

Unhealthy behaviours are socially patterned, contributing to socio-economic inequalities in morbidity and premature mortality (Laaksonen et al. 2008, Stringhini S 2010). Rates of smoking are typically higher among those living in the most deprived areas of Britain (NHS digital, 2016). Meeting F&V recommendations is less likely among those living in the lowest income households than those living in the highest income households. Likewise, those living in the lowest income households or with lower socio-economic status are less likely to engage in PA than those living in higher income households or with higher socio-economic status (PHE, 2013). The evidence for alcohol consumption is more mixed. Higher levels of consumption are evident among those with less disadvantaged backgrounds (NHS digital, 2016; Bloomfeld et al, 2006) while rates of alcohol-specific mortality are higher among those living in more deprived areas (ONS 2017a).

Promoting healthy lifestyles is central to public health policy in England, and the government's wider vision of combining improvements in health with greater improvements in disadvantaged communities (DoH 2010; DoH, 2013c; PHE 2014; NHS, 2014). Public Health England, an executive agency of the Department of Health, has identified six behaviour change opportunities which could contribute to meeting this ambition. These include reducing smoking, increasing PA, reducing obesity (and by extension, improving diet as well as levels of PA) and reducing harmful alcohol consumption (DoH, 2014). As a recent report on the *Future of Health* notes, 'unhealthy lifestyle choices' are making an increasing contribution to the burden of ill-health in England and represent a

priority area for both research and policy (Corbett et al, 2017). Lifestyle factors are also highlighted in the Department of Health's statement of its Areas of Research Interest, where it notes the need for social research into the drivers of diseases in which unhealthy behaviours play an important role (DoH, 2017).

The project is set in this policy context. Focusing on adults in England, it investigates (i) the prevalence and social patterning of four key risk behaviours and (ii) the prevalence and social patterning of changes in these behaviours.

2.2 Evidence on health behaviours

Patterns of health behaviour over time are typically measured using repeat cross-sectional surveys, such as the Health Survey for England (HSE). They point to a continuing decline in smoking prevalence: smoking rates among adults fell from 28% in 1998 to 18% in 2015 (NHS digital, 2016). There has also been a decrease in the proportion of adults consuming twice their daily recommended limits of alcohol (often called binge drinking), falling from 20% of adults in 2006 to 15% in 2015. In contrast, trends in meeting F&V and PA recommendations have remained broadly stable in the past decade (NHS digital, 2016).

While cross-sectional surveys are important in capturing trends in health behaviour at a population level, they give little insight into how behaviour is changing for individuals. To date, there has been very little exploration of how engagement in smoking, alcohol, F&V consumption and PA is changing among individuals. Previous studies of individual-level change have had a restricted focus, for example focusing on older adults (c.f. Lang et al, 2007; Colell et al, 2014), or a single health behaviour (c.f. Giordano & Lindstrom, 2010; Staff et al, 2015) or have been based on cohort studies which, while capturing what is happening in the age cohort under study, are not representative of all adults (c.f. Vinther et al, 2016; Barnett et al, 2016). Because little is known about within-person patterns of behaviour over time, little is also known about whether and how changes in health behaviours may be socially patterned, that is, whether certain individuals are more likely to change health behaviours than others.

Our project addresses these gaps. We use a large, nationally representative panel survey – *Understanding Society:* the UK Household Longitudinal Study - to explore changes in the four health behaviours between 2010/11 and 2013/14. By exploring change within individuals, we can examine the characteristics of those most likely to make changes in their behaviour.

The project provides an in-depth picture of changing health behaviours for individuals over a three-year time period. It describes the overall prevalence and patterning of unhealthy behaviours in 2013/14 as well as identifying those most and least likely to make positive changes between 2010/11 and 2013/14. We also explore the relationship between key life transitions and health behaviour change. Such evidence can inform both population-wide and targeted strategies to improve health (DoH 2010; NHS, 2014; PHE, 2014).

2.3 Evidence on health behaviour change

Like other behaviours, many health behaviours are repeated on a daily basis as part of the routines of our everyday lives, such as getting up, caring for children and travelling to work. Repeated in familiar contexts, health behaviours – our eating habits, smoking habits, patterns of PA and alcohol consumption - become habitual. They are elicited without conscious thought by the contexts in which they have been formed (Danner et al, 2008). They are rarely the outcome of deliberation and active planning (Marteau et al, 2012).

Woven into everyday contexts and routines, health behaviours therefore tend to persist over time. Past behaviour – e.g. being a smoker or being physically active – is therefore a strong predictor of current behaviour. For example, levels of PA are relatively stable across adulthood (Telama, 2009); smoking behaviour similarly tends to be maintained over time, with nicotine dependence adding to the habitual nature of regular smoking (Breslau, 2001). Habits laid down in childhood and adolescence can influence adult heath behaviours, including PA and smoking (Telama et al, 2005; NHS Digital 2016). Like dietary habits and PA, smoking careers are patterned by social disadvantage; those from more disadvantaged backgrounds are more likely to smoke in adolescence and early adulthood, and to remain smokers across their adult lives (Gilman et al, 2003; Jefferis et al, 2004).

Because health behaviours are embedded within the contexts and routines of everyday life, they can be resistant to change. However, changes in an individual's circumstances can facilitate behaviour change, including life transitions that are an expected part of adulthood. For example, leaving higher education, entering a cohabiting relationship, becoming a parent and retiring from paid work may each provide a stimulus for behaviour change. However, evidence on life transitions and lifestyle change is limited (see chapter 6 for a more extended discussion). Pregnancy, and particularly first pregnancy, is associated with positive changes in health behaviours, including quitting smoking (Graham et al, 2010), reduced alcohol consumption and healthier food choices (Crozier et al, 2009; Olson, 2005). There is also some evidence that retirement is associated with an increase in PA (Engberg et al, 2012); however, a UK-based study found that the increase in recreational and home-based activity was more than offset by reductions in occupational and travel activity (Barnett et al, 2013).

A major challenge to advancing understanding of life transitions and lifestyle change is the paucity of datasets. A key source of evidence is the UK's cohort studies, including the national birth cohort studies established in Britain in 1958, 1970 and 2000/01 which follow study participants across their lives. While a rich resource for longitudinal analyses, their design means the evidence relates to a particular age group rather than to the adult population as a whole. There are very few UK datasets that enable the behaviours of adults of all ages to be tracked over time and for patterns of stability and change to be set within the context of wider life changes and transitions. The UKHLS is unique in both respects. It enables analysis of individual-level stability and change in health behaviours over time; it also enables exploration of the impact of life events and transitions on health behaviours.

To inform our analysis, we undertook a Rapid Evidence Assessment (REA) to identify evidence relating to life transitions and changes in health behaviour. This is described in Chapter 3.5.

2.4 Project aim and objectives

We aim to strengthen the evidence base of public health policies in England by providing up-to-date information for adults in England on cigarette smoking, alcohol intake (binge drinking), fruit and vegetable consumption and PA. Our analyses focus on patterns of engagement in each health behaviour and how they change over time.

Our specific objectives were to:

- investigate the prevalence and social patterning of the four health behaviours in 2013/14
- investigate the prevalence and social patterning of changes in the four health behaviours between 2010/11 and 2013/14
- explore whether certain life transitions are associated with changes in the four health behaviours.

The report is structured around these objectives (Box 2).

Box 2: Objectives and the structure of the report

	Chapter
Objective 1: Prevalence and social patterning of the four health behaviours: • Prevalence of the health behaviours • Social patterning of the health behaviours	4
Objective 2: Prevalence and social patterning of changes in each health behaviour over time • Stability and change in the health behaviours • Social patterning of stability and change in the health behaviours	5
Objective 3: Exploratory analysis of the relationship between life transitions and changes in each health behaviour • Experience of life transitions • Relationship between life transitions and the health behaviours	6

3. DESIGN AND METHODS

3.1 Data sets

We used a nationally-representative longitudinal survey of residents in England*: Understanding Society:* the UK Household Longitudinal Study (UKHLS) [1] to address the three project objectives. An overview of the UKHLS is provided in Box 3 (for details see Knies, 2017).

Box 3: Overview of 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 who, together with an ethnic minority boost sample of around 4,000 households, are followed over time. Health behaviour data were gathered in the second wave (2010/11) from 51,000 adults in UK households (33,000 adults in English households). More information about the UKHLS is available at https://www.understandingsociety.ac.uk/

We selected the UKHLS because of its unique strengths:

- The UKHLS is large and population-wide.

- Along with rich social data, it collects information on health behaviours (cigarette smoking, diet, PA and alcohol consumption) that can be aligned to DoH recommendations along with rich social data. Social data include socio-economic measures relating to the individual (e.g. educational attainment), the households they live in (household income) and their areas of residence (Index of Multiple Deprivation).

- Its longitudinal structure means that within-person changes in health behaviour can be measured over time. In contrast to intervention studies, where behaviour change is usually measured across relatively short time periods (of weeks or months), the UKHLS enables change to be measured over a number of years. In 2010/11, the second wave of the UKHLS collected information on the four health behaviours; information on the same set of behaviours was also collected in the fifth wave of the UKHLS, in 2013/14. Its longitudinal structure also means that between-wave life transitions can be identified: we could therefore examine whether changes in people's circumstances (e.g. moving into or out of a relationship, or moving from employment to unemployment) were associated with changes in meeting recommendations for the four health behaviours.

The UKHLS data can be analysed cross-sectionally for a given year to examine the prevalence of different health behaviours in that year and longitudinally to explore change in health behaviours over time. This report uses both methods. In line with the remit of the DoH PHRC, all analyses are

[1] Understanding Society is an initiative funded by the Economic and Social Research Council and various Government Departments, with scientific leadership by the Institute for Social and Economic Research, University of Essex, and survey delivery by NatCen Social Research and Kantar Public. The research data are distributed by the UK Data Service. University of Essex. Institute for Social and Economic Research, NatCen Social Research and Kantar Public, [producers]: Understanding Society: Waves 1-7, 2009-2016 and harmonised British Household Panel Survey: Waves 1-18, 1991-2009. [computer file]. 9th Edition. Colchester, Essex: UK Data Service [distributor], November 2017. SN: 6614, http://dx.doi.org/10.5255/UKDA-SN-6614-9.

based on data for England. Further details of the design and methods of the studies can be found in Appendix A.

3.2 Data on health behaviour

Like other large surveys, the UKHLS relies on self-reported data. Self-reported data tend to underestimate the prevalence of health-damaging behaviours (Tipping et al, 2010). However, the lack of available instruments and/or 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) are not often used in large studies.

Questions on health behaviours were administered and asked in the same way at waves 2 and 5, providing a consistent set of measures for our analyses of changes in health behaviours. Information on smoking, F&V consumption and PA was collected from adults as part of the main computer assisted personal interview (CAPI). Alcohol consumption was collected by a separate self-completion questionnaire.

The exact questions asked about each health behaviour are shown in Appendix A. Because of the broad coverage of the survey and the consequent constraints on space in the questionnaire, data collected about PA, F&V consumption and alcohol consumption are more limited in the UKHLS than other comparable surveys, such as the Health Survey for England (HSE).

With respect to PA, the UKHLS asks 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. Previous analysis has shown that with this more restricted set of activities, a larger proportion in the UKHLS are classified as failing to meet the PA recommendation than in other studies (Graham et al, 2016a).

Similarly, the UKHLS questions about F&V consumption are less detailed than other studies like the HSE, asking only about number of days the individual consumed tinned, frozen, dried and/or fresh fruit/vegetables and a single follow-up question on number of portions covering both fruit and/or vegetables. Despite these differences, our earlier study of parents found that similar proportions of parents from the UKHLS and HSE were identified as failing to meet F&V recommendations (Graham et al, 2016a).

Finally, the UKHLS collects less detailed information about the type and number of alcoholic drinks consumed than studies like the HSE. Information is collected using a confidential self-completion questionnaire, a method likely to be less subject to social desirability bias. Previous comparisons with the HSE indicate that the UKHLS gives higher reported proportions of people not meeting alcohol recommendations (Graham et al, 2016a).

3.3 Health behaviour measures and government recommendations

We derived measures of the four risk behaviours that aligned as closely as possible to government recommendations at the time of data collection (2010/11 and 2013/14) (see Box 4). Two points should be noted about these measures. For alcohol, we used ‘binge’ drinking as our measure of harmful alcohol consumption, i.e. consuming more than twice the daily recommended units of alcohol on a single day. Since 2015, recommendations on alcohol consumption have changed and there is less focus on binge drinking and more on reducing total alcohol consumption. However,

these recommendations were not in place at the time of data collection (2010/11 and 2013/4) and therefore our analyses focus on those who adhered (or not) to the binge drinking recommendations in place at the time. The more limited questions on PA in the UKHLS meant that we relied on an approximate measure (see Appendix A for more details).

Box 4: Government recommendations and measures of risk behaviour used in the report

For adults in 2010/11 and 2013/14, government recommendations for a healthy lifestyle were:

Smoking

- do not smoke at all
  We use a measure of not smoking at least one cigarette per day.

Fruit and vegetable consumption

- eat at least 5 portions of fruit & vegetables a day
  We used this measure.

Physical activity

- engage in at least 150 mins a week of moderate to vigorous intensity physical activity, e.g. 30 minutes on at least 5 days a week
  We used a measure based on two questions in UKHLS which collected information on (i) the number of days in the past four weeks of 30+ minutes of brisk/fast walking and (ii) the frequency of moderate sporting activities. We defined meeting the physical activity recommendation as: 30 minutes or more of brisk or fast walking in a day 20 times in the past four weeks; or 3 days or more a week moderate to vigorous sporting activity of 30 mins or more[1]; or 1-2 times a week moderate to vigorous sporting activity and 4 days a week brisk or fast walking for 30 minutes or more.

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
  We used twice the average daily recommended amount (i.e. binge drinking) in the last 7 days: more than 6 units for women and more than 8 units for men on their heaviest drinking day.

*These were the alcohol guidelines at the time that survey data were collected. They have since been updated.

Chapter 4 looks at the prevalence of each risk behaviour using the latest UKHLS data available at the start of the project (2015), that is, data from 2013/14.

Chapter 5 examines stability and change in health behaviour across a three-year period. The chapter begins by looking at stability and change in terms of meeting and not meeting recommendations between 2010/11 and 2013/14. For each risk behaviour, the following analytical groups were created:

- Stable: met health behaviour recommendations in both 2010/11 and 2013/4
- Stable: did not meet health behaviour recommendations in both 2010/11 and 2013/14
- Started: Met health behaviour recommendations in 2013/4 but not 2010/11
- Stopped: Met health behaviour recommendations in 2010/11 but no longer did so in 2013/14.

[1] Note: constrained by the measures available in the UKHLS, this measure of physical activity (a minimum of at least 90mins of moderate to vigorous physical activity) is less exacting than the one on which the recommendation is based (at least 150 minutes).

As health behaviour data were only collected in 2010/11 and 2013/14, we acknowledge that there could be further variation in risk behaviours between these two time points. For example, some

people classified as stable might have more variable risk behaviours but happened to have consistent patterns in 2010/11 and 2013/4.

These risk behaviour measures are binary ones (meeting/not meeting the relevant recommendation). These binary measures are used in Chapters 4, 5 and 6. However, in Chapter 5, which looks at changing health behaviour over time, we moved beyond this set of dichotomous measures for smoking and drinking behaviour. Four further analysis groups were identified:

- persistent smokers who improved their smoking behaviour by smoking fewer cigarettes than previously;
- persistent smokers whose smoking behaviour worsened by smoking more cigarettes than previously;
- persistent binge drinkers who improved their drinking behaviour by consuming fewer units of alcohol on their heaviest drinking day than previously;
- persistent binge drinkers whose drinking behaviour worsened by consuming more units of alcohol on their heaviest drinking day than previously.

Among persistent smokers, an improvement in smoking behaviour was categorised as a reduction of five or more cigarettes smoked per day between 2010/11 and 2013/14. Worsening smoking behaviour was categorised as an increase in daily cigarette consumption of five cigarettes or more. The threshold of five or more cigarettes per day was chosen based on inspection of the data which showed higher than expected frequencies of people reporting smoking 5, 10, 15 and so on cigarettes per day. This 'heaping' suggests that people tend to round their cigarette consumption to units of 5. A change of five or more cigarettes between the two surveys was therefore most likely to represent real change in behaviour.

For persistent binge drinking, there were no equivalent data to guide the cut-point. Because of this, change was represented by +/- one standard deviation of the mean number of units consumed by binge drinkers. This value varied slightly for men and women but broadly meant that participants had reduced/increased their consumption by 6 units of alcohol on their heaviest drinking day to be defined as improving or worsening their alcohol consumption.[2] This approach has also been used by Vladimirov et al (2015). (See Appendix A for further details).

Because of the way data were collected, it was not possible to produce similar analysis for F&V consumption or PA (see Appendix A).

3.4 Socio-demographic and socio-economic measures

Throughout the report, we use a consistent set of socio-demographic and socio-economic measures to explore the extent to which health behaviours and changes within them are socially patterned. Some of these variables relate to individual characteristics, such as age, gender, ethnic group and marital and cohabitation status. Others relate to socio-economic factors, such as educational attainment, household income, economic activity and area deprivation. Self-reported general health status was also included as health behaviours are typically related to overall health status and it was important to take this into account. (See Appendix A for more detail on the measures included).

[2] This may seem like a large change in alcohol consumption but the focus is on stable binge drinkers and equates to reducing/increasing alcohol consumption by approximately 3 glasses of wine or 3 pints on the heaviest drinking day.

The socio-economic measures included individual-level (educational attainment, economic activity), household-level (household income) and area-level circumstances (Index of Multiple Deprivation) and our multivariate analysis allowed us to take these different dimensions into account.

3.5 Life transitions

The individual life course is marked out by a series of life transitions and events. These include changes in economic status (e.g. leaving full-time education, entering employment, retiring) and relationship status (e.g. entering into a cohabiting relationship, becoming a parent) as well as changes in income. In selecting transitions for analysis, the project team focused on transitions (i) that most people may experience at some point in their lives (ii) where there was evidence and/or a plausible hypothesis suggesting that the transition may impact on health behaviours and (iii) there were sufficient numbers of people in the UKHLS experiencing these changes between 2010/11 and 2013/14 to allow analyses to be performed.

With respect to our first criteria, we identified life transitions that characterise the life course of many adults in the UK. For example in England, over 300,000 of those aged 18 to 30 enter higher education every year, and across the time period of our study (2010/11 to 2013/14), nearly half (48%) of adults aged 17 to 30 years and domiciled in England went on to higher education at a UK institution (BIS, 2015). The large majority of students (87%) move into employment following graduation (BIS, 2016). Overall, 75% of adults aged 16 to 64 in England and Wales are in paid employment (ONS, 2017a). Across the period of our study (2010/11 to 2013/14), the majority of adults (60%) were living as a couple (married/civilly partnered or cohabiting (ONS, 2015) and most adults go on to become parents (OECD, 2011; Graham et al, 2017).

To apply our second criteria, we undertook a Rapid Evidence Assessment (REA). REA is a technique recommended by the Government Social Research Unit (GSRU, 2008) and is a delineated form of evidence review undertaken to establish the scope and strength of the evidence in areas where existing review evidence is limited. It uses the same principles as a broader evidence assessment in that it is conducted with clear research questions and predefined inclusion and exclusion criteria but, as a rapid review, it is conducted within a short time frame and thus considers fewer outputs in less detail. Details of the REA protocol are given in Appendix F.

We conducted separate REAs for each of the transitions (changes in relationship status, changes in employment status, changes in household income and having/adding a child to a household) and each of the health behaviours (smoking, drinking, F&V consumption, PA). This meant sixteen different REAs were conducted in total. Findings are discussed in Chapter 6.2. (See Appendix F for the protocols and further details of findings).

Alongside the REA, we also undertook preliminary analyses of the UKHLS dataset to establish that the numbers of adults experiencing the transition would support analyses of its association with stability and change in health behaviour.

On the basis of the REA and our preliminary analyses, the following transitions were identified for inclusion in our analyses:

- Changes in relationship status (moving in or out of a relationship)

- Changes in family composition (adding at least one child to a previously childless household)[3]
- Changes in employment status (moving from employment to unemployment; unemployment to employment; being a student to employment or unemployment and employment to retirement)
- Changes in income (changes in equivalised household income of +/- 20% or more)

3.6 Data on life transitions

Details of how the four transitions were defined are given in Box 5.

Box 5: Overview of life transitions used in analysis

Life transition	Definition	Consideration
Changes in relationships:		
Moved into a relationship	Those who were single, never married or single, divorced, widowed (and not cohabiting) in 2010/11 and cohabiting or married in 2013/14	Those who are in a relationship but not cohabiting will be excluded from this definition.
Moved out of a relationship	Those who were cohabiting or married in 2010/11 and single, never married or single, divorced or widowed (and not cohabiting) in 2013/14	Those who are in a relationship but not cohabiting will be excluded from this definition.
Adding children to the household	Those where the number of children in the household was 0 in 2010/11 and was 1 or more in 2013/14	Most only added one child to the household but 20% added more than one.
Employment transitions:		
Moved into employment	Those who were unemployed in 2010/11 and employed or self-employed in 2013/14	As data are measured only at two points, participants may have had periods of different employment status between 2010/11 and 2013/14.
Moved out of employment	Those who were employed or self-employed in 2010/11 and unemployed in 2013/14	
Student to employment	Those who were full-time students in 2010/11 and were employed/self-employed in 2013/4	
Student to unemployment	Those who were full-time students in 2010/11 and were unemployed in 2013/4	
Moved into retirement	Those who were employed/self-employed in 2010/11 and were retired in 2013/4.	
Income change:		
Income increased	Those whose equivalised household income increased by 20% or more between 2010/11 and 2013/14	A 20% change (or more) was chosen as this magnitude of change suggests real income changes rather than year-on-year changes in line with inflation.
Income decreased	Those whose equivalised household income decreased by 20% or more between 2010/11 and 2013/14	

[3] In the literature, and theoretically, it is more usual to consider specifically the *birth* of a first child. However, the way that the UKHLS questionnaire is constructed does not allow us to do this. Calculating the addition of one or more children to a previously childless household is a close proxy. For more details, see Appendix A.

3.7 Analysis techniques

The analyses were adjusted for the complex survey design of the UKHLS; weighting also took account of non-response and over-sampling to produce nationally representative results. Cross-sectional weights for 2013/14 were used for all analyses, including analyses of changing health behaviours (see Appendix A for discussion and rationale). Weighted values are presented in the tables unless otherwise indicated.

Chapters 4, 5 and 6 present Average Marginal Effects (AMEs) from multivariate logistic regression analysis of socio-demographic and socio-economic factors associated with health behaviours/behaviour change. AMEs are the estimated change in the predicted probability of engaging in the behaviour for a given factor net of the other variables.

An example is provided in Table 3.1 below. This shows the predicted prevalence of smoking among men of different ages. Like odds ratios, AMEs are presented relative to a reference category and show how much (if at all) the predicted prevalence varies from the reference group. Unlike odds ratios, they provide a direct interpretation of the association of the factor with the outcome of interest and its relative size.

Table 3.1: Prevalence of cigarette smoking and average marginal effects of being a current cigarette smoker: Men

	Unadjusted prevalence of cigarette smoking	Bases		Average Marginal Effect* (change in proportion from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*N*	*N*			
Age[a,b]						
16-24	20	*2271*	*1704*	**REF: 0.21**		
25-34	24	*2087*	*1537*	+0.03	-0.00	+0.07
35-44	20	*2339*	*2048*	+0.02	-0.02	+0.05
45-54	22	*2563*	*2267*	+0.01	-0.03	+0.05
55-64	18	*2262*	*1965*	-0.05	-0.08	-0.01
65+	10	*3316*	*2969*	-0.11	-0.15	-0.06

[a] Unadjusted prevalence varies significantly by this characteristic, p<0.05

[b] Characteristic significant in regression model, p<0.05

*Average Marginal Effects take into account other characteristics entered into the model, in this case educational attainment, ethnic group, employment status, general health, area deprivation, marital and cohabitation status and income (data not shown).

Looking at this example, we can see that, given their other characteristics (in this case, educational attainment, ethnic group, employment status, general health status, area deprivation, marital and cohabitation status and income), the predicted prevalence of smoking among men aged 16-24 was 21%. The unadjusted rate was 20%. Looking at the AMEs, we can see that current smoking varied by age and was lower among those aged 55 and over than among those aged 16-24. For those aged 55-64, the predicted prevalence was 5 percentage points lower than those aged 16-24 (i.e. 16%; calculated as 0.21 - 0.05). Among those aged 65 and over, the predicted prevalence was 11 percentage points lower than those aged 16-24 (i.e. 10%, calculated as 0.21 – 0.11).

As with odds ratios, the confidence intervals indicate whether the differences are statistically significant. If the confidence intervals include the value of 0, the difference from the reference category is not significant at conventional levels. In this example, those aged 55 and over had significantly different predicted smoking prevalence to those aged 16-24.

AMEs have advantages over odds ratios as results represent a predicted prevalence of behaviour which can be easier to interpret and understand than odds ratios. This predicted prevalence rate helps to highlight the magnitude of differences from the reference group in a meaningful way. For example, we can see that predicted smoking rates among those aged 65 and over, given their other characteristics, were broadly half that of those aged 16-24 (21% vs 11%).

Results from all models in Chapters 4, 5 and 6 are presented as AMEs. For completeness, odds ratios from the same regression models are included in Appendices C to E.

In Chapter 5 and 6, the logistic regression models were estimated on subsets of the data to explore in more detail the social patterning of health behaviour change (Chapter 5) and its relationship to life transitions (Chapter 6). In order to ensure we were comparing like with like, the models compared those who changed behaviours or experienced a life transition with those who had the same behaviour/life circumstance in 2010/11 but had not experienced any change. This is summarised is Box 6.

Box 6: Analytical groups for regression models in Chapters 5 and 6

Chapter 5		
Regression model	**Analytical groups**	**Base for model**
Starting smoking	Those who were non-smokers in both 2010/11 and 2013/14 compared with those who were current smokers in 2013/4 but were not in 2010/11	All non-smokers in 2010/11
Stopping smoking	Those who were smokers in both 2010/11 and 2013/14 compared with those who were not current smokers in 2013/4 but were in 2010/11	All smokers in 2010/11
Starting binge drinking	Those who were non-binge drinkers in both 2010/11 and 2013/14 compared with those who binge drank in 2013/14 but had not in 2010/11	All non-binge drinkers in 2010/11
Stopping binge drinking	Those who were binge drinkers in both 2010/11 and 2013/14 compared with those who binge drank in 2010/11 but did not in 2013/4	All binge drinkers in 2010/11
Starting to meet F&V recommendations	Did not meet F&V recommendations in 2010/11 and 2013/4 compared with those who met recommendations in 2013/4 but did not in 2010/11	All who did not meet F&V recommendations in 2010/11
Stopping meeting F&V recommendations	Met F&V recommendations in 2010/11 and 2013/4 compared with those who met recommendations in 2013/4 but did not in 2010/11	All who met F&V recommendations in 2010/11
Starting to meet PA recommendations	Did not meet PA recommendations in 2010/11 and 2013/4 compared with those who met recommendations in 2013/4 but did not in	All who did not meet PA recommendations in 2010/11

	2010/11	
Stopping meeting PA recommendations	Met PA recommendations in 2010/11 and 2013/4 compared with those who met recommendations in 2010/11 but did not in 2013/14	All who met PA recommendations in 2010/11
Chapter 6		
Regression model	**Analytical groups**	**Base for model**
Moved into a relationship	Those who were single (never married) or single (separated/widowed/divorced) in both 2010/11 and 2013/14 compared with those who were single in 2010/11 but married or cohabiting in 2013/4	All those who were single (never married) or single (separated, widowed, divorced in 2010/11.
Moved out of a relationship	Those who were married or cohabiting in 2010/11 and 2013/4 compared with those who were married/cohabiting in 2010/11 but single (either never married, separated, widowed or divorced) in 2013/4	All those married or cohabiting in 2010/11
Moved into employment	Those who were unemployed in both 2010/11 and 2013/4 compared with those who were unemployed in 2010/11 but employed in 2013/4	All those unemployed in 2010/11
Moved into unemployment	Those who were employed/self-employed in both 2010/11 and 2013/4 compared with those who were employed/self-employed in 2010/11 but unemployed in 2013/4	All those employed/self-employed in 2010/11
Moved from full-time student to employment	Those who were a full-time student in 2010/11 and 2013/4 compared with those who were a full-time student in 2010/11 but employed/self-employed in 2013/4	All full-time students in 2010/11
Moved from full-time student to unemployment	Those who were a full-time student in 2010/11 and 2013/4 compared with those who were a full-time student in 2010/11 but unemployed in 2013/4	All full-time students in 2010/11
Moved from employment to retirement	Those who were employed/self-employed in 2010/11 and 2013/4 compared with those who were employed/self-employed in 2010/11 and retired in 2013/14	All employed/self-employed in 2010/11
Added a child	Those who lived in households with no children under the age of 16 in both 2010/11 and 2013/4 compared with those who lived in households with no children aged 16 or under in 2010/11 but with at least one child in 2013/4	All who lived in households with no children under the age of 16 in 2010/11
Increased income	Those whose income was stable (did not change by +/- 20%) compared with those whose household income increased by 20% or more between 2010/11	Those with stable or increasing income
Decreased income	Those whose income was stable (did not change by +/- 20%) compared with those whose household income decreased by 20% or more between 2010/11	Those with stable or decreasing income

4. HEALTH BEHAVIOURS IN 2013/14: PREVALENCE AND SOCIAL PATTERNING

4.1 Introduction

This chapter addresses the first project objective, documenting the prevalence of the four health behaviours and exploring the extent to which these behaviours are socially patterned. Our measures of healthy and unhealthy behaviours are based on government recommendations at the time of data collection; 'risk behaviours' are therefore those that do not meet the recommendations (see Box 1 and 4).

The section begins by looking at prevalence of the four risk behaviours among adults aged 16 and over in 2013/14 and then explores how this varies by different socio-demographic and socio-economic characteristics. Only results that are statistically significant at conventional levels ($p<0.05$ and $p<0.01$) are reported in the text.

4.2 Prevalence of each health behaviour among all adults

Figure 4.1 summarises the prevalence of single risk behaviours among all adults in England in 2013/14. Most adults reported behaviours that met government recommendations for cigarette smoking and binge drinking: 82% did not smoke and 76% did not binge drink. For both behaviours, proportions meeting government recommendations were higher for women than men. Details are given in Appendix C (Tables C1, C3, C5 and C7 for men and Tables C2, C4, C6 and C8 for women).

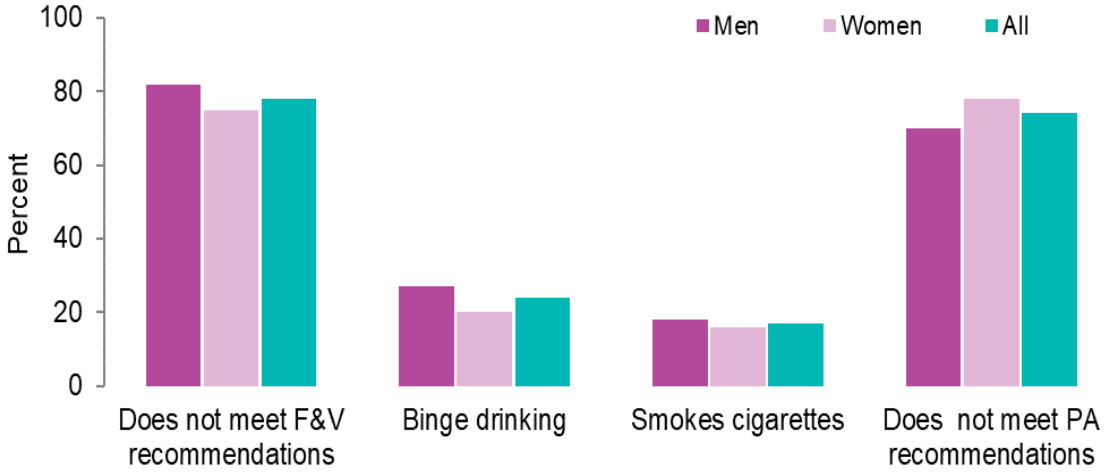
Most adults did not meet government recommendations for F&V consumption (78%) and physical activity (74%). Women were more likely to meet F&V recommendations but less likely to meet physical activity recommendations than men.

For smoking and F&V consumption, these estimates are broadly in line with those reported in the 2015 Health Survey for England (HSE) (NHS Digital, 2016). The HSE estimated that 82% of adults did not smoke and that 74% of adults did not meet F&V recommendations in 2015. HSE estimates for binge drinking were lower than those reported here (15% vs 24%) and the most recent estimates for PA, collected in HSE 2012, showed 62% of adults not meeting PA recommendations, somewhat lower than the UKHLS estimate of 74%. These differences are likely to be due to differences in the way the data were collected.[4] [5]

[4] See Graham, H et al (2016a) for fuller details.

[5] For drinking, UKHLS uses a self-completion questionnaire and HSE a face-to-face interview. For physical activity, the UKHLS collects data on a narrower range of activities than the HSE meaning that fewer people are recorded as meeting recommendations.

Figure 4.1: Prevalence of single risk behaviours in England (UKHLS 2013/14)



4.3 Social patterning of the health behaviours

To explore the social patterning of each risk behaviour, we estimated multivariate logistic regression models from which we derived the average marginal effects (AMEs) of each covariate on the four risk behaviours, namely:

- Smoking
- Binge drinking
- Not meeting F&V recommendations
- Not meeting PA recommendations.

The social factors included in the models covered a range of socio-demographic factors (age, ethnic group, marital and cohabitation status), socio-economic factors (educational attainment, employment status, equivalised household income, area deprivation) and general health status. Separate models were estimated for men and women.

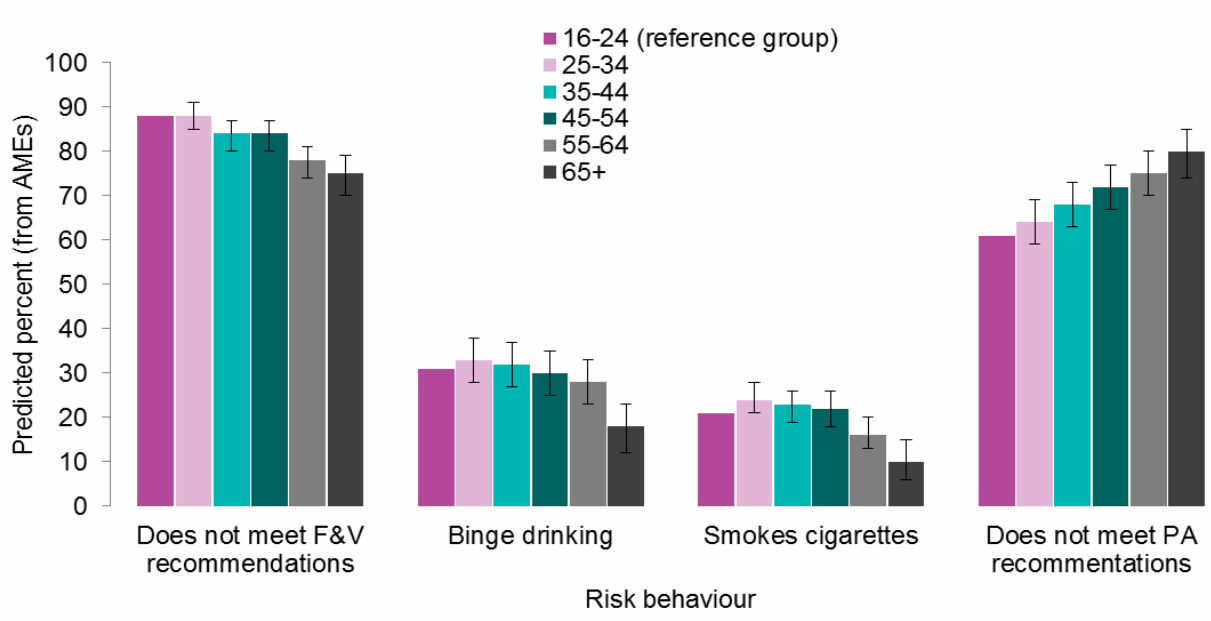
AMEs are the estimated change in predicted values from non-linear multivariate analysis (i.e. from multiple logistic regression). They provide the difference in the predicted probability of the outcome relative to the reference category and net of other covariates (see Section 3.7 for a fuller explanation). We report predicted prevalence derived from the AMEs. Full tables of models and estimates are provided in Appendix C. We organise the rest of this chapter by reporting the relationship between socio-demographic factors and each risk behaviour (Section 4.3.1), socio-economic factors (4.3.2) and health status (4.3.3).

4.3.1 Health behaviours by socio-demographic factors

Looking first at socio-demographic factors, for both men and women, age was associated with all four health behaviours. Older men (broadly those aged 55 and over) were less likely to smoke cigarettes, less likely to binge drink, less likely to meet PA recommendations but more likely to consume the recommended levels of F&V than those aged 16-24. Similar patterns were evident for women, see Figures 4.2 and 4.3 (for further details, see tables in Appendix C).

Figure 4.2: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by age

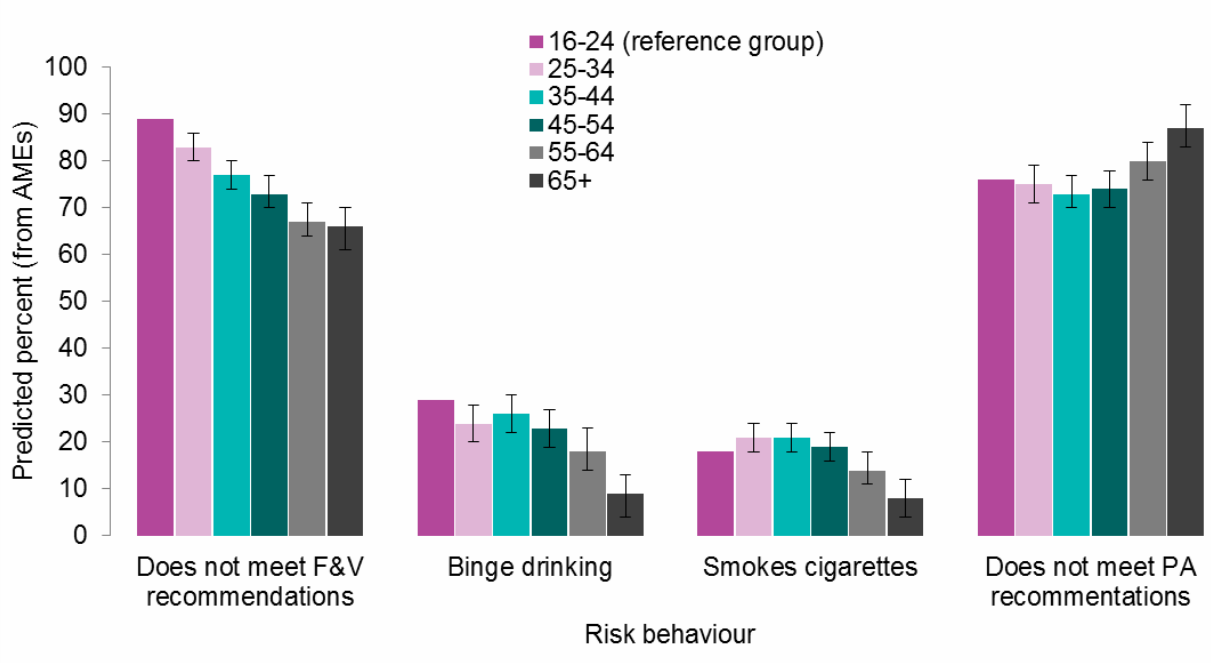
Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



(Appendix C, Tables C1, C3, C5, C7)

Figure 4.3: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by age

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



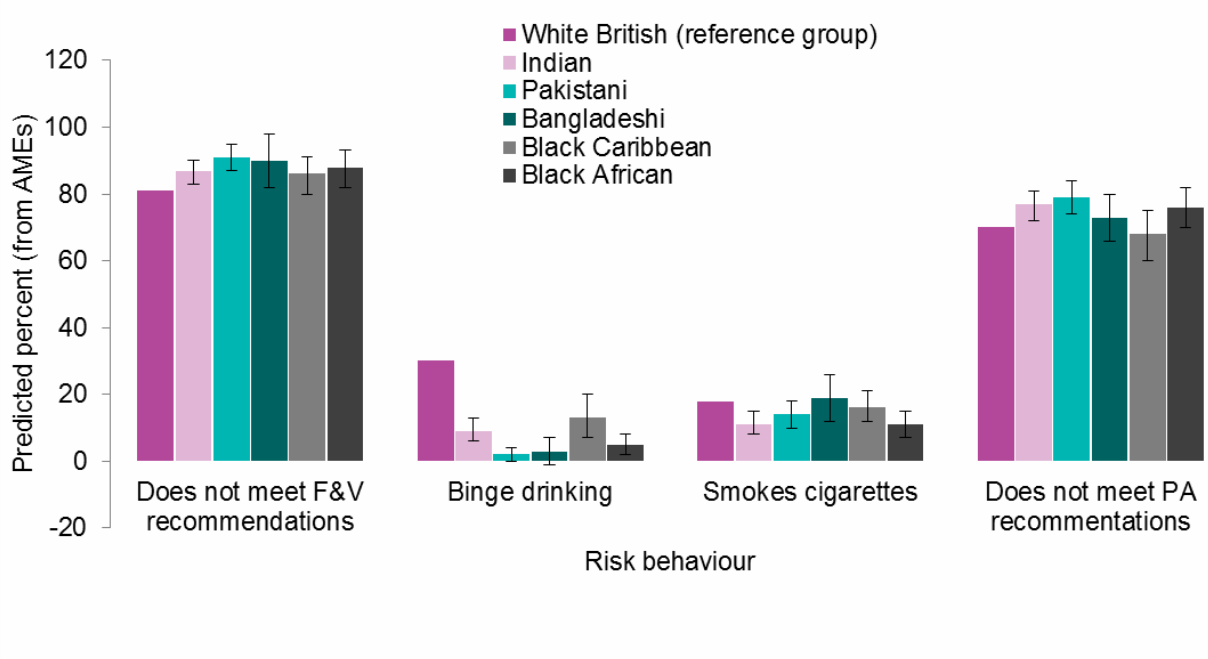
(Appendix C, Tables C2, C4, C6, C8)

For both men and women, ethnic group was associated with all four risk behaviours. For women, the general pattern was that those from non-White British ethnic groups were less likely to smoke and to

binge drink but were more likely to not meet recommendations for F&V or PA.[6] For men, whilst the broad patterns were the same, there was greater variation for specific ethnic groups. For example, men who were Black African or Indian were less likely to smoke than those who were White British whilst men from all other ethnic groups had predicted smoking rates similar to White British males. Likewise, among men, it was those who were Indian, Pakistani, Bangladeshi or Black African who were more likely to not meet F&V recommendations than those who were White British. The same pattern was evident for meeting PA recommendations. However, like women, men from all non-White ethnic groups were less likely to binge drink than those who were White British. See Figures 4.4 and 4.5.

Figure 4.4: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by ethnic group[7]

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



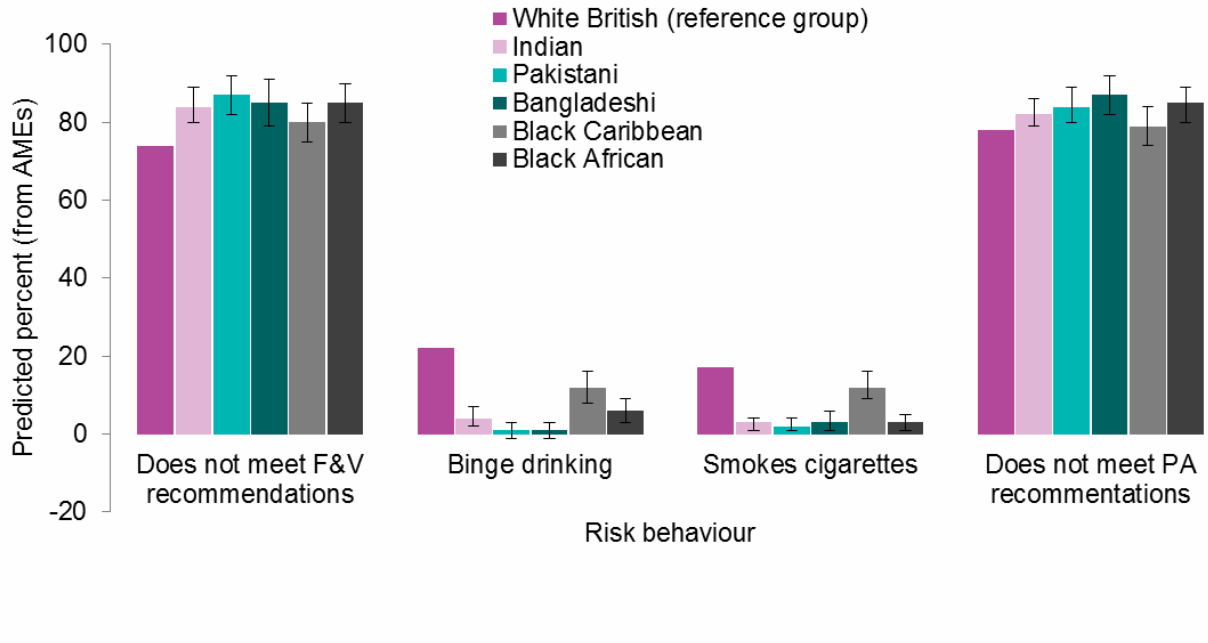
(Appendix C, Tables C1, C3, C5, C7)

[6] With the exception of Black Caribbean women who had similar levels of meeting PA recommendations to the reference group of White British.

[7] Confidence intervals straddle zero with low prevalence behaviours for small n groups. This is because the estimate for the reference group itself has a confidence interval around it and confidence intervals for each group represent the level of change from the confidence interval of the reference estimate, which means in some cases they can appear to be lower than zero.

Figure 4.5: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by ethnic group

Source: UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account



(Appendix C, Tables C2, C4, C6, C8)

Marital and cohabitation status was associated with two out of four risk behaviours for men and three out of four for women. For both men and women, it was associated with smoking and meeting PA recommendations. The predicted prevalence of smoking was lower among those who were married (14% men; 12% women) than those who were single, never married (21% men, 20% women), widowed, divorced or separated (24% men; 19% women) or cohabiting (23% men; 21% women). Among men and women who were single (never married), the predicted prevalence of not meeting PA recommendations (net of other characteristics) were 62% and 75% respectively. This was lower than those who were married (67% men; 79% women). Additionally among women, relationship status was associated with meeting F&V recommendations, with women who were single ((widowed, separated or divorced) being marginally more likely to not meet recommendations (76%) than those who were married (73%).

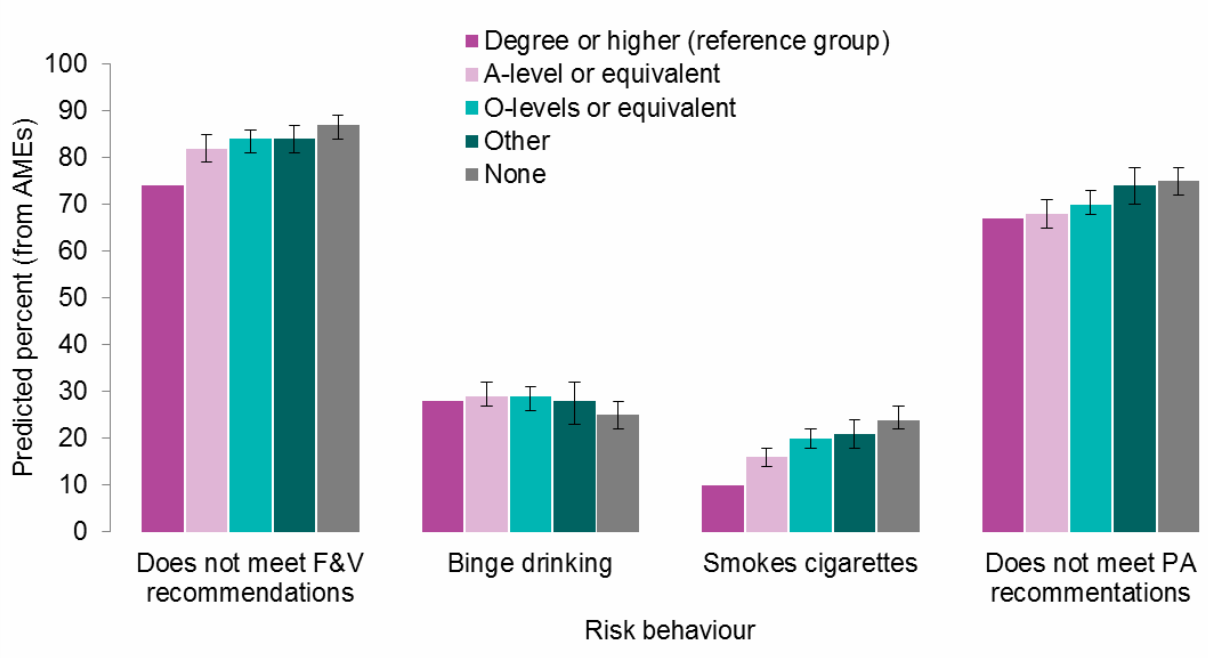
4.3.2 Health behaviours by socio-economic factors

Turning to socio-economic factors, for both men and women, educational attainment was associated with three of the four behaviours: smoking, not meeting F&V recommendations and not meeting the PA recommendations. Those with lower levels of educational attainment were more likely to smoke and more likely to not meet F&V or PA recommendations than those educated to degree level or higher. This pattern was particularly pronounced for smoking. Among women the predicted prevalence of smoking was nearly three times higher among those with no educational qualifications (23%) than those with a degree or higher (8%). Among men, the predicted prevalence of smoking was more than two times higher among those with no educational qualifications (24%) than those

with a degree or higher (10%). Educational attainment was not associated with binge drinking. See Figures 4.6 and 4.7.

Figure 4.6: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by educational attainment

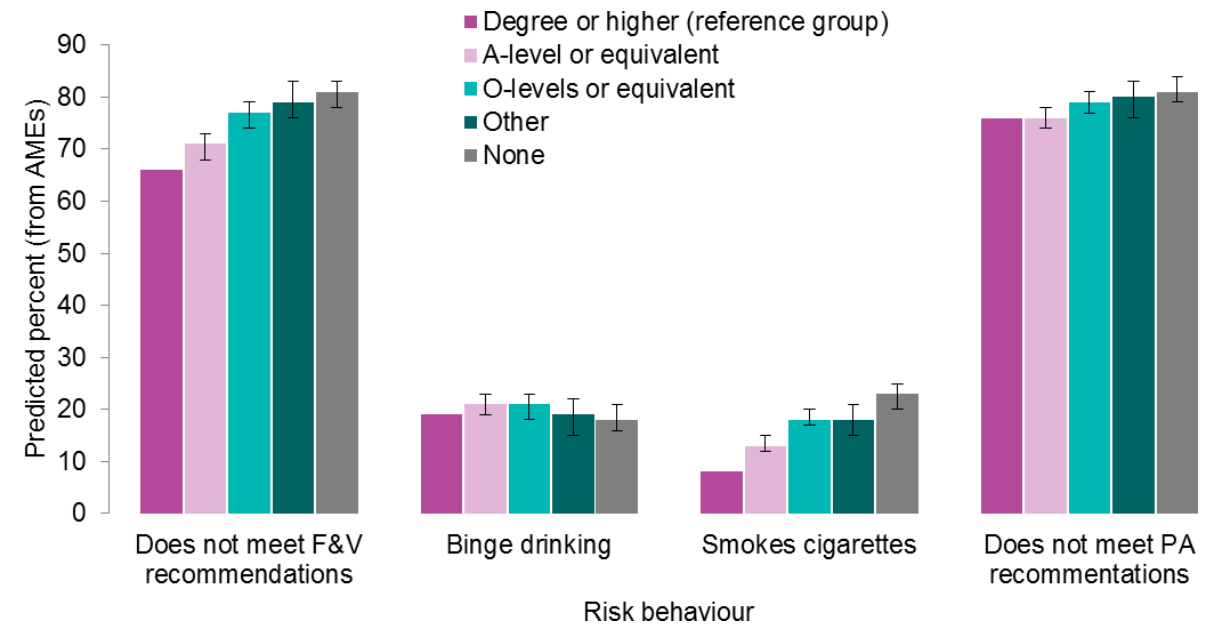
Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



(Appendix C, Tables C1, C3, C5, C7)

Figure 4.7: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by educational attainment

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



(Appendix C, Tables C2, C4, C6, C8)

For men and women alike, current employment status was associated with smoking, where those who were unemployed, students or economically inactive because of long-term illness were more likely to smoke than those in paid employment; an estimated 27% of men who were unemployed and 23% of women who were unemployed smoked compared with 19% of men and 17% of women who were in paid employment, other things being equal. Men and women who were unemployed were also less likely to meet F&V recommendations than those in paid employment; an estimated 88% of men and 81% of women who were unemployed did not meet F&V recommendations compared with 82% men and 76% women who were in paid employment.

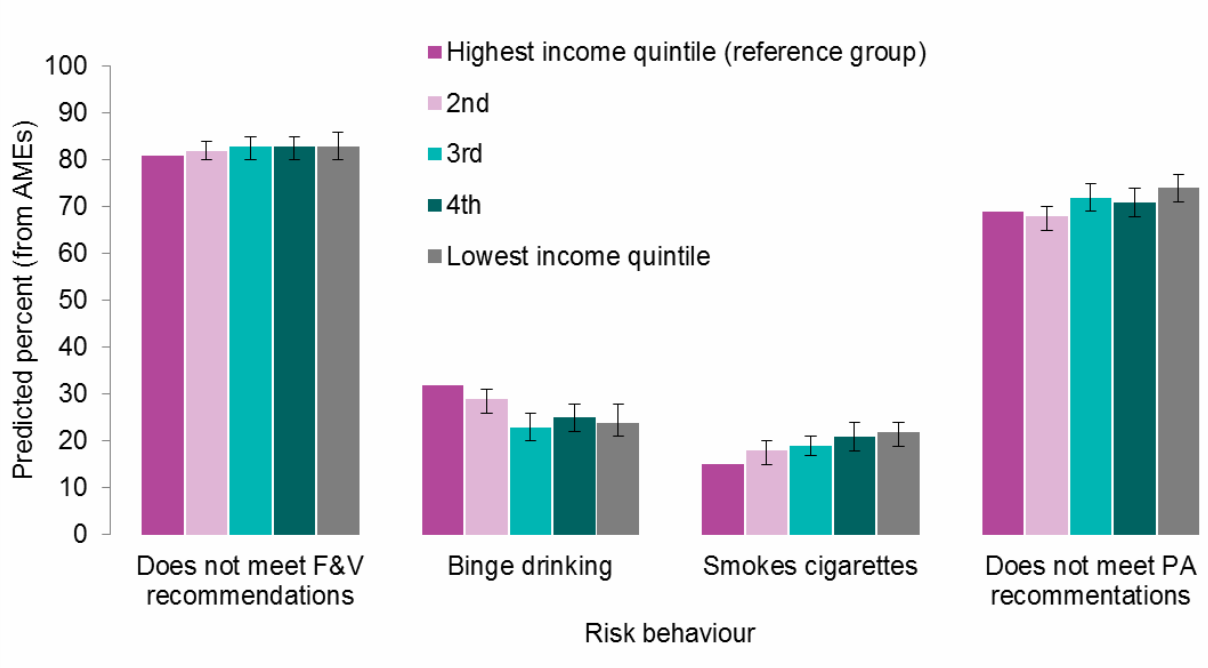
Among men, current employment status was not associated with meeting PA recommendations. Among women those who were economically inactive because of long-term illness were more likely not to meet PA recommendations (predicted prevalence 90%) than women in paid employment (predicted prevalence 78%).

Finally, whilst current employment status was associated with binge drinking, the patterns varied for men and women. Among men, those who were economically inactive because of long-term illness were less likely to binge drink than those in paid employment (predicted prevalence of 18% vs 29% respectively). Among women, it was those who were looking after the family/home and students who were less likely to binge drink. Predicted prevalence estimates were 22% for women in paid employment, 17% among female students and 15% among women who were looking after the family/home.

Figures 4.8 and 4.9 show, for men and women respectively, the predicted prevalence of each risk behaviour by equivalised household income. For both men and women, the prevalence estimates for smoking and meeting PA recommendations varied by income, with those in the lowest income households being more likely to smoke and more likely to not meet PA recommendations. The opposite pattern was true for binge drinking, with the prevalence of binge drinking being higher among those from the highest income households and lower among those from lower income households. Among men, meeting F&V recommendations did not vary by household income but it did for women. Women living in the lowest income households were more likely to not meet F&V recommendations than women living in the highest income households.

Figure 4.8: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by equivalised household income

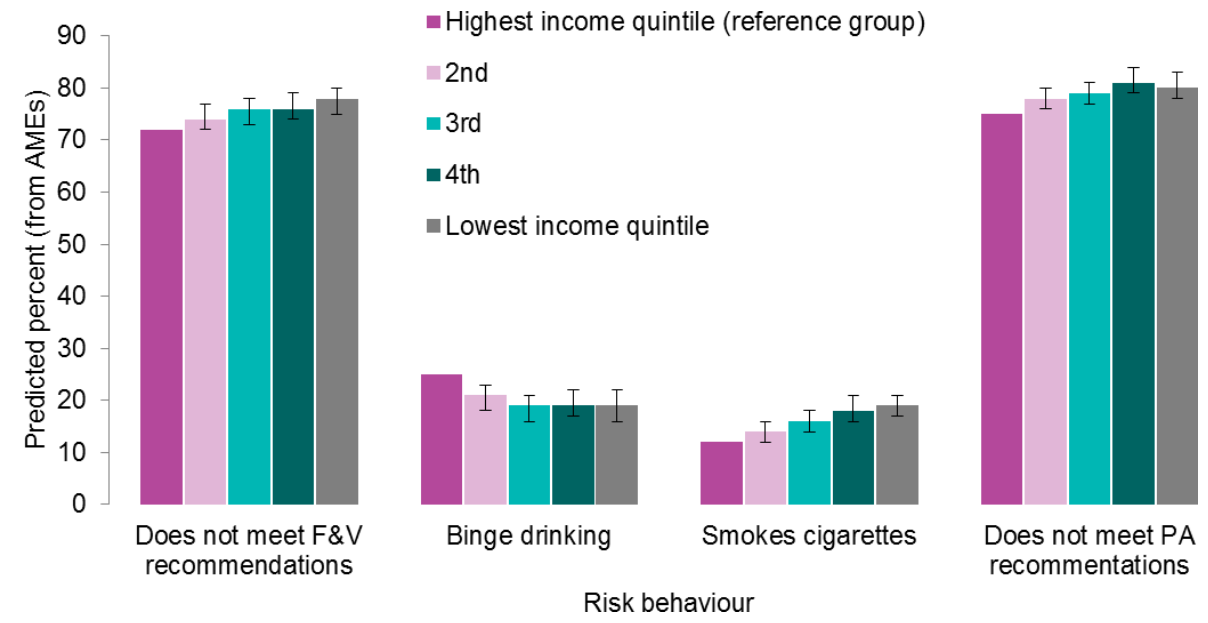
Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



(Appendix C, Tables C1, C3, C5, C7)

Figure 4.9: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by equivalised household income

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



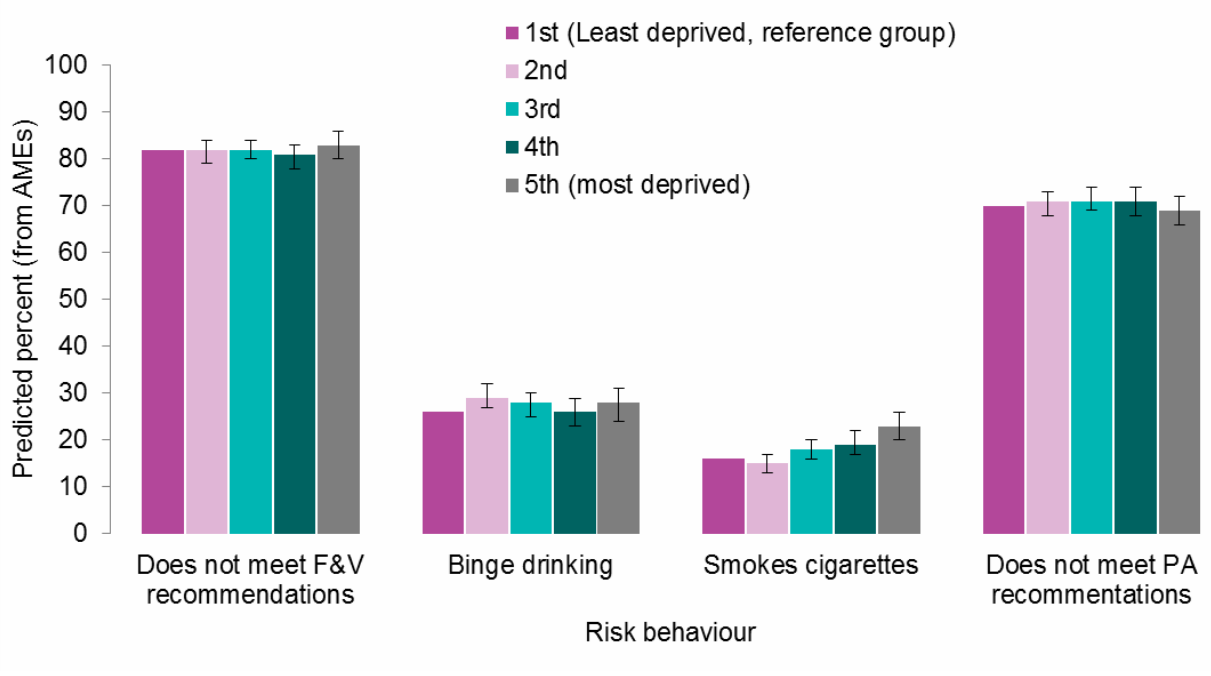
(Appendix C, Tables C2, C4, C6, C8)

Area deprivation, as measured using the Indices of Multiple Deprivation (IMD), was only associated

with smoking for both men and women and with binge drinking for women.[2] Looking at smoking, those who lived in the most deprived areas of England had higher predicted rates of smoking (23% men; 19% women) than those who lived in the least deprived areas (16% men; 12% women). Conversely, however, women who lived in the most deprived areas were less likely to binge drink (18%) than those who lived in the least deprived areas (21%) (see Figures 4.10 and 4.11).

Figure 4.10: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by Indices of Multiple Deprivation quintile group

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

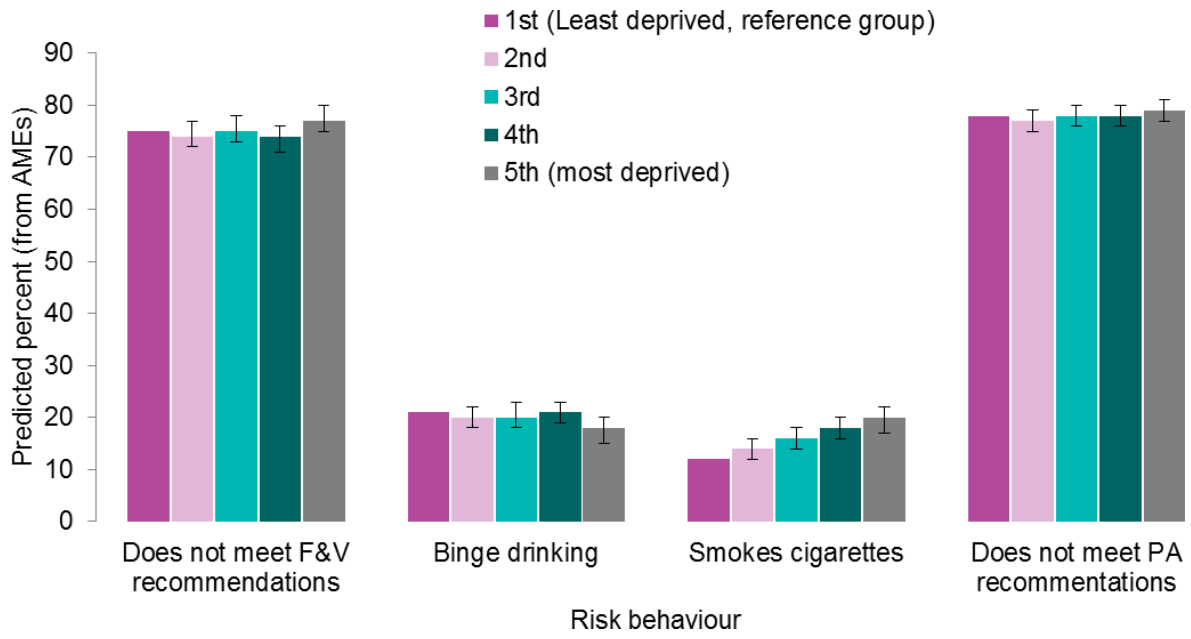


(Appendix C, Tables C1, C3, C5, C7)

[2] As noted on page 30, all the analyses on social patterning of risk behaviours are adjusted; Figure 4.10 therefore takes account of individual-level (educational attainment, employment status) and household- level (equivalised household income) socio-economic factors.

Figure 4.11: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by Indices of Multiple Deprivation quintile group

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



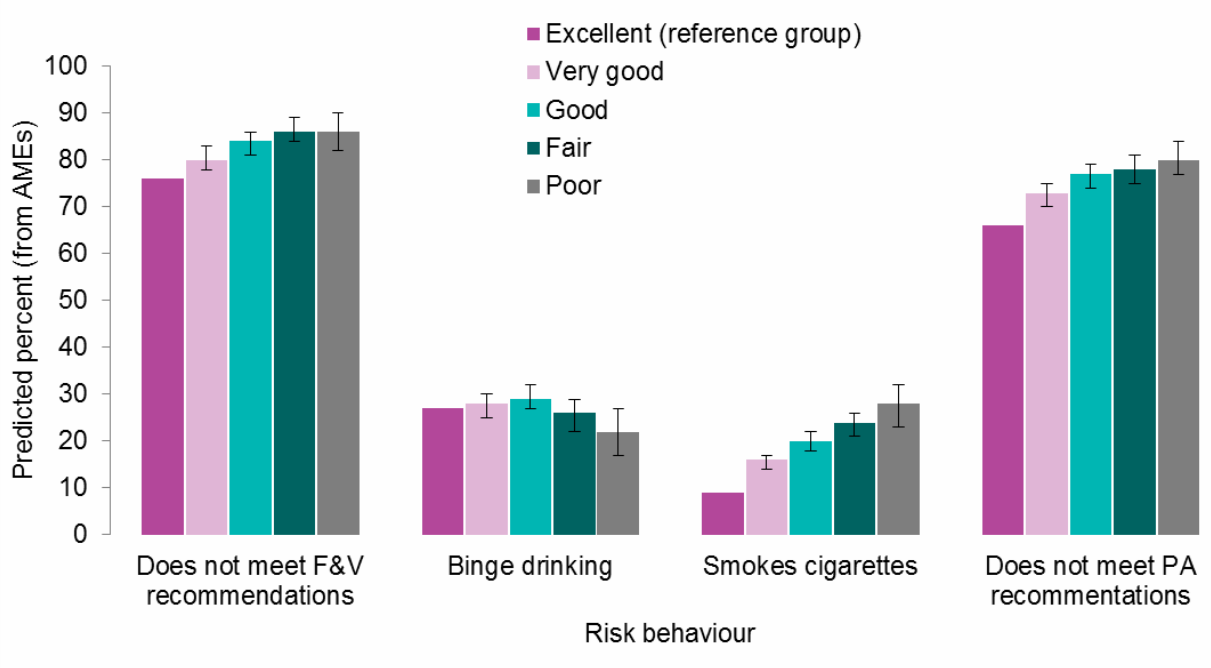
(Appendix C, Tables C2, C4, C6, C8)

4.3.3 Health behaviours by general health status

Finally, self-reported general health status was associated with all four risk behaviours. The patterns were the same for men and women. Those in poor health were more likely to smoke than those in excellent health. They were also more likely to not meet F&V or PA recommendations. However, those in poor health were less likely than those in excellent health to binge drink. See Figures 4.12 and 4.13.

Figure 4.12: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, men, by self-reported general health

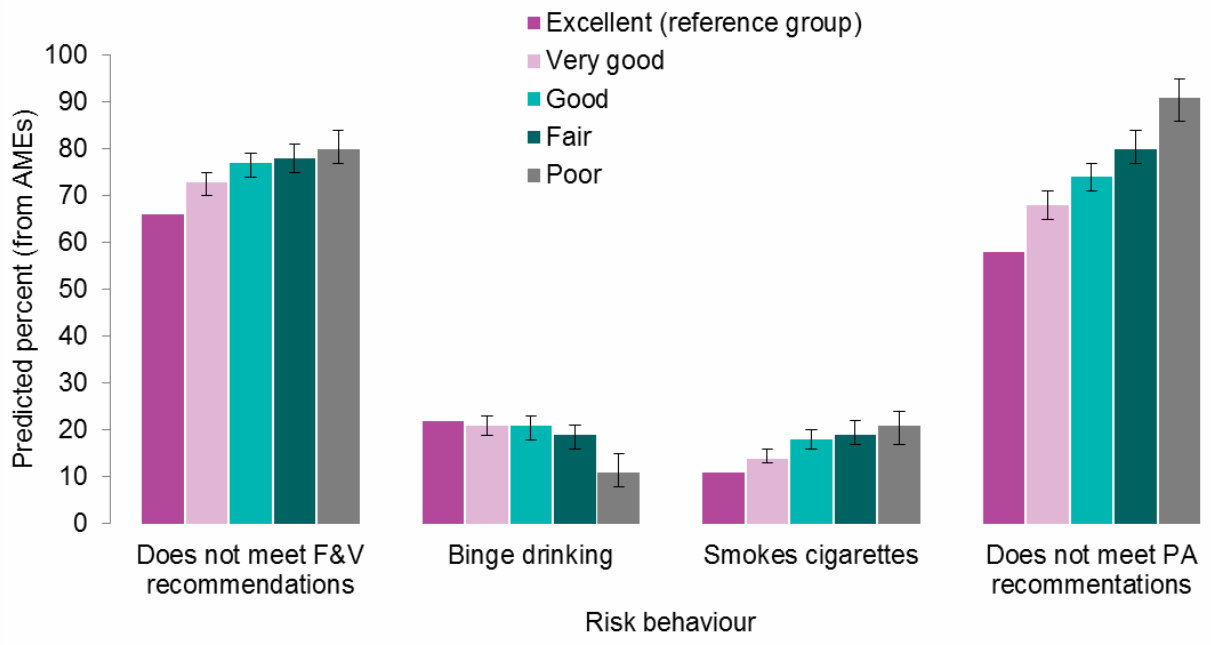
Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



(Appendix C, Tables C1, C3, C5, C7)

Figure 4.13: Predicted prevalence (with 95% confidence intervals) of each risk behaviour, women, by self-reported general health

Source: *UKHLS 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



(Appendix C, Tables C2, C4, C6, C8)

4.4 Summary

Overall, engagement in risky health behaviours varied; smoking was not common with less than one in five men and women being cigarette smokers. Binge drinking too was uncommon: around 3 out of 4 men and women did not binge drink. However, most people (at least 3 out of 4) did not meet recommendations for F&V or PA.

Adherence to recommendations was socially patterned. The patterns for men and women were broadly similar; however, with the exception of PA, women were more likely to meet the recommendations than men. Age was strongly associated with all health behaviours. In broad terms, those who were older typically displayed more positive health behaviours, being less likely to smoke and binge drink and more likely to meet F&V recommendations. However, older people were less likely to meet PA recommendations, even after health status and socio-economic factors were taken into account. PA recommendations are intended to be applicable to all adults and variance in adherence by age suggests that there are barriers to participation among older people.

Along with age, health behaviours were also patterned by ethnicity, where those from non-white ethnic groups were less likely to smoke and binge drink but more likely not to meet F&V or PA recommendations. Engagement in risk behaviours was also related to people's socio-economic circumstances. In broad terms, social disadvantage was associated with smoking, and with levels of F&V consumption and PA that did not meet the recommendations, while social advantage was associated with binge drinking. Thus, those with the lowest levels of educational attainment, who were unemployed or with low incomes tended to be more likely to smoke and less likely to meet F&V recommendations. Those with lower levels of educational attainment or low incomes were also less likely to meet PA recommendations. When looking at binge drinking and income, however, the opposite pattern was true: those with low incomes were less likely to binge drink than those with higher incomes.

Area deprivation did not discriminate between those meeting F&V or PA recommendations. This is an interesting finding given that the local environment has been identified as an influence on these behaviours, for example with respect to food outlets (Fraser et al, 2010; White, 2007) and to accessible greenspace (Jones & Combes, 2009), and policies are giving increasing emphasis to locality-based approaches to promoting health (Kings Fund, 2013; PHE, 2015). It may be that area deprivation is a poor proxy for the area-level factors that may be associated with F&V or PA or that the main drivers of these health behaviours are related more to the individual than the area in which they live. However, area deprivation was strongly associated with smoking status, with those living in more deprived areas being more likely to smoke. Area deprivation has been identified as an important influence on smoking status in both quantitative and qualitative studies (Ellaway & Macintyre, 2009; Stead et al, 2001).

Overall, our analysis shows that meeting government recommendations for key health behaviours is socially patterned but that these associations do not operate in the same way for all four behaviours. In particular, binge drinking is more likely to be associated with social advantage, whereas disadvantage is a predictor of smoking and not meeting F&V or PA recommendations.

5. STABILITY AND CHANGE IN HEALTH BEHAVIOURS: 2010/11 TO 2013/14

5.1 Introduction

This chapter addresses the project's second objective, to investigate the prevalence and social patterning of changes in the four health behaviours between 2010/11 and 2013/14. To our knowledge, it provides the first analysis of health behaviour change for all four risk behaviours for England's adult population.

Section 5.2 looks at stability and change in health behaviours. In Section 5.2.1, we examine stability and change in meeting government recommendations between 2010/11 and 2013/14. The measures used to explore adherence to government recommendations at the two time points were whether or not they:

- smoked one or more cigarettes per day;
- consumed twice or more the (then) daily recommended units of alcohol in a single day in the past week (called binge drinking hereafter)
- ate five or more portions of F&V per day
- did moderate/vigorous PA on three or more days per week

Section 5.2.2 focuses on persistent smokers and binge drinkers (i.e. those who were smokers and those who were binge drinkers in both 2010/11 and 2013/14). It presents evidence on reductions and increases in cigarette and alcohol consumption. Improved health behaviour among persistent smokers was defined as smoking five or more cigarettes per day fewer than previously. Worsening health behaviour was smoking five or more cigarettes per day more than previously. For persistent binge drinkers, 'improvers' reduced their alcohol consumption on their heaviest drinking day by more than about six units of alcohol. Those whose drinking behaviour worsened increased their alcohol consumption on the heaviest drinking day by more than about six units of alcohol (see Chapter 3.3. for a summary and Appendix A for fuller details).[8] Because of the way data were collected, it was not possible to look at improving or worsening health behaviours with respect to F&V and PA among those who failed to meet the recommendations (see Appendix A).

Section 5.3 investigates the social patterning of changes in health behaviours. It examines the social factors potentially associated with change to assess whether there was evidence of patterning in who was more or less likely to change their health behaviours and in which direction (i.e. starting or ceasing to meet recommendations).

Because changes in some health behaviours were relatively rare, we did not have the statistical power to conduct multivariate analysis separately for men and women. Therefore, in this chapter and Chapter 6, analyses are presented for all with sex entered as a co-variate in the analysis. As noted in Chapter 3, our multivariate analyses took account of a range of other factors, including age, ethnic group, health status, marital and cohabitation status, and employment status. The models also included standard measures of an individual's socio-economic circumstances: educational attainment, household income and area deprivation (see Appendix A for fuller details).

[8] The drinking thresholds were calculated separately for men and women to take account of the different recommended levels of consumption. We used a threshold of one standard deviation from the mean to classify improvement or worsening: to one decimal place, this was 6.3 units for men and 6.6 for women.

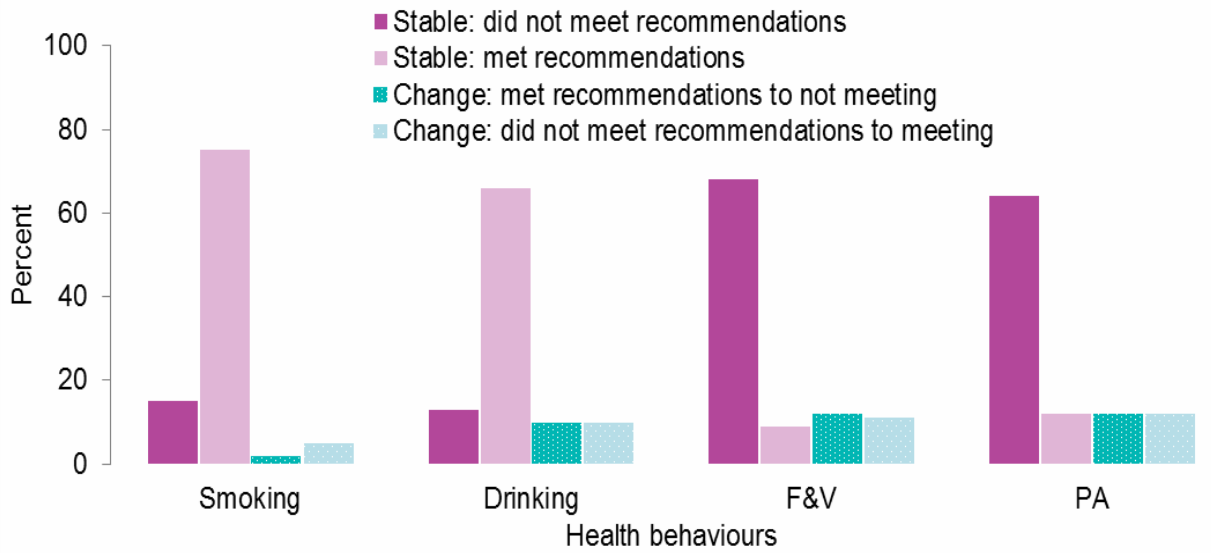
As discussed in Appendix A, a key consideration when measuring individual behaviour change is the extent to which data reflect real behaviour change rather than differences in question wording or when data were collected. This is particularly pertinent for F&V, PA and binge drinking. For F&V, participants were asked to consider a usual week and day, and for PA, to consider an average frequency over the last 12 months for sporting activities and the last 4 weeks for walking. This makes it less likely that differences in behaviour are due to when data were collected as responses are averaged over a longer time frame. Binge drinking questions asked about alcohol consumed in the past seven days. This makes this information potentially more susceptible to differences in when data were collected (for example, if someone had a birthday in the week prior to interview in one year but not the other). However, respondents tended to be surveyed in the same month each year, and results tended to show stability in binge drinking habits for individuals, which would not be expected if data were subject to measurement error due to different times of data collection.

5.2 Stability and change in health behaviours

5.2.1 Stability and change in meeting recommendations

Figure 5.1 describes stability and change in the four behaviours between 2010/11 and 2013/14. It indicates that stability in health behaviour was the norm: most people had the same pattern of behaviour in 2013/4 as 2010/11. For smoking and drinking, the majority of respondents who met the recommendations in 2010/11 (by not smoking or binge drinking) continued to meet them three years later. The pattern was similar for F&V consumption and PA, though this was driven by most people failing to meet the F&V and PA recommendations over time.

Figure 5.1: Stability and change in health behaviours, 2010/11 to 2013/14
Source: *UKHLS 2010/11 and 2013/14; Base: all adults*



(Appendix D, Tables D1-D4)

For a minority of the adult population, improved health behaviours were evident: 2% stopped smoking, 10% stopped binge drinking, 11% started to eat 5 or more portions of F&V and 12% met PA recommendations when they had not previously (Figure 5.1; Tables D1-D4).

However, there were also some who met recommendations in 2010/11 but who, when followed up in 2013/14, no longer did so. Smoking was unique among the health behaviours with the proportion of people stopping smoking outstripping the proportion starting, though those who 'started' smoking

were likely to include a large proportion of relapsed ex-smokers.[9] For all other behaviours, the proportions starting and stopping meeting recommendations were broadly similar (see Figure 5.1 and Tables D1-D4).

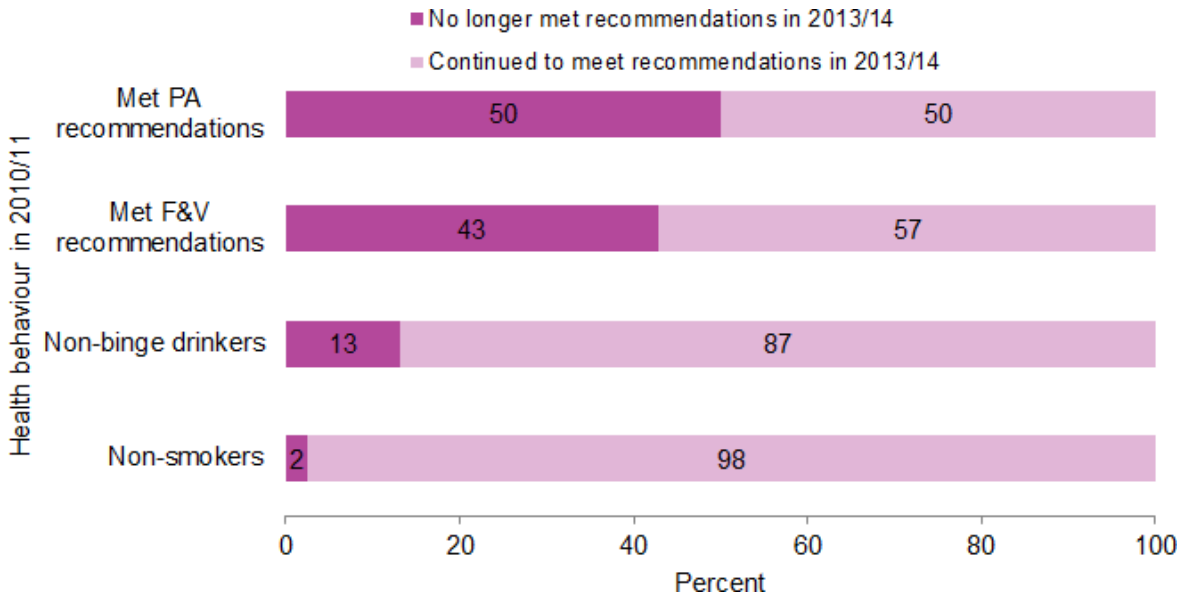
Figures 5.2a and 5.2b take a more detailed look at behaviour change among two different sub-groups: those who met recommendations in 2010/11 (Figure 5.2a) and those who did not meet recommendations in 2010/11 (Figure 5.2b). For each group, we present the proportion that maintained the same behaviour in 2013/4 or who changed.

Looking at Figure 5.2a first, there was a high degree of change in behaviours evident among the small proportion of individuals who previously met F&V and PA recommendations: 50% of those who met PA recommendations in 2010/11 no longer did so in 2013/14. The equivalent proportion of changers for F&V was 57%. As Figure 5.2a shows, such fluctuation was not apparent for smoking and drinking, where behaviours among the majority of respondents who met recommendations tended to be more stable. Thus, only 2% of those who were previously non-smokers were smokers three years later and 13% of those who had not been binge drinkers in 2010/11 reported levels of alcohol consumption in 2013/14 that classified them as binge drinkers.

Figure 5.2b focuses on those who did not meet the relevant recommendation in 2010/11 and shows whether they did so in 2013/14. For smoking, F&V and PA, there was a large degree of stability. Those who did not meet F&V or PA recommendations in 2010/11 tended not to meet them in 2013/4; only 14% and 16% started to meet recommendations respectively. The majority of smokers remained smokers (24% stopped smoking between 2010/11 and 2013/14). Patterns among binge drinkers, however, were different. Over 40% of binge drinkers in 2010/11 did not binge drink in 2013/14, displaying a greater level of change between survey years than seen for other risk behaviours.

Figure 5.2a: Stability and change among those who met the recommendation in 2010/11

Source: *UKHLS 2010/11 and 2013/14; Base: those who met recommendations in 2010/11*

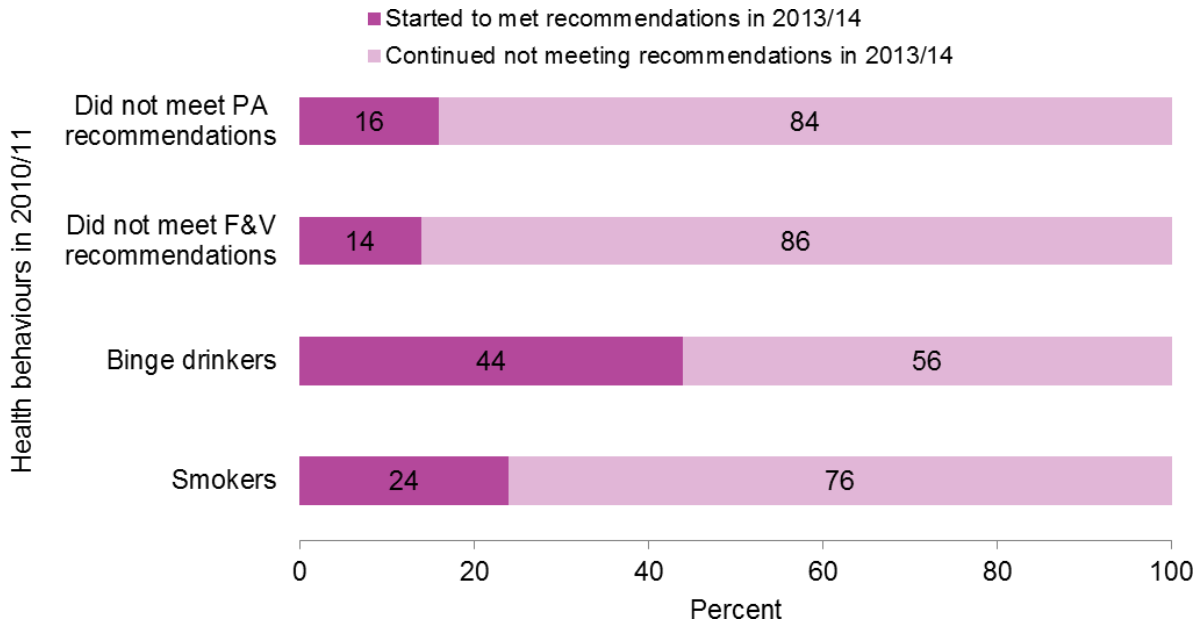


[9] About 82% of those who 'started' smoking at wave five had at wave two responded "yes" to the question "Have you ever smoked a cigarette, a cigar or a pipe?".

(Appendix D, Tables D1-D4)

Figure 5.2b: Stability and change among those who did not meet the recommendation in 2010/11

Source: *UKHLS 2010/11 and 2013/14; Base: those who did not meet recommendations in 2010/11*



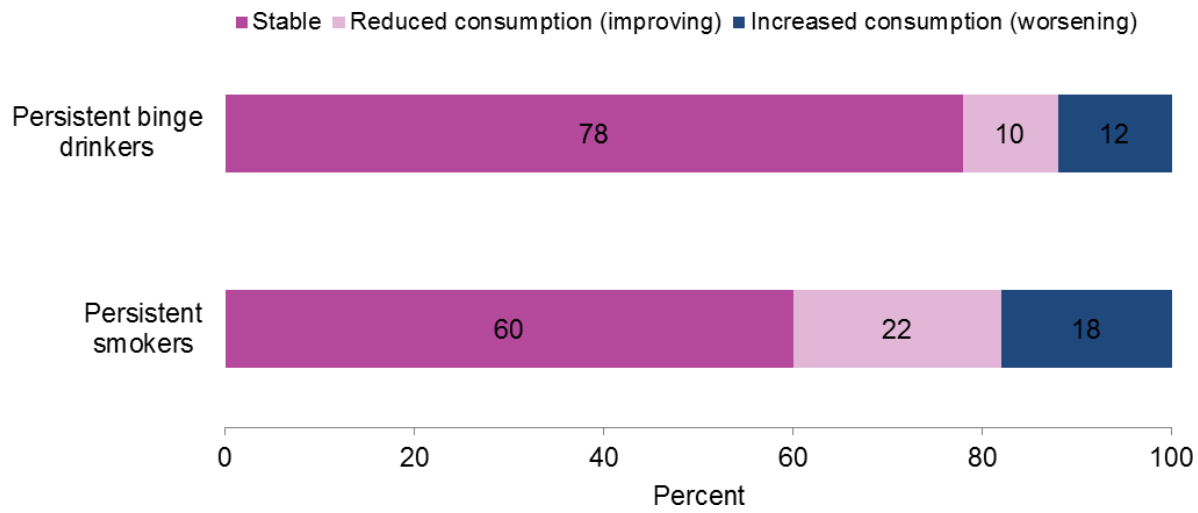
(Appendix D, Table D1-D4)

5.2.2 'Improving' and 'worsening' health behaviour: persistent smoking and binge drinking

Among persistent smokers and binge drinkers, consistency in their consumption patterns was the norm. Using our measure of change (smoking five or more cigarettes per day fewer/more than previously and reducing/increasing alcohol consumption on the heaviest drinking day by more than about six units of alcohol), we found that most people tended to smoke or binge drink in 2013/14 at levels similar to those in 2010/11. For a minority, however, behaviours did change. Among smokers, 18% increased the number of cigarettes they smoked per day and 22% decreased the number. Among binge drinkers, 10% reduced their consumption of alcohol on their heaviest drinking day whereas 12% increased it.

Figure 5.3: Changing health behaviours among persistent smokers and binge drinkers[10]

***Source**: UKHLS 2010/11 and 2013; Base: those who were either current smokers or binge drinkers in both 2010/11 and 2013/4*



(table not shown)

5.3 Social patterning of change

To explore whether changes in health behaviours were socially patterned, multivariate regression models were estimated for positive and negative behavioural change. We estimated logistic regression models looking at the factors associated with the following outcomes:

- stopping meeting recommendations for each health behaviour,
- starting to meet recommendations for each health behaviour,

and for smoking and drinking, for those who did not meet recommendations at both waves ("persistent" smokers or binge drinkers):

- improving health behaviour (smoking and drinking less than previously),
- worsening health behaviour (smoking and drinking more than previously).

We report the estimated probability of the outcome, based on average marginal effects, for each factor included in these regressions: age, sex, ethnic group, marital and cohabitation status, educational attainment, employment status, household income and area deprivation, and health status.

These covariates were based on data collected in 2010/11 with the exception of ethnic group and educational attainment where information collected in 2013/14 was used.[11] (For details of the measures used in our analyses, see Appendix A). We also supply the full models with both AMEs and ORs in Appendix D, Tables 17 to 24.

[10] The number of persistent smokers in our sample was 3,256, and of persistent binge-drinkers was 2,535 (unweighted)

[11] Both ethnic group and educational attainment had a great degree of missing data in 2010/11 and therefore more complete information from 2013/4 was used instead.

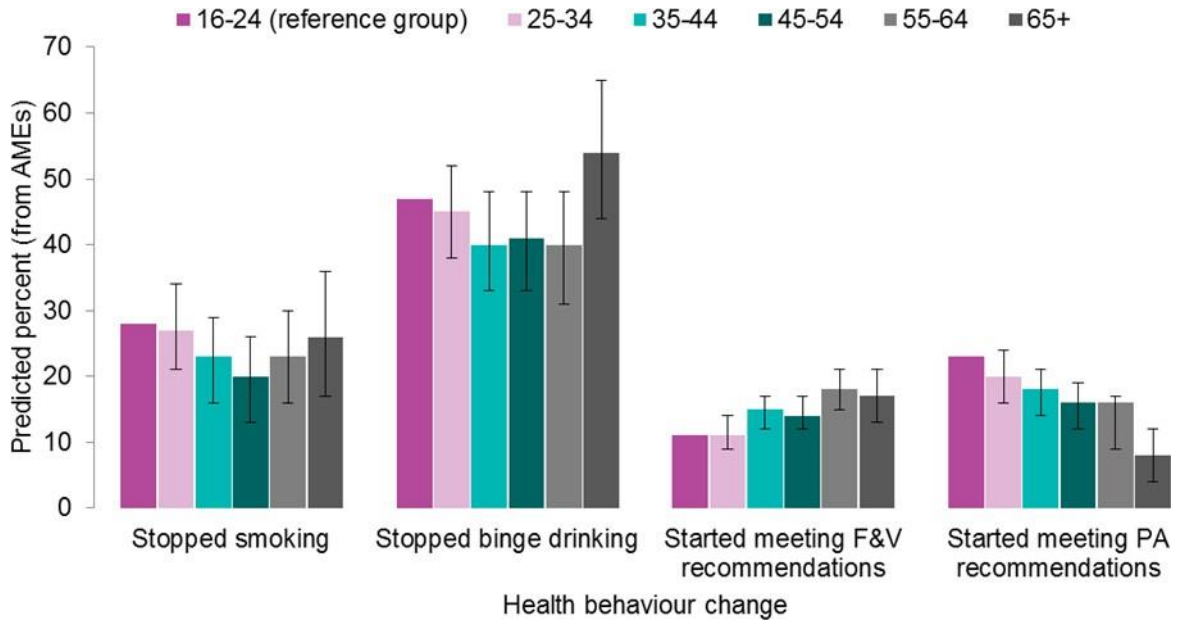
The subsections below discuss the patterning of change for each outcome according to its net association with other factors. Section 5.3.1 shows socio-demographic factors (age, sex, ethnic group, marital and cohabitation status); section 5.3.2 moves on to socio-economic factors (educational attainment, employment status, household income and area deprivation). Section 5.3.3 considers patterning of change by health status.

5.3.1 Health behaviour change by socio-demographic factors

Age: was strongly associated with changing health behaviours. Age was associated with starting and stopping meeting recommendations for all health behaviours, except stopping meeting the PA recommendations and stopping binge drinking. The patterns by age are summarised in Figures 5.4a and 5.4b and discussed in more detail below (for full details, see Appendix D, Tables D5-D12).

Figure 5.4a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by age group

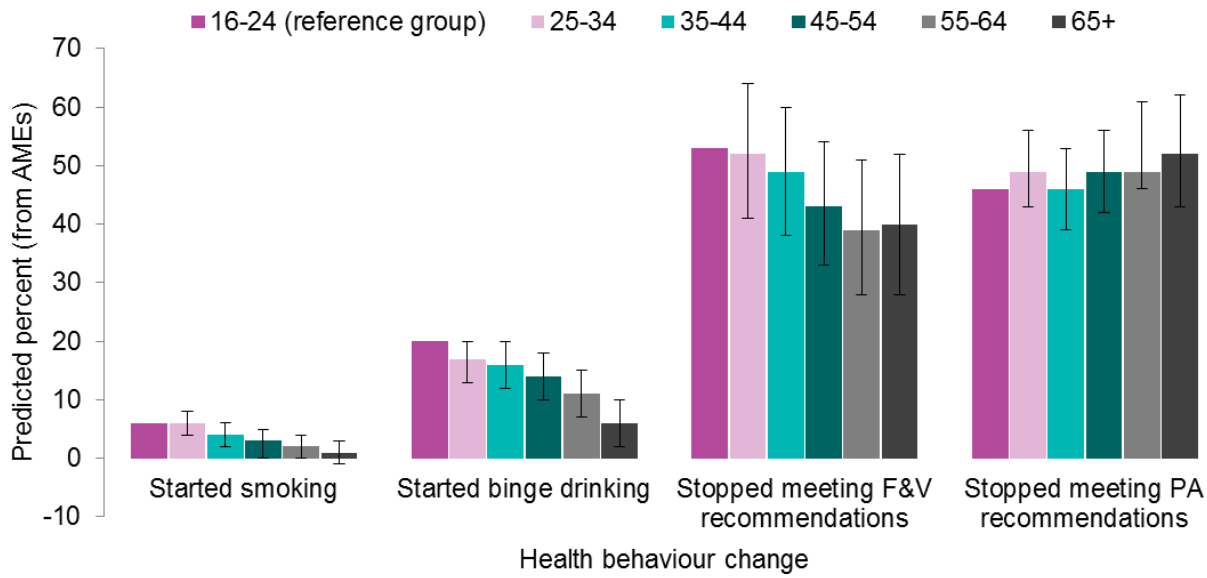
Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

Figure 5.4b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by age group[12]

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

With respect to smoking, those aged 45 and over were less likely than those aged 16-24 (the reference group) to start smoking but those aged 45-54 who already smoked were less likely to give up smoking than those aged 16-24. Predicted prevalence of starting to smoke for those aged 16-24 was 6%, whereas it ranged between 1-3% for those aged 45 and over (see Figure 5.4b). The predicted prevalence of stopping smoking among those aged 16-24 was 28%; eight percentage points higher than those aged 44-54 (20%) (see Figure 5.4a).

With respect to the other three behaviours, those aged 35 and over were less likely to start binge drinking than those aged 16-24: the predicted prevalence was 6-14 percentage points lower than those aged 16-24 (20%). Those aged 55 and over were less likely to stop eating five portions of F&V per day. Those aged 35 and over were more likely to start meeting recommendations for F&V consumption than those aged 16-24; 11% of those aged 16-24 started meeting F&V recommendations, with rates being 3-7 percentage points higher for those aged 35 and over. For those aged 16-24, the predicted prevalence of stopping meeting F&V recommendations was 53%; equivalent rates among those aged 55 and over were 13-14 percentage points lower than this (See Figures 5.4a and 5.4b; Appendix D, Tables D5-D12). This suggests that the instability in meeting F&V recommendations noted in section 5.5.11 (see Figure 5.2a) may be driven by greater variation among younger people. Finally, those aged 35 and over were less likely to start meeting PA recommendations than those aged 16-24 (18% to 8% for those aged 35 and over vs 23% for those aged 16-24).

[12] Confidence intervals straddle zero with low prevalence behaviours for small n groups. This is because the estimate for the reference group itself has a confidence interval around it and confidence intervals for each group represent the level of change from the confidence interval of the reference estimate, which means in some cases they look as if they are lower than zero.

Sex: Like age, sex was strongly associated with changes in health behaviour. With the exception of starting and stopping smoking, it was significantly associated with starting and stopping meeting the health behaviour recommendations. The patterns are summarised in Figures 5.5a and 5.5b.

As Figures 5.5a and 5.5b indicate, women were more likely than men (the reference group) to experience positive behaviour change in relations to binge drinking and F&V recommendations; they were more likely to stop binge drinking and less likely to start than men (49% women vs 41% men for stopping; 12% women vs 15% men for starting). Women were also more likely than men to start eating 5 portions of F&V a day (16% women; 12% men) and less likely to stop (40% women; 49% men). However, men were more likely than women to experience positive behaviour change in relation to PA, being more likely to start meeting PA recommendations (14% women; 18% men) and less likely to stop meeting recommendations (52% women; 46% men) (see Figure 5.5a and 5.5b).

Figure 5.5a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by sex

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

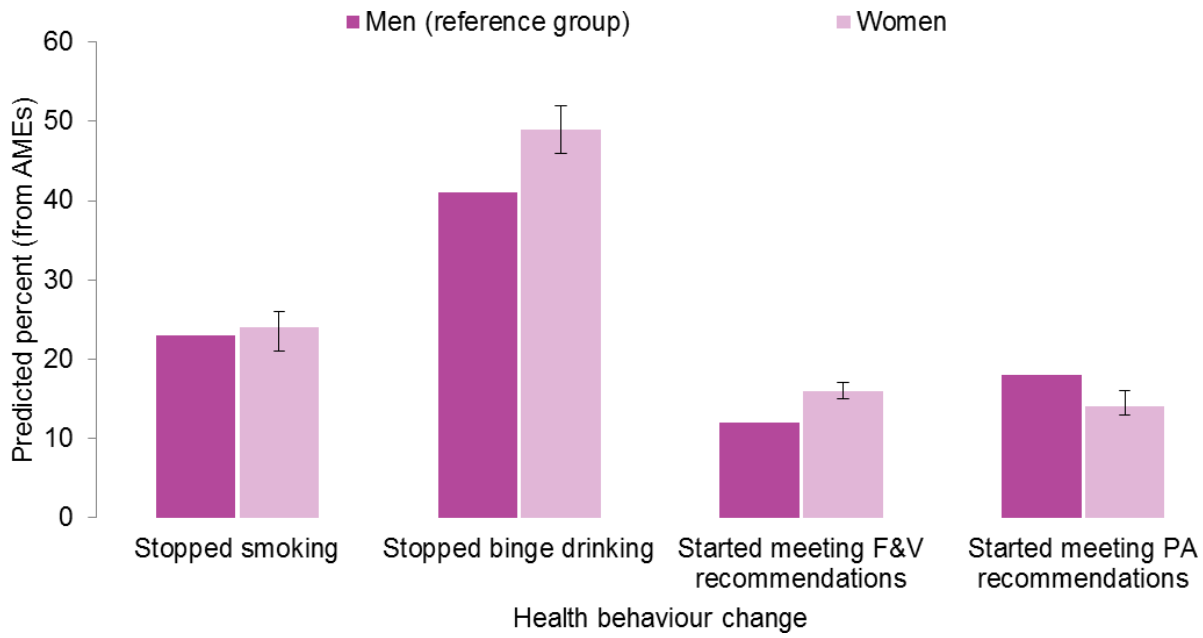
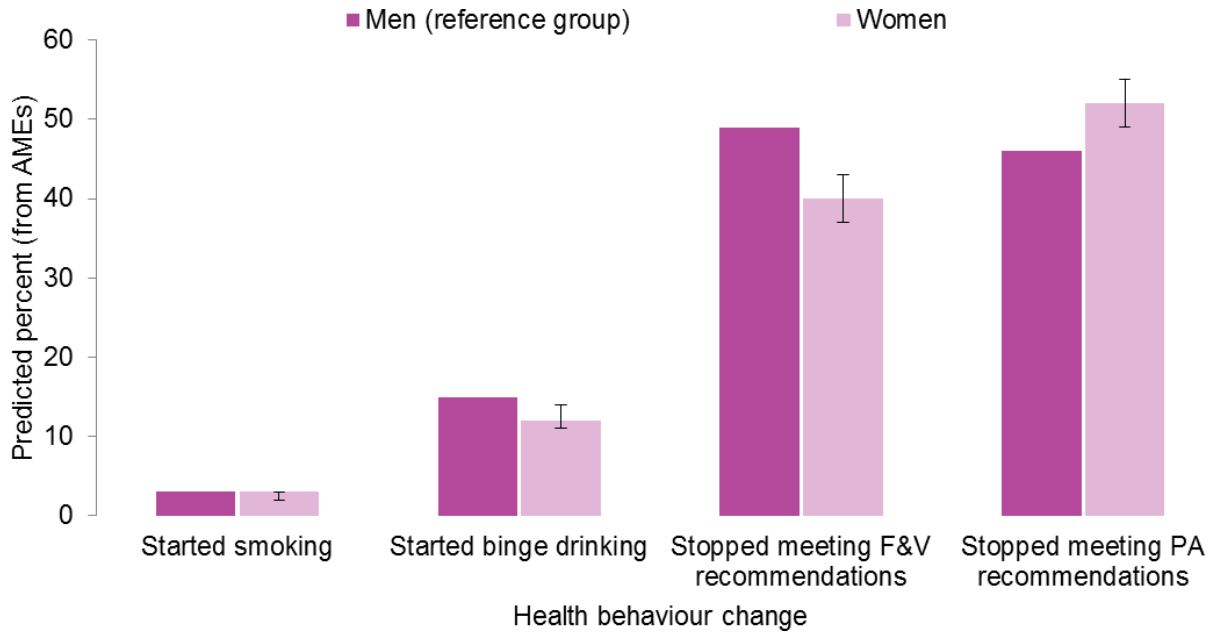


Figure 5.5b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by sex

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Table D5-D12

Ethnic group: With the exception of smoking, ethnicity was associated with changes in meeting recommendations for all other health behaviours. Patterns are summarised in Figures 5.6a and 5.6b below.

As the Figures indicate, those from non-white backgrounds were more likely to stop binge drinking and less likely to start than White British (the reference group). Predicted prevalence of stopping binge drinking was 43% among White British but among those from South Asian groups it was 60%; among Black African or Black Caribbean groups, it was 66%. Those from South Asian groups were less likely to start meeting F&V recommendations (9%) than White British (14%) and were more likely to stop meeting them (60%) than White British (43%). Those from Black African/Caribbean backgrounds were also more likely to stop meeting the F&V recommendations. South Asians were also less likely to start meeting the PA recommendations (13%) than White British (16%). Therefore, whilst South Asians were more likely to change their alcohol consumption in a positive way, they were less likely to replicate this for F&V consumption and PA.

Figure 5.6a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by ethnic group

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

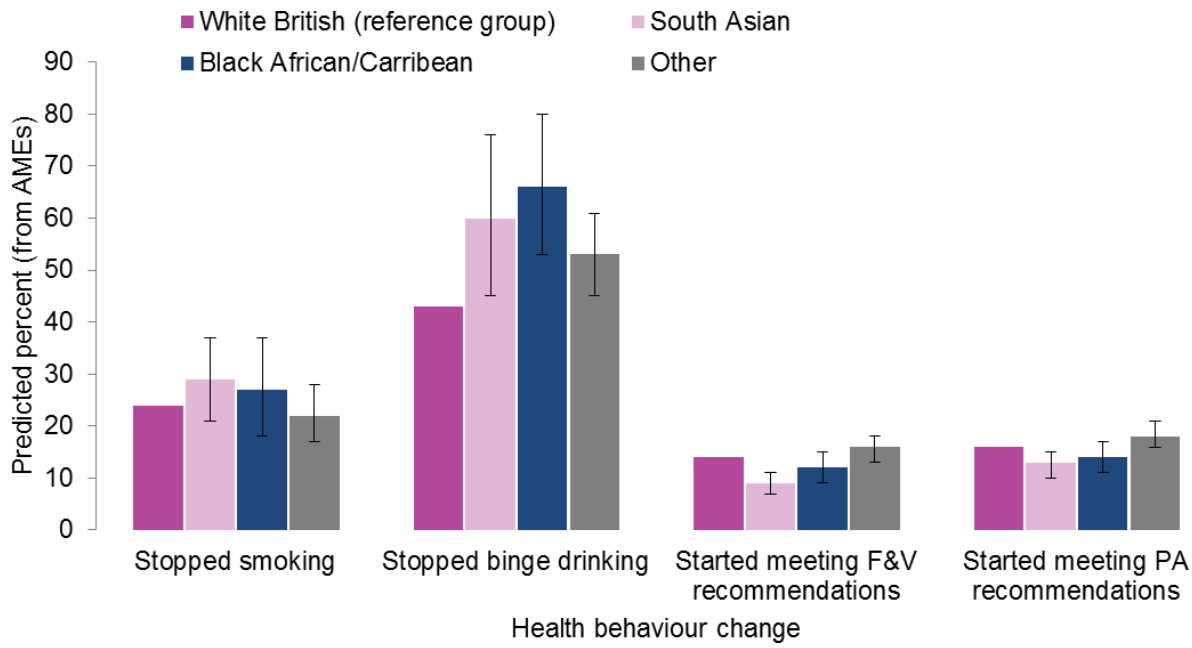
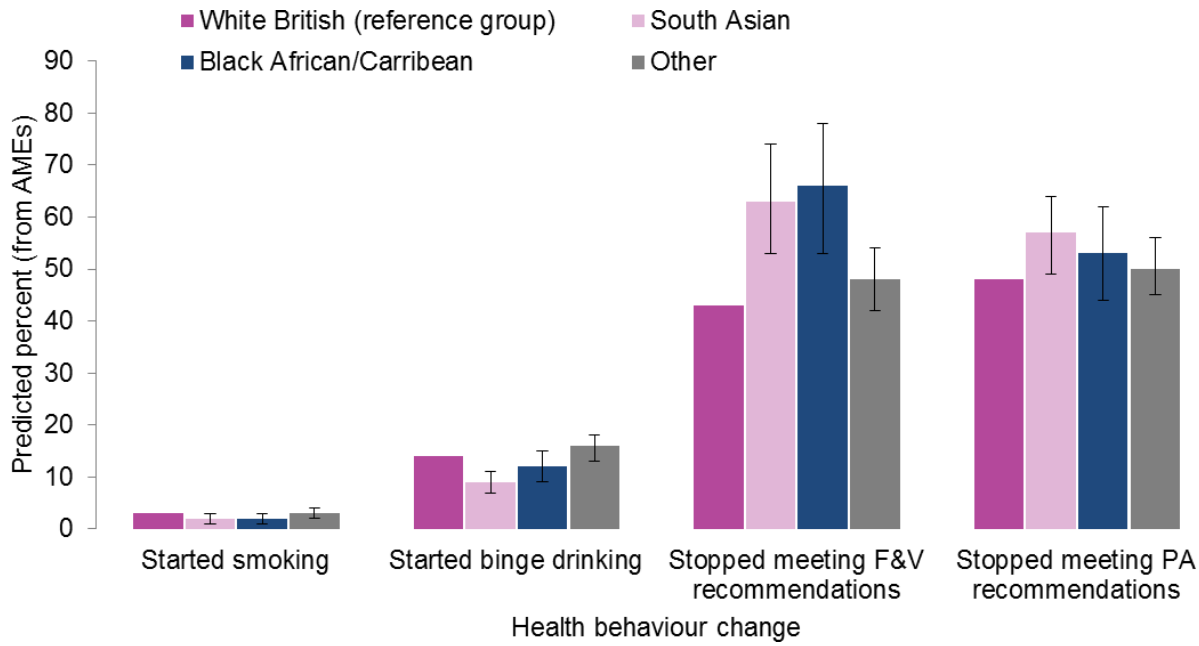


Figure 5.6b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by ethnic group

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



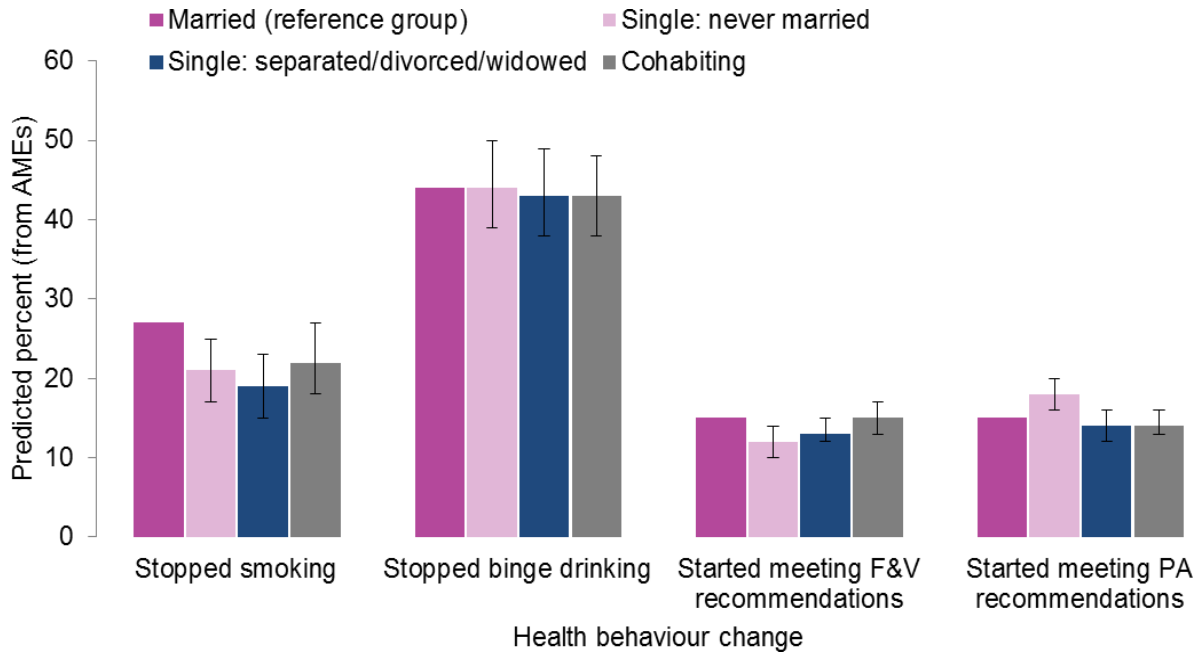
Appendix D, Tables D5-D12

Marital and cohabitation status: The patterns of behaviour change are summarised in Figures 5.7a and 5.7b. Marital and cohabitation status in 2010/11 was associated with changes in smoking behaviour and starting to meet recommendations for F&V consumption and PA. With regard to smoking, those who were not married were more likely to start smoking and those who already

smoked were less likely to stop than those who were married (the reference group). Looking at stopping smoking, predicted prevalence rates were 5 to 8 percentage points lower among those who were not married than those who were married (27%). Those who were single (never married) or single (separated, widowed or divorced) were less likely than married people to start meeting F&V recommendations. Predicted prevalence estimates were 12%, 13% and 15% respectively. Those who were single (never married) were more likely to start meeting PA recommendations (18%) than their married counterparts (15%). Marriage may confer a protective benefit in relation to changes in smoking behaviour and F&V consumption which is not evident for other risk behaviours (see Figure 5.7a and 5.7b).

Figure 5.7a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by marital and cohabitation status

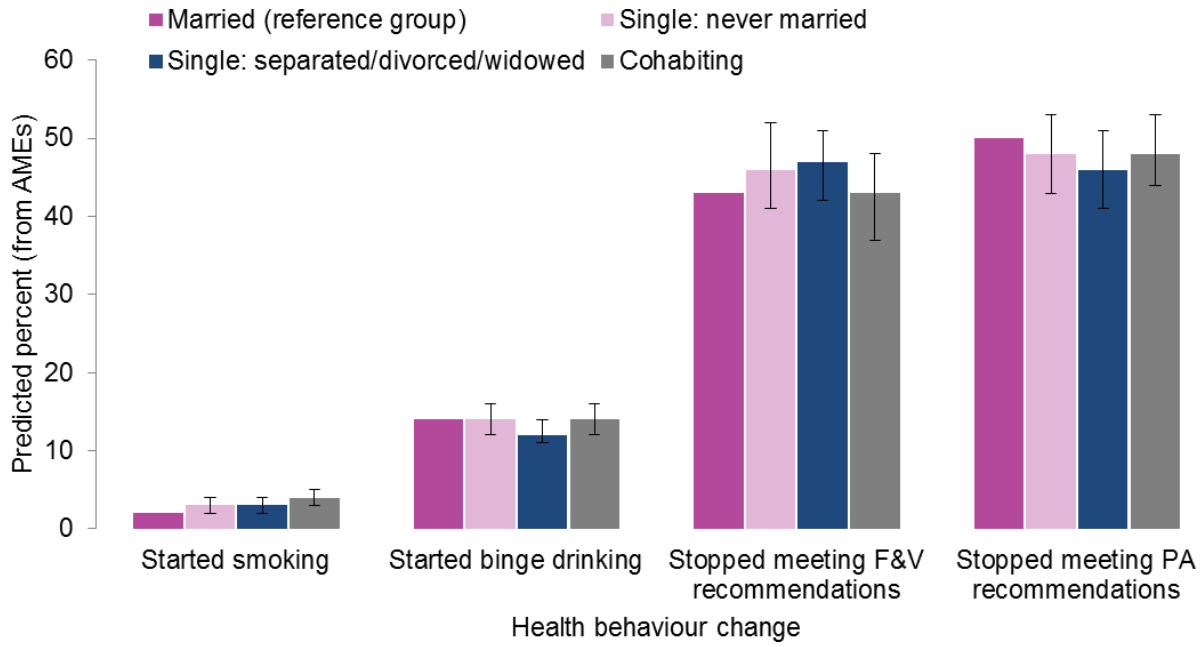
Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

Figure 5.7b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by marital and cohabitation status

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

5.3.2 Health behaviour change by socio-economic factors

A range of measures of socio-economic circumstances (educational attainment, employment status, household income and area deprivation) were included in the multivariate models to explore whether there were social gradients in health behaviour change.

The area-based measure (IMD) of socio-economic circumstances was not significantly associated with any health behaviour change. The household measure, household income, was only associated with starting to binge drink and stopping meeting the PA recommendations. Those with lower incomes were less likely to start binge drinking than those in the highest income quintile group (the reference group) and more likely to stop meeting the PA recommendations (those in the 4th income quintile group were more likely to stop meeting the PA recommendations than those in the highest income group. (Figures not shown; further details are available Appendix D, Tables D5-D12).

Stronger associations between people's socio-economic circumstances and changes in health behaviours were evident for the individual-level measures: education and employment status. Social patterning by education was evident for many dimensions of behaviour change (see Figures 5.8a and 5.8b). Those with lower levels of educational attainment were less likely to stop smoking (Appendix D, Table D5) and less likely to start meeting F&V or PA recommendations (Appendix D, Table D9) than those educated to degree level or higher (the reference group). This pattern was particularly pronounced for smoking. The predicted prevalence of stopping smoking was 35% among those educated to degree level or higher compared with 19% for those with no or other educational qualifications.

Similarly, as Figure 5.8b indicates, those with lower educational attainment were more likely to start smoking (see Appendix D, Table D6 for further details) and more likely to stop meeting F&V and PA recommendations (Appendix D, Table D10). For example, with respect to stopping meeting the F&V recommendations, the predicted prevalence was 34% among the highest educational group compared with 54% among the lowest educational group (Appendix D, Table D10).

For binge drinking, however, the opposite pattern was evident (Figure 5.8a). Those with no/other educational qualifications were more likely to stop binge drinking (48%) than those with a degree or higher (41%) (Appendix D, Table D7).

Figure 5.8a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by educational attainment

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

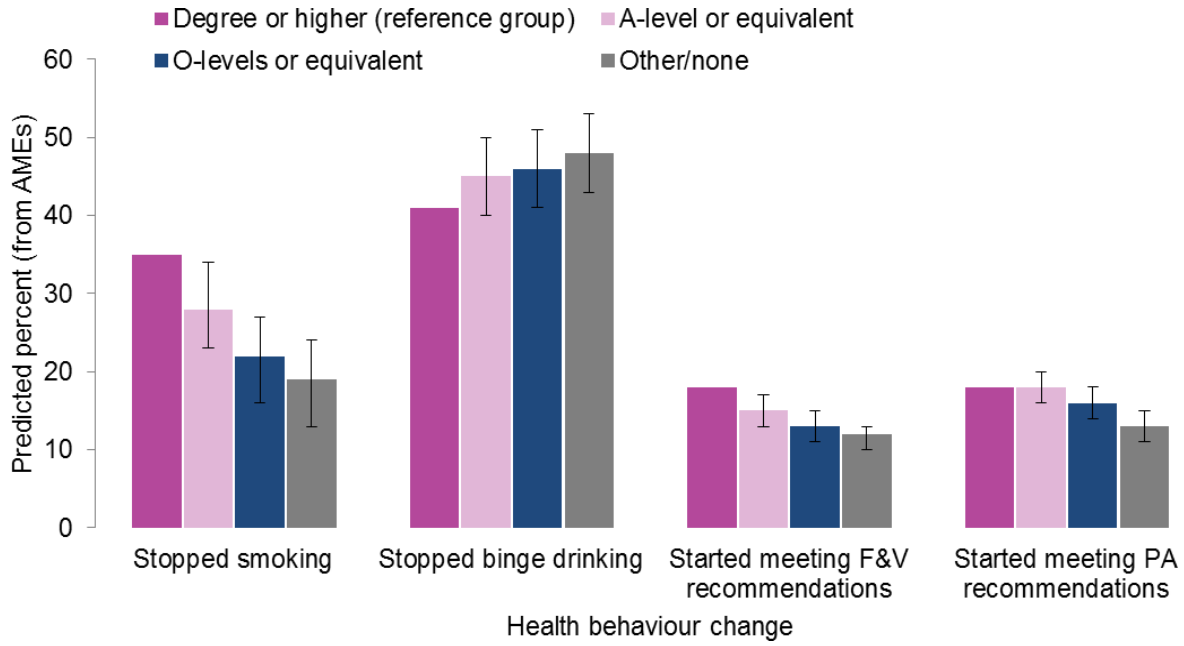
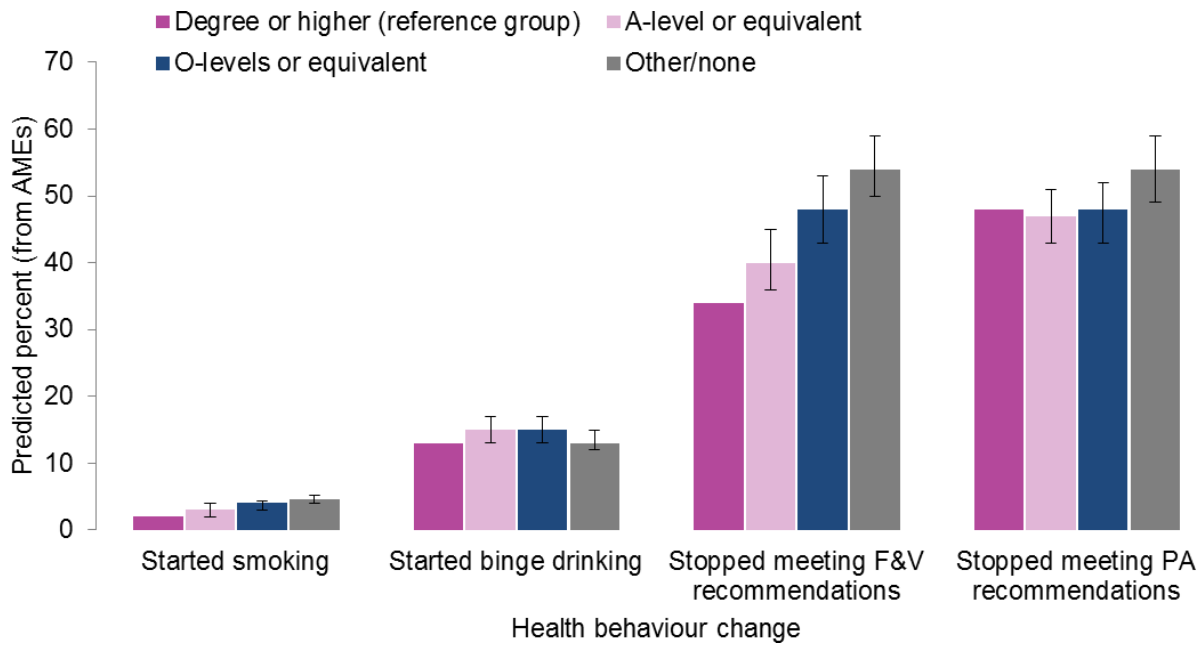


Figure 5.8b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by educational attainment

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

The patterns for employment status, our other individual-level measure of socio-economic circumstances, are summarised in Figures 5.9a and 5.9b. Employment status was associated with stopping smoking, starting binge drinking and starting to meet F&V recommendations. Compared with people in paid employment (the reference group), those who were unemployed were less likely to stop smoking (18% compared with 26%) and less likely to start meeting F&V recommendations (10% compared with 14%). Students were more likely to start binge drinking than those in paid employment (18% vs 14% respectively).

Figure 5.9a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour change (not meeting recommendation in 2010/11 but meeting it in 2013/14), by economic activity

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

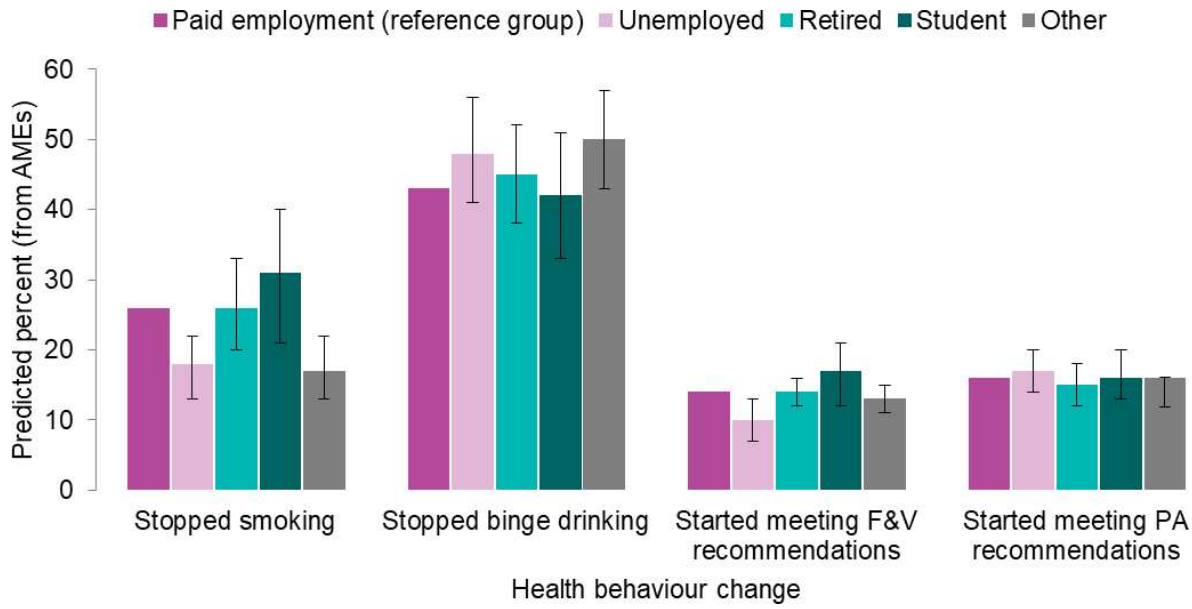
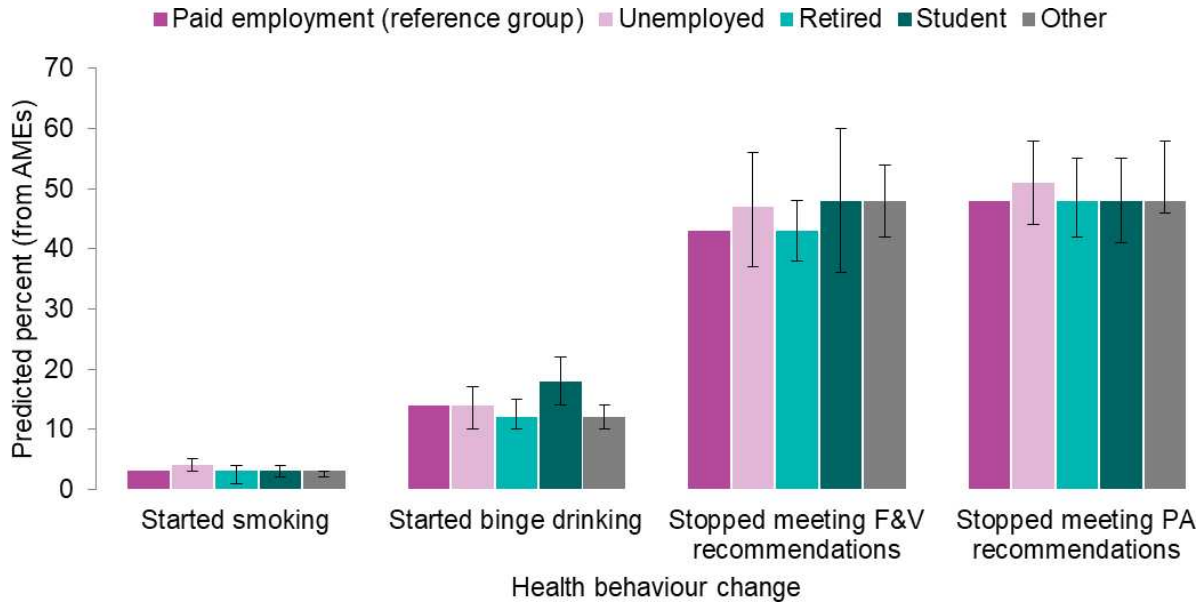


Figure 5.9b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by economic activity

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

5.3.3 Health behaviour change by general health status

Figures 5.10a and 5.10b summarise the patterns of change in the four health behaviours by self-reported health status. As the Figures indicate, health status was associated with changes in PA. Compared to those in good health (the reference group), those in fair or poor health were more

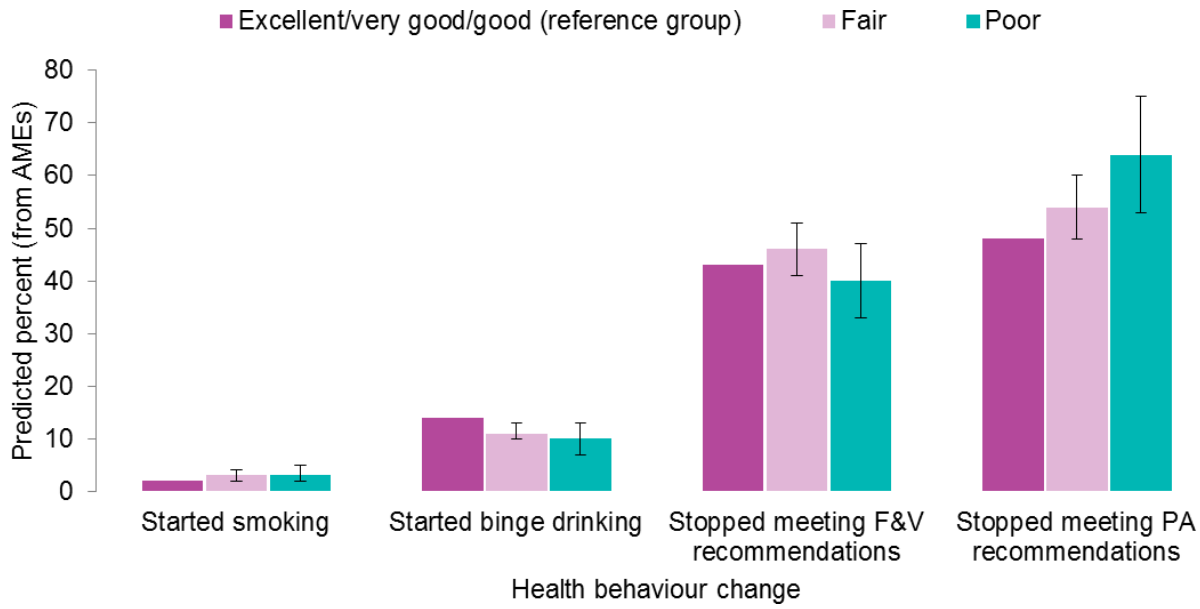
likely to stop meeting the PA recommendations and less likely to start meeting them (starting PA: 17% for good health; 8% for poor health; stopping PA: 48% for good health, 64% for poor health). However, those with poor health were less likely to start binge drinking than those with good health (10% poor health; 14% good health). Compared with those in good health, those in fair health were more likely to start smoking and less likely to stop binge drinking (see Figures 5.10a and 5.10b). There was no relationship between self-reported health and change in meeting F&V recommendations.

Figure 5.10a: Predicted prevalence (with 95% confidence intervals) of positive health behaviour changes (not meeting recommendation in 2010/11 but meeting it in 2013/14), by self-reported general health

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

Figure 5.10b: Predicted prevalence (with 95% confidence intervals) of worsening health behaviours (meeting recommendation in 2010/11 but not meeting it in 2013/14), by self-reported general health

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Appendix D, Tables D5-D12

5.3.4 'Improving' and 'worsening' health behaviour by socio-demographic, socio-economic factors and general health status

Among those who did not meet the recommendations for smoking and binge drinking in both 2010/11 and 2013/14), we additionally explored whether they showed any improvement (reduced consumption) or deterioration (increased consumption) in these behaviours (see section 5.2.2 above). Few factors were associated with improving and worsening health behaviour among persistent smokers and binge drinkers. Age, sex and ethnic group were the main distinguishing factors. Full details are given in Appendix D, Tables D13-16.

Among persistent smokers, those aged 25 and over were less likely than those aged 16-24 to increase the number of cigarettes they smoked. Predicted prevalence of increasing cigarette consumption was 27% for those aged 16-24 and ranged between 15 - 19% for those aged 25 and over. However, persistent binge drinkers aged 25 and over were less likely than those aged 16-24 to reduce the number of units of alcohol consumed. Estimates ranged between 5%-12% for those aged 25 and over, compared with 20% for those aged 16-24 (Appendix D, Table D15). Persistent binge drinkers aged 55 and over, however, were less likely to increase their alcohol consumption than those aged 16-25 (4% vs 14% respectively).

Female smokers were more likely than male smokers to reduce the number of cigarettes they smoked but female binge drinkers were less likely than male binge drinkers to reduce their alcohol consumption. Finally, persistent South Asian binge drinkers were more likely to reduce their alcohol consumption than those who were White British. Persistent Black Caribbean/African smokers were less likely than White British to reduce the number of cigarettes smoked.

5.4 Summary

Two broad conclusions can be drawn from our analysis: stability in adult health behaviours is the norm and, while few adults change their behaviour, for those that do there is some evidence that these changes are socially patterned.

Looking firstly at stability, it was rare that people either started or stopped smoking between 2010/11 and 2013/14. Most people did not smoke or binge drink in 2010/11 and continued not to do so in 2013/14. Similarly, most people did not meet F&V or PA recommendations in 2010/11 and continued not to do so in 2013/4. Such stable patterns of behaviour provide the context in which policies to promote healthy lifestyles are set and point to the challenge of achieving positive changes in behaviour. Particularly for behaviours which the majority of the population fail to meet, it suggests that attention should be paid to increasing positive health behaviours below the recommendation- thresholds (e.g. what is associated with moving from no/low levels of F&V consumption and PA).

With respect to F&V and PA, it should also be noted that the overall pattern of stability masks considerable variation in behaviour over time. A large proportion of those who met recommendations for F&V and PA in 2010/11 did not do so in 2013/4; a finding that points to the difficulty not only of achieving but also of maintaining these healthy behaviours, as well as difficulties in measuring these behaviours accurately.

Turning to the social patterning, there was some evidence that lifestyle changes varied in line with people's circumstances. Net of other socio-demographic and socio-economic factors, those less likely to stop smoking were adults with lower levels of educational attainment; those who were unemployed and those who were not married. Conversely, those most likely to start smoking were those with lower levels of educational attainment, those who were not married and those who were younger.

Like smoking, negative changes in F&V consumption were more likely among those who were more disadvantaged. Those with lower levels of educational qualifications were less likely to start meeting recommendations as were those who were unemployed. In addition, those who were not married (single and widowed/divorced/separated) and those from South Asian groups were also less likely to start meeting recommendations. Women and older people were more likely to start meeting recommendations than men and those who were younger. Women and older people were also less likely to stop meeting recommendations, suggesting that, on balance, women and older people were most likely to achieve positive behaviours in relation to F&V recommendations. Those with lower levels of educational attainment and those from non-White ethnic groups were more likely to stop meeting recommendations, suggesting that these groups face additional barriers in maintaining health behaviours that meet the recommendations for F&V.

With respect to PA, women, older people, those from South Asian groups, those who described their health as poor and those with lower levels of educational attainment were all less likely to start meeting PA recommendations. However, those who were single (never married) were more likely to start meeting recommendations than those who were married. Women, those in poor health, with the lowest levels of educational attainment and with lower household incomes were also more likely to stop meeting recommendations.

For binge drinking, a markedly different social pattern was evident. Those most likely to stop binge drinking were women, those with the lowest levels of educational attainment and those from non-white ethnic groups. Those less likely to start binge drinking were women, older people, those with poor health, those from non-white ethnic groups and those with the lowest household incomes. Change in binge drinking behaviour therefore does not display the same social gradients as other health behaviours.

When looking at behaviour change among persistent smokers and binge drinkers, there was also some evidence of social patterning. The factors were socio-demographic rather than socio-economic, with age, sex and ethnic group being the main net predictors.

Taken together, the patterns point to some widening of social inequalities in health behaviours over time. With the exception of binge drinking, those with lower levels of educational attainment were typically less likely to make positive improvements in behaviour and more likely to make negative changes. More disadvantaged groups were less likely to stop smoking and less likely to start meeting F&V and PA recommendations. We found particularly marked social gradients for stopping smoking; the predicted prevalence of stopping smoking was 35% among those educated to degree level or higher compared with 19% for those with no or other educational qualifications, though the populations to whom this applies are small (smoking prevalence overall is low). For binge drinking, however, the opposite pattern was evident. Those with no/other educational qualifications were more likely to stop binge drinking (48%) than those with a degree or higher (41%). However, as with smoking, we should be aware that binge drinking is a minority behaviour (unlike low PA or low F&V consumption). It is also notable that certain factors which were strongly associated with the prevalence of health behaviours (see Chapter 4), such as household income, were less important when looking at behaviour *change*. This alerts us to the fact that the factors predictive of individual behaviour at a single point in time (i.e. when viewed cross-sectionally) are not necessarily associated with change in behaviour over time.

6. RELATIONSHIP BETWEEN LIFE TRANSITIONS AND CHANGES IN HEALTH BEHAVIOURS

6.1 Introduction

This chapter addresses the third project objective, which is to explore the relationship between key life transitions and events (hereafter 'transitions') and changing health behaviours. As explained in Chapter 3.5, we focused on transitions that many people will experience in the course of their lives and where lifestyle changes may be anticipated; additionally, we selected transitions experienced by a sufficient number of study participants across a three-year period (2010/1 to 2013/14) to allow analyses to be undertaken. Using the large-scale and nationally representative UKHLS, we were able to explore the relationship between these transitions and changes in all four health behaviour change across the adult population.

The transitions considered are:

- Changes in relationship status (moving in or out of a relationship)
- Changes in family composition (adding at least one child to a previously childless household)[13]
- Changes in employment status (moving from employment to unemployment; unemployment to employment; being a student to employment or unemployment and employment to retirement)
- Changes in income (changes in equivalised household income of +/- 20% or more)

To support our analysis, we undertook a rapid assessment of evidence on the selected life transitions (changes in relationship status, adding a child/ren to a childless household, changes in employment status and changes in household income) and changes in the four health behaviours (Section 6.2). Then, focusing on adults in England, Section 6.3 describes the number and characteristics of people in the UKHLS who experienced each transition between 2010/11 and 2013/14. Finally, Section 6.4 presents exploratory analyses showing the relationship between the experience of each life transition and health behaviour change. Section 6.5 provides a summary and offers some conclusions.

6.2 Rapid Evidence Assessment of life transitions and health behaviour changes

Rapid Evidence Assessments (REA) were conducted to identify evidence about the relationship between each life transition and each health behaviour change (sixteen individual reviews in total). Details of the REA methods are given in Appendix F.

Overall, 54 studies were included in the review, some of which addressed more than one life transition (n=16). There was considerable diversity in the studies, including in the study populations and the measures of the four behaviours. All of the UK studies were based on analyses of its major longitudinal studies. These included:

[13] In the literature, and theoretically, it is more usual to consider specifically the *birth* of a first child. However, the way that the UKHLS questionnaire is constructed does not allow us to do this. Calculating the addition of one or more children to a previously childless household is a close proxy. For more details, see appendix A.

- National Child Development Study (NCDS) following a cohort of children born in 1958[14]
- English Longitudinal Study of Ageing (ELSA) following men and women aged 50 and older at recruitment[15]
- EPIC-Norfolk (European Prospective Investigation of Cancer-Norfolk) following men and women aged 40 to 79 years at recruitment[16]
- British Household Panel Survey (BHPS) which recruited people living in households in Britain (then extended to Northern Ireland) and followed them every year; the BHPS has now been incorporated into the UKHLS[17]

Details of the UK-based studies are shown in Table 6.1; these are arranged by health behaviour (smoking, alcohol consumption, PA and F&V consumption). Full details of the 54 studies in the REA are given in Appendix F.

The overall finding from the REA is the paucity of evidence on life transitions and lifestyle change:

A) *There is a paucity of UK-based evidence examining the impact of life transitions (relationship, employment and income transitions and having children) on smoking, alcohol consumption, PA and F&V.*

Six UK studies based were identified. Two of the six used the 1958 National Child Development Study to explore the relationship between a) changes in labour market categories and alcohol consumption and b) changes in family composition and alcohol consumption. Staff et al (2014) examined how within-person changes in family composition (union formation and becoming a parent) impacted on alcohol consumption; they found that consumption was lower when men and women were married and lived with children under the age of 5. Colell et al (2014) found that men who became sick or were mainly sick between the ages of 30 and 53 decreased their alcohol intake at a greater rate than others. Women who became employed after being a 'homemaker' (compared with those who were employed throughout) increased their alcohol intake.

A further two studies used the EPIC Norfolk study to explore a) the relationship between retirement and PA and b) marital transitions and F&V intake. Barnett et al (2013) found that retirement was associated with an increase in recreational physical activity but a decrease in occupational and travel activity, giving a net overall reduction in PA. Vinther et al (2016) found that marital transitions were associated with changes in F&V intake for men but not women. Relative to men who remained married, men who became widowed, separated or divorced reduced their consumption of F&V.

Two other studies looked at changes in smoking behaviour. Lang et al (2007) examined data from the English Longitudinal Study of Ageing to explore smoking cessation and the transition to retirement. They found that those who retired were more likely to stop smoking than those who remained employed. Giordano and Lindstrom (2010) used two waves of the British Household Panel Survey (2003 and 2005) to look at changes in social

[14] http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=724&sitesectiontitle=National+Child+Development+Study
[15] https://www.elsa-project.ac.uk
[16] http://www.srl.cam.ac.uk/epic
[17] https://www.understandingsociety.ac.uk/about/bhps-in-understanding-society

capital (trust in other people and levels of community participation) on smoking behaviours. This included looking at income change, employment change and marital status change. In multivariate analyses, they found no relationship between income change and stopping or starting smoking. Looking at marital and cohabitation status, compared with those who remained single, those who remained married were more likely to stop smoking. Conversely, compared with those who remained married, those who remained single were more likely to start smoking. Notably, those whose marital and cohabitation status changed did not vary significantly from the reference groups of those who remained single (in the smoking cessation model) and those who remained married (in the starting smoking model). A similar pattern was found for employment status, where those who were employed in both 2003 and 2005 were more likely to stop smoking than those who were unemployed in both years. Again, those whose employment status had changed did not vary significantly from the reference category of those who remained unemployed.

The REA pointed to some particular gaps in the UK-based literature. Of the studies identified through the assessment:

- The only studies which looked at drinking behaviour changes and their relationship with life transitions used data from a single birth cohort (i.e. those born in 1958) and focused on changes in mid-life. Whilst this gives useful insight for middle-aged adults born in a single year, 1958, it does not explore how this relationship might operate for those of different ages and other cohorts. Furthermore, these studies looked only at changes in family composition and employment and not at income changes.
- The only studies looking at change in PA and F&V consumption used data from EPIC Norfolk, whose results may not be generalisable to those outside of this age group and region. Changes in PA were only considered relative to retirement, and changes in F&V consumption were considered only relative to marital transitions. No UK studies were identified looking at changes in F&V consumption and employment transitions, income change or adding a child to the household. Likewise, no UK studies were identified looking at changes in PA and marital transitions, other employment changes, income change or the addition of a child to the family.
- Of the two studies which considered smoking transitions, one used data from the English Longitudinal Study of Ageing and assessed this relationship with retirement only. The other used the British Household Panel Survey (a panel study that included adults of all ages) and conducted analysis similar to that undertaken in our project and reported below. However, the BPHS analysis is based on data collected over 12 years ago and the focus of that study was restricted to changes in smoking behaviour, leaving gaps in knowledge around the relationship between life transitions and changes in drinking, F&V and PA.

B) *The international literature provides some evidence about life transitions and changes in smoking behaviour, drinking behaviour and PA.*

Results were mixed and often showed different patterns for men and women or older and younger age groups (see Appendix F for details). The most consistent evidence was found for:

a. becoming unemployed and increased smoking;
b. starting employment and a reduction in PA among younger men and women;

c. retirement being associated with an increase in leisure time PA;
d. becoming a parent being associated with reductions in smoking (though with resumption of smoking likely) and alcohol consumption, and;
e. additional children being associated with lower levels of PA (see Appendix F for fuller details).

C) *While the REA located little evidence around life transitions and health behaviour change, the impact of changing income on health behaviours emerged as a particular research gap.*

The limited pool of studies tended to show no relationship in the case of income change and smoking behaviour (reported in three out of four studies identified). Few studies were identified which explore the relationship between income change and changes in F&V consumption and in PA.

D) *There was a general paucity of evidence relating to life transitions and F&V consumption.*

Only six studies in the review included F&V consumption; and none of these related to employment transitions. The evidence base appears to focus on dietary change more broadly, with fat and sugar consumption as the main outcomes rather than F&V consumption.

Overall, there is a lack of UK-based evidence on the relationship between key life transitions and changes in all four health behaviours. Internationally, evidence is also patchy and tends to paint a mixed picture about the nature of the relationships. The exploratory analysis of the UKHLS presented in Sections 6.3 and 6.4 therefore provides an important opportunity to add to this very limited evidence base, using the most recent data available for adults in England.

Table 6.1 Summary of UK studies identified in REA					
Author	**Data and population of focus**	**Life transitions considered**	**Health behaviour change**	**Life transition and health behaviour measures**	**Summary of findings**
Giordano & Lindstrom (2010)	British Household Panel Survey 2003/2005; adults aged 16+ (n=10512)	Marital status; employment status; income	Smoking	**Smoking status change**: coded as still a smoker: now a non-smoker; now a smoker; still a non-smoker; based on responses to the question "do you smoke cigarettes". **Employment change**: coded as still employed; now unemployed; now employed; still unemployed. No further details provided. **Marital status**: coded still married; now unmarried; now married; still unmarried. No further details provided. **Household income change**: coded as still higher income; now lowest quartile; now higher income; still lowest quartile. Change defined in terms of movements between income quartile groups.	In bi-variate analysis, those who became unemployed (compared with those who remained employed), got married or became unmarried (compared with those who remained married) had higher odds of starting smoking. These relationships were not observed in the multivariate models which took into account cofounders like age, gender and psycho-social health. There was no relationship between household income change and smoking status change and no relationship between employment change, marital relationship change and stopping smoking.
Lang et al (2007)	English Longitudinal Study of Ageing; compares data between baseline (HSE 1998-2000) and follow-up, (either 2002 or 2004). Smokers at baseline: n=1712	Employment transition - Retirement	Smoking cessation	**Smoking status change**: coded as stopped smoking based on changes to the question "Do you smoke cigarettes at all nowadays?" between baseline and follow-up. **Employment transition**: coded as: Employed at baseline, retired at follow-up; Employed at baseline, employed at follow-up: Retired at baseline, retired at follow-up; Other (e.g. long-term sick; full-time caregiver). Based on standard economic activity question which included employment, retirement, full time education, long-term sick etc.	This analysis focused on those who were smokers at baseline and looked at rates of quitting by employment transition group. Those who transitioned into retirement had higher rates of stopping smoking than those who did not. These results remained significant in various multivariate models adjusting for cofounders.
Colell et al (2014)	National Child Development (1958 cohort); uses data from waves aged 33 to 50; n=9960	Employment transition	Drinking	**Alcohol consumption**: units of alcohol consumed in the past week. **Employment transitions:** For men were coded as (1) mainly FT employed: (FT employed in at least three sweeps); (2) mainly PT or unemployed (PT employed in at least three sweeps, or unemployed in at least three sweeps, of combinations of the two); (3) became unstable (FT employed at age 33 and 42 and PT or unemployed at age 46 and 50 or at age 50 only); (4) mainly sick or became sick (sick/disabled in at least three sweeps; or any activity at age 33 and 42 and sick/disabled at age 46 and 50); and (5) other. For women,	Using multi-level growth curves showed that women who became employed after being a homemaker had higher levels of alcohol consumption than those who were mainly employed and alcohol consumption increased at a marginally greater rate. Men who were mainly sick or became sick had higher levels of alcohol consumption than those mainly in FT employment but their alcohol consumption decreased rapidly over time.

				transitions coded as: (1) mainly employed (either FT or PT employed in at least three sweeps); (2) mainly homemaker (homemaker in at least three sweeps); (3) from employed to homemaker (either FT or PT employed at age 33 and 42 and homemaker at age 46 and 50 or at age 50 only); (4) from homemaker to employed (homemaker at age 33 or at age 33 and 42 and either FT or PT employed at age 46 and 50 only); (5) mainly sick or became sick: (sick/disabled in at least three sweeps or any activity at age 33 and 42 and sick/disabled at age 46 and 50); (6) other.	
Staff et al (2014)	National Child Development Study (1958 cohort); uses data from waves at aged 16 to 50; n=14,589	Marital/ relationship transitions; adding a child to a household	Drinking	**Alcohol consumption**: measured by units of alcohol consumed in the past week and a dichotomous variable showing whether women drank more than two units and men drank more than three units per day in the 7 days prior to interview (called heavy daily drinking by authors). **Relationship status**: coded as whether single and not cohabiting; single and cohabiting; married; separated, widowed, or divorced and cohabiting; separated, widowed, or divorced and not cohabiting at each time point. Children status: coded as whether not residing with children; residing in household with children under age 5; from ages 5 to 16; or from ages 17 to 21 at each timepoint.	Results from fixed effect models showed a relationship between parenthood and alcohol consumption that was mediated by the age of the child. Parents consumed fewer units of alcohol per week when living with children under the age of 5 compared with those who had no children. Residing with older children (ages 17 to 21) had little association with women's alcohol use, whereas for men the link was positive; men had higher alcohol consumption when older children resided in the household. There was no association between relationship status change and alcohol consumption.
Barnett et al (2013)	EPIC-Norfolk; baseline = 1997-2000 and follow up = 2006-2007; adults aged 39-78, n=3334	Employment transitions - retirement	PA	**PA change**: measured by the EPAQ2. Total energy expenditure estimated by multiplying hours per week of activity by the metabolic cost for that activity. Change in these two values compared between baseline and follow-up. **Retirement**: coded as 'remained employed' (includes those who are retired but have a paid job) or 'employed to retired' (those who are retired and do not do any paid work). Based on whether they were currently retired from their main occupation and whether they had a paid job at present in each round.	Transition to retirement was associated with a decrease in occupational and travel PA and an increase in recreational and household PA, except among women from manual groups. The net effect was a decrease in overall PA.
Vinther et al, 2016	EPIC-Norfolk; baseline = 1993 to 1997 and follow up = 1998 to	Marital and relationship transitions	F&V	**F&V change**: average daily consumption estimated from questions asking about yearly consumption of 11 fruits and 26 vegetables. Differences between baseline and follow-up compared. **Marital transitions**: coded as remain	Fruit quantity varied by marital transition for men but not women. Relative to those who remained married, men who became widowed or separated reduced fruit intake. Similar patterns were observed for vegetable intake with

	2002; adults aged 39-78, n=11,577			married (married at both time-points); remain unmarried (single, divorced or widowed at both time-points); became separated/divorced (married at baseline and separated or divorced at follow-up); became widowed (married at baseline and widowed at follow-up); and became married (single, widowed, divorced or separated at baseline and married at follow-up).	reduction in vegetable intake for men (but not women) who became widowed, became separated/divorced, or remained unmarried.

6.3 Experience of each life transition

Before undertaking our UKHLS analyses of the relationship between life transitions and health behaviour change, it was important to establish how common these transitions were and whether the social profile of those who experienced the transition differed from those who did not. Table 6.2 shows the proportion of people who experienced each life transition between 2010/11 and 2013/14 (see Appendix A for details of how each life transition was coded).

With the exception of changes in household income, the experience of the transitions across the relatively short time period of the study was uncommon, with just 1% to 3% of adults experiencing each transition between 2010/11 and 20913/14.

Changes in household income were much more common than other changes; 18% experienced a decrease in household income of 20% or more between 2010/11 and 2013/14 whilst 36% experienced an increase in household income of 20% or more over the same time period.[18]

Table 6.2 Prevalence of life transition change between 2010/11 and 2013/4

Life transition	**%**
Moved into a relationship	2
Moved out of a relationship	3
Moved from employment to unemployment	1
Moved from unemployment to employment	2
Moved student to employment	3
Moved from student to unemployment	1
Moved from employment to retirement	3
Increased household income by 20% or more	36
Decreased household income by 20% or more	18
Added a child to the household	3
Base	*25,849*

Although the experience of each life transition was uncommon, there was variation in who was more likely to experience these transitions. Bi-variate analysis explored the profile of people experiencing each life transition by sex, age group, levels of educational attainment, ethnic group and general health status. These were the factors most closely associated with health behaviour change (see Chapter 5). It was therefore important to see how these factors were related to life transitions.

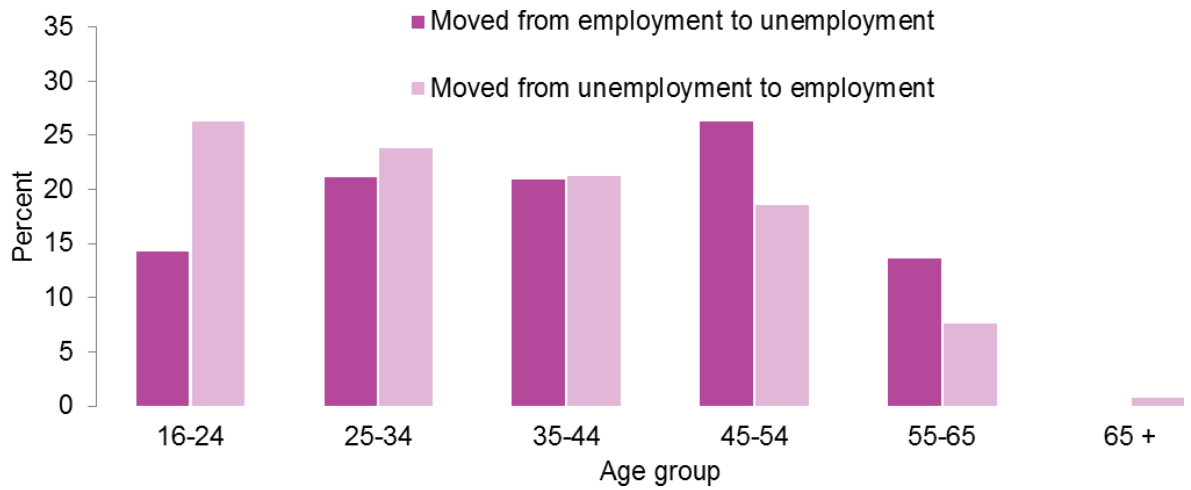
[18] This threshold was chosen to represent real and meaningful change in equivalised household incomes, with income change less likely to be an artefact of measurement error in reporting of household incomes.

As expected, there was significant variation in the types of people who were more likely to experience each life transition. Looking first at marital and cohabitation status, those who moved into a relationship tended to be younger than those moving out of a relationship or for whom relationship status was stable. Those who moved into a relationship tended to have higher levels of educational attainment (82% educated to CSE equivalent or higher) than those who remained single (64%) and were less likely to have poor health in 2010/11; 3% of those moving into a relationship had poor general health compared with 8% who remained single.

Employment transitions were strongly associated with age. Those who moved from unemployment to employment tended to be younger than those who moved from employment to unemployment (see Figure 6.1). Those moving from unemployment to employment were also disproportionately male and were less likely to report poor health in 2010/11; 63% of those moving from unemployment to employment were men compared with 51% of those whose employment status was stable. Likewise 3% of those moving from unemployment to employment described their health status as poor compared with 6% for those with stable employment status.

Figure 6.1: Age profile of those who moved between employment and unemployment

Source: *UKHLS 2010/11 and 2013/14; Base; those who moved from employment to unemployment and from unemployment to employment*



Those who added a child to their household were younger than those who did not; 53% were aged 25-34 whereas just 14% of those who did not add a child to their household were aged 25-34. Those adding a child had higher levels of educational attainment (45% educated to degree level or higher vs 23%), and had better self-reported health in 2010/11, than those that did not. A larger proportion of those who added a child to their household came from non-white ethnic groups than those who did not: 20% vs 12%.

The profile of people experiencing an increase or decrease in their household income did not vary by age, sex, educational attainment, ethnic group or general health.

With the exception of income, this analysis highlights that the profile of people who experienced each life transition varied, particularly with respect to age, educational attainment and general health status. These are clearly interrelated with different life course stages and were also key factors associated with health behaviour change. Therefore, in the analysis that follows, age, sex, educational attainment, ethnic group and general health status are included as controls. These

factors were selected as they had the strongest and most consistent relationship with each health behaviour and health behaviour change in Chapters 4 and 5. Variables like area deprivation did not display a strong relationship in these prior analyses and therefore were not included as a control.

6.4 Patterning of life transitions and changing health behaviours

6.4.1 Overview

To explore the relationship between life transitions and changing health behaviours, the extent to which health behaviour change varied among those who did and did not experience each life transition was examined. As with our previous analysis, we focused on those whose health behaviours changed in terms of meeting or not meeting government recommendations.

For each transition, predicted prevalence estimates of health behaviour change were compared between those who experienced the life transition and those who had the same behaviour at baseline but did not experience change. For example, rates of health behaviour change among those who moved into unemployment were compared with those who were employed at both waves. Similarly, rates of health behaviour change among those who moved out of a relationship were compared with the rates of change among those who remained in a relationship (see Chapter 3.6 and Box 5 for more details).

We estimated a series of logistic regression models of behaviour change: one model each for all four positive and negative behavioural changes and for each of the transitions.[19] As before, we report the results in the form of predicted prevalence derived from the average marginal effect (AME) of each independent variable on the probability of behavioural change. As noted, the models controlled for age, sex, educational attainment, ethnic group and general health status as the profile of people experiencing each transition varied. Results are summarised in Tables 6.3 and 6.4. Table 6.3 summarises significant associations between each life transition and positive health behaviour change, focusing on those who started to meet recommendations for each health behaviour in 2013/14. Table 6.4 summarises significant associations between each life transition with negative health behaviour change, that is stopping to meet recommendations for each health behaviour in 2013/14. Statistically significant results are those significant at conventional levels ($p<0.05$). In Tables 6.3 and 6.4, 'no association' means that there was not a statistically significant association at these conventional levels.

[19] In total, 80 different models were run. For example, there were five different employment transitions considered. These were: moving from employment to unemployment; moving from unemployment to employment; moving from FTE to employment; moving from FTE to unemployment and retiring. Models were estimated for each health behaviour looking at both starting and stopping meeting recommendations. This means that for smoking alone, ten models were estimated to look at the associations with changes in employment status. Tables of all models are provided in Appendix E.

Table 6.3: Summary AME analyses showing significant associations between life changes and positive health behaviour changes (started meeting recommendations)				
Life transition	**Positive health behaviour change**			
	Stopped smoking	**Stopped binge drinking**	**Started meeting F&V recommendations**	**Started meeting PA recommendations**
Relationship behaviour change				
Moved out of relationship (compared with those remaining in relationship)	No association	No association	No association	Starting to meet PA recs higher among those moving out of relationship than those remaining in relationship
Moved into relationship (compared with those remaining single)	No association	No association	No association	No association
Employment transition				
Became employed (compared with those who remained unemployed)	No association	Stopping binge drinking lower among those who moved to employment than those who remained unemployed	No association	No association
Became unemployed (compared with those who remained employed)	No association	No association	Starting to meet F&V recs lower among those who became unemployed than those who remained employed	No association
Moved from full time education (FTE) to employment (compared with those who remained in FTE)	Stopping smoking lower among students who moved into employment than those still in FTE	No association	No association	No association
Moved from FTE to unemployment (compared with those who remained in FTE)	No association	No association	No association	Starting to meet PA recs lower among students who became unemployed than those still in FTE
Retired (compared with those who remained employed)	No association	No association	No association	No association
Income change				
Income increased (compared with those whose income stayed the same)	No association	No association	No association	No association
Income decreased (compared with those whose income stayed the same)	No association	No association	No association	No association
Adding children to household				
Childfree households who added at least one child to the household (compared with those that remained childfree)	No association	No association	No association	Starting to meet PA recs lower among those adding a child than those who remained child-free

Table 6.4: Summary AME analysis showing significant associations between life changes and negative health behaviour changes (stopped meeting recommendations)				
Life transition	**Negative health behaviour change**			
	Started smoking	**Started binge drinking**	**Stopped meeting F&V recommendations**	**Stopped meeting PA recommendations**
Relationship behaviour change				
Moved out of relationship (compared with those remaining in relationship)	Starting smoking higher among those moving out of relationship than those remaining in relationship	Starting binge drinking higher among those moving out of relationship than those remaining in relationship	Stopping meeting F&V recs higher among those moving out of relationship than those remaining in relationship	No association
Moved into relationship (compared with those remaining single)	No association	No association	No association	Stopping meeting PA recs higher among those moving into a relationship than those who remained single
Employment transition				
Became employed (compared with those who remained unemployed)	No association	No association	No association	No association
Became unemployed (compared with those who remained employed)	Starting smoking higher among those who became unemployed than those who remained employed	Starting binge drinking lower among those who became unemployed than those who remained employed	No association	No association
Moved from full time education (FTE) to employment (compared with those who remained in FTE)	Starting smoking higher among students who moved into employment than those still in FTE	No association	No association	No association
Moved from FTE to unemployment (compared with those who remained in FTE)	Starting smoking higher among students who became unemployed than those who remained in FTE	Starting to binge drink lower among students who became unemployed than those who remained in FTE	No association	No association.
Retired (compared with those who remained employed)	No association	No association	No association	No association
Income change				
Income increased (compared with those whose income stayed the same)	No association	No association	No association	No association
Income decreased (compared with those whose income stayed the same)	No association	Starting to binge drink lower among those whose income decreased than those whose income stayed the same	No association	No association
Adding children to household				
Childfree households who added at least one child to the household (compared with those that remained child-free)	No association	Starting to binge drink lower among those who added a child than those who remained child-free	No association	Stopping meeting PA recs higher among those adding a child than those who remained child-free

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*

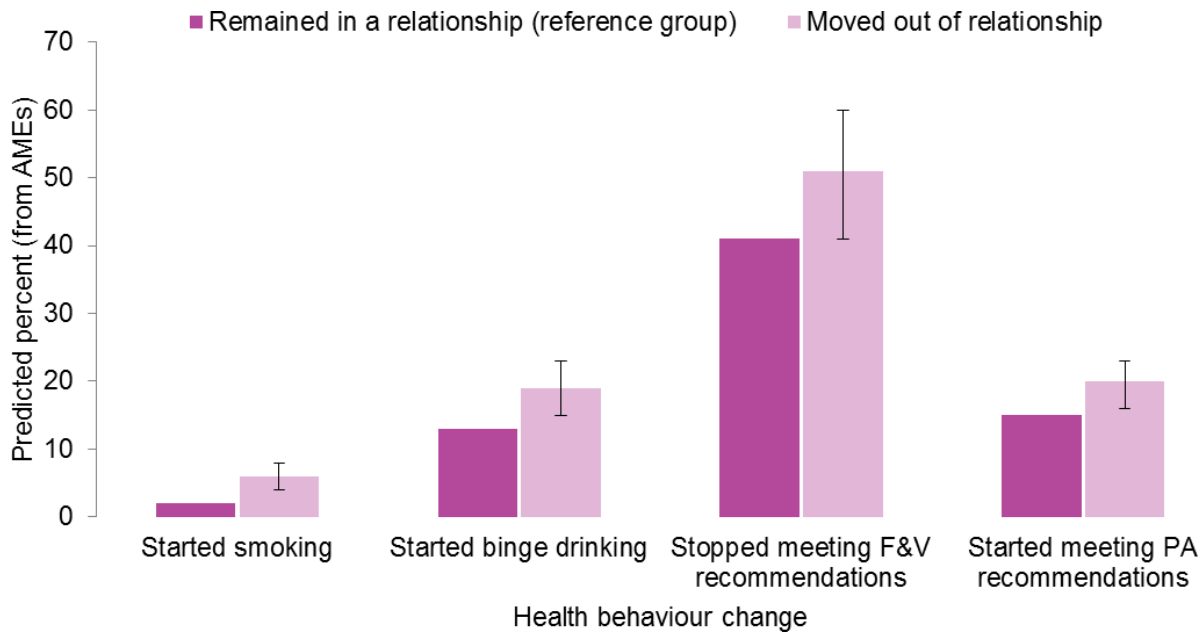
6.4.2 Relationship transitions and health behaviour change

Only one positive health behaviour change had a significant association with changes in marital and cohabitation status. Those who moved out of a relationship were more likely to start meeting

recommendations for PA (predicted prevalence 20%) than those who remained in a relationship (15%). However, on the whole, moving out of a relationship was associated with a greater range of negative health behaviour changes. Those moving out of a relationship were more likely to start smoking than those who remained in a relationship (6% vs 2%), to start binge drinking (19% vs 13%) and to stop meeting F&V recommendations (51% vs 41%). With the exception of PA, it appears that moving out of a relationship is more likely to be associated with negative than positive health behaviour changes (see Figure 6.2).

Figure 6.2: Predicted prevalence (with 95% confidence intervals) of selected changes in health behaviours by relationship transition: moving out of a relationship.[20]

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



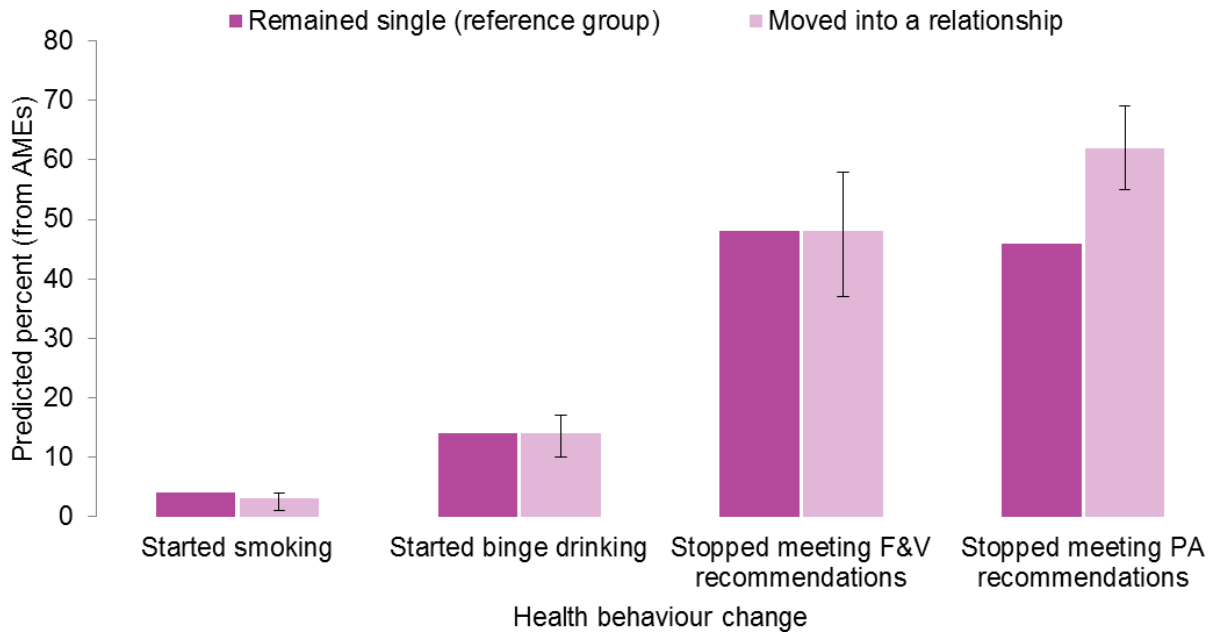
Whilst moving out of a relationship was associated with an increase in risk behaviours, the converse was not true for those moving into a relationship. Those who moved into a relationship were not more likely that those who remained single to show improved health behaviour change. Those moving into a relationship were no more likely than their single counterparts to stop smoking, stop binge drinking or start meeting F&V recommendations. The exception to this was PA; those who moved into a relationship were more likely to stop meeting PA recommendations than those who remained single (62% vs 46%, see Figure 6.3). With respect to PA, it appears that moving out of a relationship was associated with a positive effect on health behaviour change whilst moving into a relationship was associated with a negative effect. For other health behaviour changes, moving out of a relationship was associated with a negative impact but moving into a relationship did not appear to confer any health behaviour benefit.

(Appendix Tables E1 – E8)

[20] The relationships shown are those where there was a significant association between moving out of a relationship and health behaviour change.

Figure 6.3: Predicted prevalence (with 95% confidence intervals) of selected changes in health behaviours by relationship transition: moving into a relationship.

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



6.4.3 Employment transitions and health behaviour change

Employment transitions were considered firstly for all adults. A second group of transitions were then considered among the sub-group of those who were moving out of full-time education (called students hereafter). This is a transition undertaken by a large proportion of young adults (see Chapter 3.5).

Moving in and out of employment – all adults

Becoming employed was associated with only one health behaviour change. However, as Table 6.1 shows, this was not a positive relationship. Those who became employed were less likely to stop binge drinking (predicted prevalence 46%) than those who remained unemployed (63%). No other associations with health behaviour change, either positive or negative, were evident among those who became employed.

Those who became unemployed were more likely to start smoking (predicted prevalence 6%) and less likely to start meeting F&V recommendations (9%) than those who remained in employment (3% and 15% respectively). While moving into unemployment is associated with a negative behaviour change for these two health behaviours, those who became unemployed were less likely to start binge drinking (9%) than those who remained employed (17%).

Taken together, these patterns suggest that, while becoming unemployed is associated with negative changes in smoking and F&V consumption, moving into employment is not associated with positive changes in these behaviours. Further, transitions into employment were associated with a lower propensity to stop binge drinking whilst transitions into unemployment were associated with a lower propensity to start binge drinking.

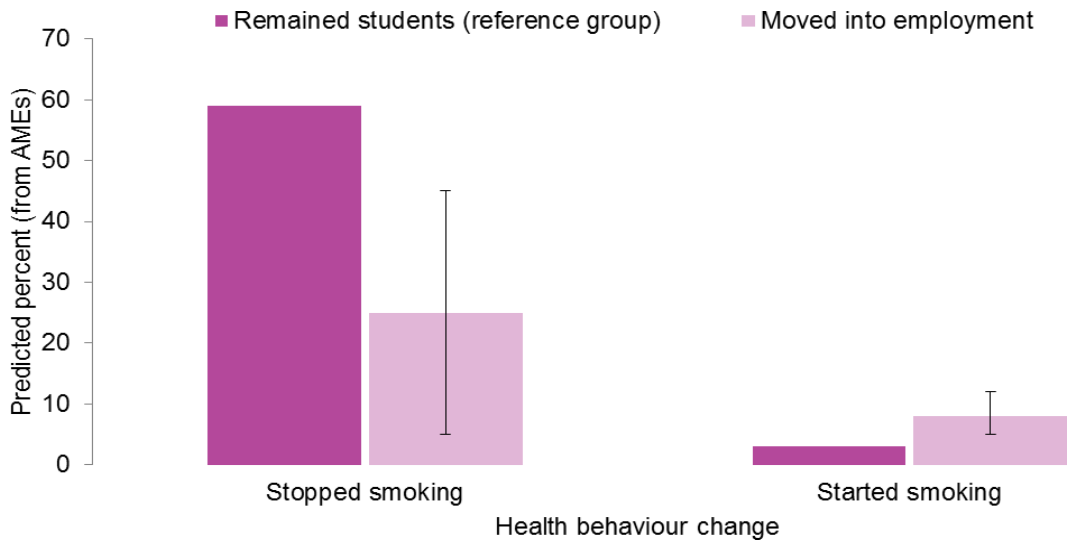
Moving in and out of employment – students

Analyses were also conducted looking at transitions among those moving out of full-time education (FTE) compared with those remaining in FTE.

Only changes in smoking status were associated with movements from FTE to employment. The pattern was symmetrical; those who moved into employment were less likely to stop smoking (predicted prevalence 25%) than those who remained in FTE (the reference group) (59%), whilst those who moved into employment were more likely also to start smoking (5%) than those who remained in FTE (3%) (see Figure 6.4).

Figure 6.4: Predicted prevalence (with 95% confidence intervals) of changing smoking status, by employment transition: moved from student to employment

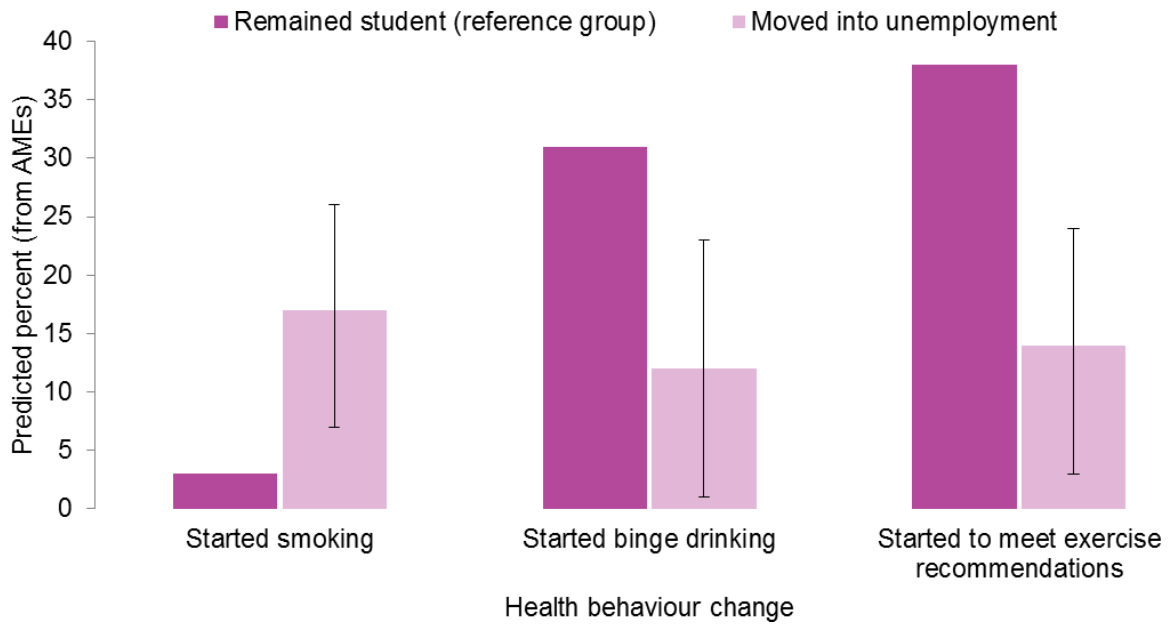
Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Those who left FTE and who moved into unemployment were more likely to start smoking (14%) and less likely to start meeting PA recommendations (14%) than those who remained in FTE (the reference group) (3% started smoking; 38% started meeting PA recommendations). However, those who left FTE and became unemployed were less likely to start binge drinking (12%) than those who remained in FTE (31%) (See Figure 6.5).

Figure 6.5: Predicted prevalence (with 95% confidence intervals) of health behaviour change, by employment transition: moved from student to unemployed.

Source: *UKHLS 2010/11 and 2013/4; predicted prevalence derived from logistic regression models taking all other variables into account*



Retirement

Interestingly, given the REA findings noted in Section 6.2, the transition into retirement from employment was not associated with any health behaviour change.

(Appendix E, Tables E9-E16)

6.4.4 Income change and health behaviour changes

Changes in household income were generally not associated with health behaviour change. There was one exception to this; those whose household income decreased by 20% or more were slightly less likely to start binge drinking than those whose income was stable (estimates were 12% vs 14% respectively).

(Appendix E, Tables E17-E24)

6.4.5 Adding a child to the household and health behaviour change

Adding a child to a previously childless household was associated with changes in binge drinking and PA. Those who added a child to the household were less likely to start binge drinking (predicted prevalence 9%) than those who continued to live in child-free households (13%). Those who added a child to the household were less likely to start meeting PA recommendations (10%) than those who did not (15%) and were also more likely to stop meeting PA recommendations (56% to 48%).

(Appendix E, Tables E25-E32)

6.5 Summary

To our knowledge, our exploratory analysis of the UKHLS represents the first attempt to examine the relationship between a range of key life transitions and positive and negative changes in four key health behaviours for the adult population in England. Focusing on a set of common transitions (relating to changes in relationship status, family composition, employment status and household income), we examined whether they were associated with changes in meeting/not meeting recommendations.

A number of key themes emerge from our analysis. First, the associations evident with each life transition do not operate in a uniform direction for all health behaviours. For example, moving out of a relationship brought with it a greater likelihood of starting smoking, binge drinking and stopping meeting F&V recommendations but also a greater likelihood of meeting the PA recommendations. A greater proportion of people who moved out of a relationship met the PA recommendations than those who remained in a relationship. Likewise, moving from employment to unemployment was associated with negative behaviour change for smoking and F&V consumption but more positive behaviour change for binge drinking, with those moving into unemployment being less likely to start binge drinking. Adding a child to a household meant being less likely to start binge drinking but also being less likely to start to meet, and more likely to stop meeting, the PA recommendations.

Second, whilst some life changes were associated with negative health behaviour change, it was not always evident that the reverse transition was associated with positive health behaviour change. For example, moving out of a relationship was associated with a greater likelihood of starting smoking and binge drinking but moving into a relationship did not reduce the likelihood of experiencing these negative changes in behaviour. Similarly, becoming unemployed meant a greater likelihood of starting smoking but becoming employed was not associated with any changes in smoking behaviour.

Third, any move from full-time education (FTE) seem to be associated with greater risk for smoking behaviour; this is regardless of whether people become employed or unemployed, both of which saw higher rates of starting smoking that those who remained in FTE.

Fourth, of the life transitions considered, very few displayed an association with changing F&V consumption. Only moving out of a relationship and becoming unemployed were associated with changes in whether people met F&V recommendations. The vast majority of people do not meet F&V recommendations and it may be there was behaviour change at lower levels of consumption. As the REA indicated, there is a paucity of studies examining life transitions and F&V consumption; these null findings therefore add to a limited evidence base.

Fifth, some of the null findings may be considered to be surprising. For example, adding a child to the household had no association with changing smoking status. Studies have found that pregnancy, particularly first pregnancy, is associated with smoking cessation (Crozier et al, 2009; Graham et al, 2010); however, post-partum resumption rates are high (Bauld et al, 2017). There were no significant associations between moving into retirement and changing health behaviours. Other studies have found a relationship between retirement and changes in PA (Barnett et al, 2013; Engberg et al, 2013). The lack of association in our study may be related to how PA is measured in the UKHLS, which excludes occupational activity; however, changes in recreational activity should have been detected. It may be that there are increases in recreational activity that nevertheless do not move people above the recommended threshold and are thus not detected in this analysis.

Finally, whilst the UKHLS has a very large sample size (over 25,000 people in this analysis), few people experience each life transition over a three-year period. This, combined with general stasis in health behaviours between 2010/11 and 2013/4, means that the sample sizes for analysis were often small. It may be that some of the non-associations shown in Tables 6.1 and 6.2 are because the study is underpowered to detect these differences.[21] This should be borne in mind when reviewing results from this exploratory analysis.

[21] At the same time, given the number of models estimated, it is possible that some associations will appear as significant when they are not actually observed in the population.

7. CONTRIBUTION TO CONSORTIUM THEMES

The PHRC's programme of research is structured around a set of inter-related themes. These include individual health behaviours (focused on smoking, diet and alcohol use) and multiple risk behaviours (in which smoking, diet, alcohol use and physical activity are all included). The behavioural themes are complemented by consortium themes related to living and working conditions. Information on themes and their related projects can be found at http://phrc.lshtm.ac.uk/projects_by_theme.html.

Our project's main contribution is to the behavioural themes. It advances these themes by providing in-depth analysis of the health behaviours that contribute most to the burden of ill-health and premature mortality among adults in England.

It uses measures of smoking, diet, physical activity and alcohol consumption based on government recommendations, together with measures of consumption for smoking and hazardous alcohol intake, to describe the prevalence of risk behaviours among the adult population in 2013/14 and changes in risk behaviours since 2010/11. It uses the UKHLS' rich measures of social circumstances and identity to analyse the social patterning of prevalence and of stability and change in risk behaviours. In so doing, it points to inequalities in risk behaviour and behaviour change, thus providing a link to the consortium theme around living and working conditions. The project's contribution to consortium evidence on living and working conditions is further strengthened by its analyses of associations between life events and transitions, on the one hand, and health behaviour change, on the other. These analyses included employment transitions (from full-time education into employment and unemployment, from employment into unemployment and from unemployment to employment, and from employment to retirement). The project also investigated the impact of changes in household income on the four health behaviours. To our knowledge, our project is the first UK study to provide evidence on the social patterning of changes in health behaviour and on the impact of life events and transitions on health behaviour.

8. CONCLUSIONS

The project has focused on four behavioural risk factors - cigarette smoking, harmful alcohol intake, poor diet and physical inactivity – that contribute to ill-health and premature mortality in England. Estimates suggest that eliminating these risk factors could prevent up to 80% of heart disease, stroke and type 2 diabetes and over a third of cancers (WHO, 2008). The four risk factors are also associated with high healthcare costs (Scarborough et al, 2011; NHS, 2014).

We used measures of the four behaviours aligned to government recommendations; three of these measures – not smoking, consuming a minimum of 5 portions of F&V a day and undertaking a minimum of 150 minutes of moderate to vigorous activity a week - are also used to track progress at local and national level in promoting healthy lifestyles and reducing social inequalities in key risk factors for ill-health (DoH, 2013c).

Using a large representative study of the adult population, the project sheds light on the patterning of the four health behaviours. Most adults met the recommendations for smoking (they did not smoke) and drinking (they did not binge drink) in 2010/11 and continued to meet the recommendations in 2013/14. But the majority of those who smoke and binge drank in 2010/11 were also smokers and binge drinkers three years later. For F&V consumption and PA, the majority did not meet the recommendations in 2010/11 and also failed to do so three years later. For both health behaviours, a larger proportion of those who had previously met the recommendations no longer did so three years later. This was true for 1 in 2 (50%) of adults who had previously met PA recommendations and over 4 in 10 (43%) of those who had previously met the F&V recommendations. Such patterns of physical activity and diet point to the challenge of achieving and maintaining positive changes in these behaviours.

In our analyses of change in health behaviours, we took account of a wide range of dimensions of people's lives, including socio-demographic factors (like age and ethnic group), socio-economic factors and health status. We found that positive changes in three of the four behaviours (smoking, F&V consumption and PA) were less likely to be made by those in disadvantaged circumstances; social disadvantage also increased the likelihood of making negative changes in the these behaviours. For example, those with lower levels of educational attainment were less likely to stop, and more likely to start, smoking. The same patterns were evident for F&V consumption and for PA; study participants with low levels of educational attainment were less likely to start meeting the F&V and the PA recommendations - and were more likely to stop. Binge drinking was the exception to this pattern. Social disadvantage was associated with an increased likelihood of stopping binge drinking and a reduced likelihood of starting.

Ethnic group was also an important predictor of health behaviour and health behaviour change. For example, those from non-white groups were less likely to smoke and binge drink but more likely not to meet the recommendations for F&V consumption and PA. Those from South Asian groups were also less likely to start meeting the F&V and the PA recommendations. Our evidence lends weight to policies grounded in an understanding of cultural diversity, and supports Public Health England's emphasis on 'people and community-centred approaches to health and wellbeing' (PHE, 2015).

Our analyses took account of individual-level, household-level and area-level measures of people's socio-economic circumstances. In the cross-sectional analyses, area deprivation (measured by IMD

quintile group) did not discriminate between those meeting F&V and PA recommendations; however, it was strongly associated with smoking status, with men and women in more deprived areas more likely to smoke. In the analyses of changes in meeting the recommendations, area deprivation was not significantly associated with any change, positive or negative, in any of the four health behaviours. This finding is of interest given the increasing policy emphasis on locality-based approaches to promoting health (Kings Fund, 2013). It suggests that area-level factors may not be the key drivers of lifestyle change but that multi-component approaches addressing individual-level disadvantage may also be required.

The UKHLS also enabled us to explore whether the transitions that many people experience as they move through adulthood were springboards for positive changes in health behaviour. In broad terms, our analysis suggests that this is not the case. Only one of the transitions we examined was associated with a positive change: those moving out of a cohabiting relationship were more likely to start meeting the PA recommendations than those remaining in a relationship. Additionally, some employment transitions – specifically, moving from full-time education or employment to unemployment – reduced the likelihood of starting to binge drink, as did the addition of a child to the household and a decrease in household income. We recognise that our analysis is exploratory; even with a sample the size of the UKHLS (over 25000 for England), relatively few people experienced the transitions of interest over the 3 year period for which we had health behaviour data. Extending the analysis to subsequent years would provide capacity to investigate associations between life course processes and health behaviour change.

9. DISSEMINATION/OUTPUTS

Presentations given

H Graham and H Wardle (2017) "Are we creatures of habit? Persistence and change in adult health behaviours in England", plenary lecture, *2017 Understanding Society conference*, University of Essex, https://www.understandingsociety.ac.uk/scientific-conference-2017/papers/212

Bespoke reports for the Department of Health (Health Improvement Analytical Team)

- *Multiple risk behaviours among adults in England, 2013-14* (short report for DoH Health Improvement team on health behaviours in 2013/14), June 2016

- *Multiple risk behaviours among adults in England, 2013-14 including IMD analysis* (short report for DoH Health Improvement team on health behaviours in 2013/14), Aug 2016

Manuscripts planned

- "Persistence and change in adult health behaviours in England", to be submitted to JECH
- "Life transitions and changes in health behaviour: insights from a study of English adults", to be submitted to Social Science and Medicine: Population Health

10. REFERENCES

General

Anderson P, Chisholm D, Fuhr DC (2009) Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *The Lancet, 373: 2234-46*

Bauld L, Graham H, Sinclair L, Flemming K, Naughton F, Ford A, et al. (2017) Barriers to and facilitators of smoking cessation in pregnancy and following childbirth: literature review and qualitative study. *Health Technol Assess,* 21(36)

Bloomfield K, Grittner U, Kramer S, Gmel G (2006) Social inequalities in alcohol consumption in the study countries of the EU concerted action 'gender, culture and alcohol problems: a multi-national study'. *Alcohol & Alcoholism*, 41(1): i26–i36.

Booth A et al (2008) *Independent review of the effects of alcohol pricing and promotion*, ScHARR, University of Sheffield.

Booth HP, Prevost AT, Gulliford MC (2013) Validity of smoking prevalence estimates from primary care electronic health records compared with national population survey data for England. *Pharmacoepidemiology and Drug Safety*, 22, 12: 1357-1361

Breslau N, Johnson EO, Hiripi MS and Kessler R (2001) Nicotine dependence in the United States: prevalence, trends and smoking persistence. *Archives of Psychiatry*, 9, 58: 810- . doi:10.1001/archpsyc.58.9.810

Christakis N, Fowler J (2009) *Connected: the surprising power of our social networks and how they shape our lives.* Harper Press: London.

Connolly A (2016) Measuring alcohol consumption: comparting Health Survey for England and Understanding Society. https://www.understandingsociety.ac.uk/research/publications/523976

Corbett J, d'Angelo C, Gangitano L, Freeman J (2017) *Future of Health: Findings from a survey of stakeholders on the future of healthcare in England*. RAND Europe for National Institute for Health Research (NIHR). https://www.rand.org/pubs/research_reports/RR2147.html

Crozier SR et al. (2009) Do women change their health behaviours in pregnancy? Findings from the Southampton Women's Survey. *Paediatric and Perinatal Epidemiology*, 23(5): p. 446-453.

Danner UN, Aarts H, de Vries NK (2008) Habit vs intention in the prediction of future behaviour. *British Jnl of Psychology*, 47: 245-65.

Department for Business Innovation and Schools (BIS) (2015) Participation Rates in Higher Education: academic years 2006-07 – 2013/14. https://www.gov.uk/government/statistics/participation-rates-in-higher-education-2006-to-2015

Department for Business Innovation and Skills (2016) Graduate labour market statistics https://www.gov.uk/government/statistics/graduate-labour-market-statistics-2015

Department of Health (DoH) (2003) *5 A DAY.* Available at: http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Publichealth/Healthimprovement/FiveADay/index.htm

Department of Health (DoH) (2005) *Binge drinking and public health*. Available at: http://www.parliament.uk/documents/post/postpn244.pdf

Department of Health (DoH) (2009) *Guidance on the consumption of alcohol by children and young people*. Available at: http://www.cph.org.uk/wp-content/uploads/2013/09/Guidance-on-the-consumption-of-alcohol-by-children-and-young-people.pdf

Department of Health (DoH) (2010) *Healthy lives, healthy people. White paper: our strategy for public health in England.* London: Stationery Office. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216096/dh_127424.pdf

Department of Health (DoH) (2011a) *Physical activity guidelines for adults (16-64 years) Fact sheet 4*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/213740/dh_128145.pdf

Department of Health (DoH) (2011b) *Physical activity guidelines for children (5-18 years) Factsheet 3.* Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/213739/dh_128144.pdf

Department of Health (DoH) (2012) *The Public Health Outcomes Framework for England, 2013-2016*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216159/dh_132362.pdf

Department of Health (DoH) (2013a) *Reducing smoking.* Available at: https://www.gov.uk/government/policies/reducing-smoking

Department of Health (DoH) (2013b) *Reducing harmful drinking.* Available at: https://www.gov.uk/government/policies/reducing-harmful-drinking

Department of Health (DoH) (2013c) *Improving outcomes and supporting transparency Part 1A: a public health outcomes framework for England*. 2013-2016. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263658/2901502_PHOF_Improving_Outcomes_PT1A_v1_1.pdf

Department of Health (DoH) (2014) *Living well for longer. A call to action to reduce avoidable premature mortality.* London: Department of Health

Department of Health (DoH) (2017) Areas of Research Interest. https://www.nihr.ac.uk/research-and-impact/research-priorities/areas-of-research-interests.htm

Ellaway A, Macintyre S (2009) Are perceived neighbourhood problems associated with the likelihood of smoking? *Journal of Epidemiology & Community*. http://dx.doi.org/10.1136/jech.2007.068767

Fraser LK, Edwards KL, Cade J, Clarke GP (2010) The geography of fast food outlets: a review, *Int. J. Environ. Res. Public Health*, 7(5), 2290-2308. doi:10.3390/ijerph7052290

Gilman SE, Abrams DB, Buke SL (2003) Socioeconomic status over the life course and stages of cigarette use: initiation, regular use, cessation. *JECH*, 57: 802-8

Gorber SC, Schofield-Hurwitz S, Hardt J et al (2009). The accuracy of self-reported smoking: a systematic review of the relationship between self-reported and cotinine- assessed smoking status, *Nicotine and Tobacco Research*, 11:12-24

Government Social Research Unit (2008). Rapid Evidence Assessment Toolkit. http://webarchive.nationalarchives.gov.uk/20140402164155/http://www.civilservice.gov.uk/networks/gsr/resources-and-guidance/rapid-evidence-assessment

Graham H, Sherburne Hawkins S, Law C (2010). Lifecourse influences on women's smoking before, during and after pregnancy, *Social Science and Medicine*, 70 (4): 582-87.

Graham H, Wardle H, Law C, Platt L, Hutchinson J, McAloney K, Byron C, Hall, J (2016a). Multiple risk behaviours among parents with dependent children. Public Health Research Consortium project, final report. http://phrc.lshtm.ac.uk/papers/PHRC_001_Final_Report.pdf.

Graham H, Hutchinson J, Law C. Platt L, Wardle H (2016b) Multiple health behaviours among mothers and partners in England: clustering, social patterning and intra-couple concordance. *Social Science and Medicine Population Health*, 2: 824-833.

Graham HM, Bland JM, Cookson RA, Kanaan M, White PCL (2017) Do people favour policies that protect future generations? Evidence from a British survey of adults. *Journal of Social Policy*, 46(3), 423-445. doi:10.1017/S0047279416000945

Jefferis BJMH, Power C, Graham H, Manor O (2004) Changing social gradients in cigarette smoking and cessation over two decades of adult follow-up in a British birth cohort. *Journal of Public Health* 26(1), p.13-18

Jones A, Combes E (2009) Greenspace access, use, and physical activity: Understanding the effects of area deprivation. *Preventive Medicine*, 49(6): 500-505. https://doi.org/10.1016/j.ypmed.2009.10.012Get rights and content

Kings Fund (2013) *Improving the public's health: a resource for local authorities*. https://www.kingsfund.org.uk/sites/default/files/field/field_publication_file/improving-the-publics-health-kingsfund-dec13.pd3

Knies, G. (ed). (2017) *Understanding Society. The UK Household Longitudinal Study Waves 1-7: User Guide*. Essex: University of Essex.

Laaksonen M, Talala K, Martelin T, Rahkonen O, Roos E, Helakorpi S, Laatikainen T, Prättälä R (2008) Health behaviours as explanations for educational level differences in cardiovascular and all-cause mortality: a follow-up of 60 000 men and women over 23 years. *European Journal of Public Health*, 18(1): 38–43. https://doi.org/10.1093/eurpub/ckm051

Mackenbach JP (2005) *Health Inequalities: Europe in Profile.* Rotterdam: Erasmus MC University Medical Centre.

Marteau TM, Hollands GJ, Fletcher PC (2012) Changing human behavior to prevent disease: the importance of targeting automatic processes. *Science*: 337, 6101:1492-1495. DOI: 10.1126/science.1226918

National Health Service (NHS)(2014) *Five Year Forward Review*. Available at: http://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf

NHS digital (2016) *Health Survey for England 2015 Trend tables*. Available at http://www.content.digital.nhs.uk/catalogue/PUB22616.

Office for National Statistics (ONS) (2015) *Population estimates by marital status and living arrangements, England and Wales: 2002 to 2014*. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/populationestimatesbymaritalstatusandlivingarrangements/2015-07-08#changes-in-marital-status-and-living-arrangements-over-time-2002-to-2014

Office for National Statistics (ONS) (2017a) *Statistical bulletin: Alcohol-specific deaths in the UK registered in 2016*. https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/alcoholrelateddeathsintheunitedkingdom/registeredin2016#relationship-between-alcohol-specific-deaths-and-socioeconomic-deprivation

Office for National Statistics (ONS) (2017b) *People in Work Employment and Employment Type*. https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes

Olson CM (2005) Tracking of food choices across the transition to motherhood. *Journal of Nutrition Education and Behavior*, 37(3): p. 129-136.

Office for Economic Co-operation and Development (OECD) (2011) *Doing Better for Families*. Paris: OECD. http://www.oecd.org/social/soc/doingbetterforfamilies.htm

Picket KE, Rathouz PJ, Kasza K, Wakschlag LS, Wright R (2005) Self-reported smoking, cotinine levels and patterns of smoking in pregnancy, *Paediatric and Perinatal Epidemiology*, 19 (5): 368-76.

Public Health England (PHE) (2013) *Social and economic inequalities in diet and physical activity*. London: Public Health England.

Public Health England (2014) *From evidence into action: opportunities to protect and improve the nation's health*. London: Public Health England.

Public Health England (2015) *A Guide to Community-centred Approaches for Health and Wellbeing*. https://www.england.nhs.uk/wp-content/uploads/2017/01/ph-participation-frmwrk.pdf

Public Health England (2017) *Health Profile for England*. London: *Public Health England* https://www.gov.uk/government/publications/health-profile-for-england/

Scarborough P, Bhatnagar P, Wickramasinghe KK, Allender S, Foster C, Rayner M (2011) The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK:

an update to 2006–07 NHS costs. *Journal of Public Health*, 33(4): 527–535. https://doi.org/10.1093/pubmed/fdr033)

Stead M, MacAskill S, MacKintosh A-M, Reece J, Eadie D (2001) "It's as if you're locked in": qualitative explanations for area effects on smoking in disadvantaged communities. *Health & Place,* 7(4): Pages 333-343. https://doi.org/10.1016/S1353-8292(01)00025-9

Stringhini S, Sabia S, Shipley M, Brunner E, Nabi H, Kivimaki M, Singh-Manoux A (2010) Association of socioeconomic position with health behaviors and mortality. *JAMA*. 303(12):1159–1166. https://doi.org/10.1001/jama.2010.297

Telama R (2009) Tracking of physical activity from childhood to adulthood; a review. *Obesity Facts*, 3: 187-195

Tipping S, Hope , Pickering E, Erens B, Roth MA, Mindell JS (2010) The effect of mode and context on survey results: analysis of data from the Health Survey for England 2006 and the Boost Survey for London, BMC *Medical Research Methodology,* 10, 84.

University of Essex. Institute for Social and Economic Research, NatCen Social Research and Kantar Public, [producers]: Understanding Society: Waves 1-7, 2009-2016 and harmonised British Household Panel Survey: Waves 1-18, 1991-2009. [computer file]. 9th Edition. Colchester, Essex: UK Data Service [distributor], November 2017. SN: 6614, http://dx.doi.org/10.5255/UKDA-SN-6614-9.

White M (2007). Food access and obesity. *Obesity Reviews*. DOI: 10.1111/j.1467-789X.2007.00327.x

World Health Organisation (WHO) (2008) *Global Burden of Disease Update.* Geneva: WHO.

World Health Organisation (WHO) (2010) *Global status report on noncommunicable diseases 2010.* Geneva: WHO.

World Health Organisation (WHO) (2014) *Global status report on noncommunicable diseases 2014.* Geneva: WHO.

References for Rapid Evidence Assessment

Smoking and marital and cohabitation status

Giordano, G., Lindstrom, M (2010). The impact of social capital on changes in smoking behaviour: a longitudinal cohort study. *European Journal of Public Health*, 21 (3); 347–354.

Kutob, R.M., Yuan, N.P., Wertheim, B.C., Sbarra, D.A., Loucks, E.B, Nassir, R., Bareh, G., Kim, M.M., Snetselaar ,L.G, Thomson, C.A. (2017) Relationship Between Marital Transitions, Health Behaviors, and Health Indicators of Postmenopausal Women: Results from the Women's Health Initiative. *Journal of Women's Health*. 26(4): 3130-320.

Merline A.C. , Schulenberg, J.E., O'Malley, P.M, , Bachman, J.G., Johnston, L. (2008) Substance Use in Marital Dyads: Premarital Assortment and Change Over Time. *Journal of Studies on Alcohol and Drugs,* 69(3): 352–361.

Tamers, SL., Okechukwu, C., Marino, M., Guéguen, A., Goldberg, M., Zins, M. (2015) Effect of stressful life events on changes in smoking among the French: longitudinal findings from GAZEL. *European Journal of Public Health*, 25(4): 711-5.

Smoking and employment change

Arcaya, M., Glymour, M.M., Christakis, N.C., Kawachi, I., Subramanian, S.V., (2014). Individual and spousal unemployment as predictors of smoking and drinking behaviour. *Social Science and Medicine*,1 10: 89-95.

Blakely, T., van der Deen, F., Woodward, A., Kawachi, I., Carter, K. (2013) Do changes in income, deprivation, labour force status and family status influence smoking behaviour over the short run? Panel study of 15 000 adults. Tobacco Control. doi:10.1136/tobaccocontrol- 2012-050944

Giordano, G., Lindstrom, M (2010). The impact of social capital on changes in smoking behaviour: a longitudinal cohort study. *European Journal of Public Health*, 21 (3); 347–354.

Golden, S.D., Perriera, K.M. (2015) Losing jobs and lighting up. Employment experiences and smoking in the Great Recession. *Social Science and Medicine*, 138: 110-118.

Lang, A.I., Rice, N.E, Wallace, R.B., Guralnik, J.M., Melzer, D., (2007) Smoking cessation and transition into retirement: analyses from the English Longitudinal Study of Ageing
Age and Ageing, 36(6): 638–643,

Tamers, SL., Okechukwu, C., Marino, M., Guéguen, A., Goldberg, M., Zins, M. (2015) Effect of stressful life events on changes in smoking among the French: longitudinal findings from GAZEL. *European Journal of Public Health*, 25(4): 711-5.

Virtanen, P., Vahtera, J., Broms, U., Sillanmäki, L., Kivimäki, M., Koskenvuo, M. (2008) Employment trajectory as determinant of change in health-related lifestyle: the prospective HeSSup study. *European Journal of Public Health*, 18(5): 504-8.

Smoking and income

Blakely, T., van der Deen, F., Woodward, A., Kawachi, I., Carter, K. (2013) Do changes in income, deprivation, labour force status and family status influence smoking behaviour over the short run? Panel study of 15 000 adults. Tobacco Control. doi:10.1136/tobaccocontrol- 2012-050944.

Reczek, C., Pudrovska, T., Carr, D., Thomeer, M.B., Umberson, D. (2016) Marital Histories and Heavy Alcohol Use among Older Adults. *Journal of Health and Social Behaviour*, 57(1):77-96.

Giordano, G., Lindstrom, M (2010). The impact of social capital on changes in smoking behaviour: a longitudinal cohort study. *European Journal of Public Health*, 21 (3); 347–354.

Golden, S.D., Perriera, K.M. (2015) Losing jobs and lighting up. Employment experiences and smoking in the Great Recession. *Social Science and Medicine*, 138: 110-118.

Young-Hoon. N.K. *(2012)* A Longitudinal Study on the Impact of Income Change and Poverty on Smoking Cessation. *Canadian Journal of Public Health*. 103(3): 189-94.

Smoking and children

Gilbert, N.L., Nelson, C.R., Greaves, L. (2015) Smoking cessation during pregnancy and relapse after childbirth in Canada. *Journal of obstetrics and gynocology Canada*. 37(1):32-9.

Kaneko, A., Kaneita, Y., Yokoyama, E., Miyake, T., Harano, S., Suzuki, K., Ibuka, E., Tamaki, T., Nakajima, H., Ohida, T. (2008) Smoking trends before, during, and after pregnancy among women and their spouses, Pediatrics International. 50(3):367-75.

Martin, LT., McNamara, M., Milot, A., Bloch, M., Hair, EC., Halle, T. (2008) Correlates of smoking before, during, and after pregnancy. *American Journal of Health Behaviour*, 32(3):272-82.

Meernik, C., Goldstein, A.O. (2015) A critical review of smoking, cessation, relapse and emerging research in pregnancy and post-partum. British Medical Bulletin, 2014: 135-46.

Mumford, E.A., Weiwei, L. (2016) Social integration and maternal smoking: A longitudinal analysis of a national birth cohort. Maternal Child Health, 20(8): 1586–1597

Drinking and marital and cohabitation status

Kretsch, N., Paige Harden, K. (2013) Marriage, Divorce, and Alcohol Use in Young Adulthood: A Longitudinal Sibling-Comparison Study. *Emerging Adulthood*, 2(2):138-149.

Kutob, R.M., Yuan, N.P., Wertheim, B.C., Sbarra, D.A., Loucks, E.B, Nassir, R., Bareh, G., Kim, M.M., Snetselaar ,L.G, Thomson, C.A. (2017) Relationship Between Marital Transitions, Health Behaviors, and Health Indicators of Postmenopausal Women: Results from the Women's Health Initiative. *Journal of Women's Health*. 26(4): 3130-320.

Merline A.C. , Schulenberg, J.E., O'Malley, P.M, , Bachman, J.G., Johnston, L. (2008) Substance Use in Marital Dyads: Premarital Assortment and Change Over Time. *Journal of Studies on Alcohol and Drugs,* 69(3): 352–361.

Molander, R.C, Yonker, J.A., Krahn, D.D. (2010). Age-related changes in drinking patterns from mid- to older age: results from the Wisconsin longitudinal study. *Alcoholism, Clinical and Experimental Research,* 34(7):1182-92.

Staff. J., Greene, K.M., Maggs, J.L., Schoon. I. (2014) Family transitions and changes in drinking from adolescence through mid-life. *Addiction*, 109(2):227-36.

van der Deen, F.S., Carter, K.N., McKenzie, S.K., Blakely, T. (2014) Do changes in social and economic factors lead to changes in drinking behavior in young adults? Findings from three waves of a population based panel study. *BMC Public Health*, 14: 928.

Vladimirov D., Niemelä S., Auvinen J., Timonen M., Keinänen-Kiukaanniemi S., Ala-Mursula L., Laitinen J., Miettunen J. (2016) Changes in alcohol use in relations to sociodemographic factors in early midlife. Scandinavian Journal of Public Health,44(3):249-57.

Drinking and employment change

Arcaya, M., Glymour, M.M., Christakis, N.C., Kawachi, I., Subramanian, S.V., (2014). Individual and spousal unemployment as predictors of smoking and drinking behaviour. *Social Science and Medicine*,1 10: 89-95.

Bosque-Prous, M., Espelt, A., Sordo, L., Guitart, A., M. Brugal, T., Bravo, M.J. (2015)
Job Loss, Unemployment and the Incidence of Hazardous Drinking during the Late 2000s Recession in Europe among Adults Aged 50–64 Years. Plos One. doi.org/10.1371/journal.pone.0140017.

Colell, E., Bell, S., Britton, A. (2013) The relationship between labour market categories and alcohol use trajectories in midlife. *Journal of Epidemiology and Community Health*. doi:10.1136/jech-2014-204164.

Popovicia, I., French, T.B. (2013) Does Unemployment Lead to Greater Alcohol Consumption? *Industrial Relations*. 52(2): 444–466.

Molander, R.C, Yonker, J.A., Krahn, D.D. (2010). Age-related changes in drinking patterns from mid- to older age: results from the Wisconsin longitudinal study. *Alcoholism, Clinical and Experimental Research,* 34(7):1182-92.

Staff. J., Greene, K.M., Maggs, J.L., Schoon. I. (2014) Family transitions and changes in drinking from adolescence through mid-life. *Addiction*, 109(2):227-36.

van der Deen, F.S., Carter, K.N., McKenzie, S.K., Blakely, T. (2014) Do changes in social and economic factors lead to changes in drinking behavior in young adults? Findings from three waves of a population based panel study. *BMC Public Health*, 14: 928.

Virtanen, P., Vahtera, J., Broms, U., Sillanmäki, L., Kivimäki, M., Koskenvuo, M. (2008) Employment trajectory as determinant of change in health-related lifestyle: the prospective HeSSup study. *European Journal of Public Health*, 18(5): 504-8.

Vladimirov D., Niemelä S., Auvinen J., Timonen M., Keinänen-Kiukaanniemi S., Ala-Mursula L., Laitinen J., Miettunen J. (2016) Changes in alcohol use in relations to sociodemographic factors in early midlife. Scandinavian Journal of Public Health,44(3):249-57.

Zins, M., Guéguen, A., Kivimaki, A., Singh-Manoux, A., Leclerc, A., Vahtera, J., Westerlund, H., Ferrie, J.E., Goldberg, M. (2011) Effect of Retirement on Alcohol Consumption: Longitudinal Evidence from the French Gazel Cohort Study. Plos One. doi.org/10.1371/journal.pone.0026531.

Drinking and income

Kalousova, L., Burgard, S.A. (2014) Unemployment, measured and perceived decline of economic resources: contrasting three measures of recessionary hardships and their implications for adopting negative health behaviors. *Social Science and Medicine*, 106:28-34.

Ólafsdóttir, T., Ásgeirsdótti, T.L.,(2015) Gender differences in drinking behavior during an economic collapse: evidence from Iceland. *Review of Economics of the Household*, 13(4): 975-1001.

van der Deen, F.S., Carter, K.N., McKenzie, S.K., Blakely, T. (2014) Do changes in social and economic factors lead to changes in drinking behavior in young adults? Findings from three waves of a population based panel study. *BMC Public Health*, 14: 928.

Drinking and children

Little M, Handley E, Leuthe E, Chassin L. (2009) The impact of parenthood on alcohol consumption trajectories: variations as a function of timing of parenthood, familial alcoholism, and gender. *Development and psycholpathology,* 21(2):661-82.

Liu W, Mumford EA, Petras H. (2015) Maternal patterns of postpartum alcohol consumption by age: a longitudinal analysis of adult urban mothers. *Prevention Science,* 16(3):353-63.

Matusiewicz AK, Ilgen MA, Bohnert KM. (2016) Changes in alcohol use following the transition to motherhood: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence,* 168:204-210.

Mellingen S, Torsheim T, Thuen F. (2015) Predictors of Postpartum Change in Alcohol Use in Norwegian Mothers. *Journal for the Study of Alcohol and Drugs*, 76(4):559-68.

Staff. J., Greene, K.M., Maggs, J.L., Schoon. I. (2014) Family transitions and changes in drinking from adolescence through mid-life. *Addiction*, 109(2):227-36.

Tran NT, Najman JM, Hayatbakhsh R. (2015) Predictors of maternal drinking trajectories before and after pregnancy: evidence from a longitudinal study. *Aust N Z J Obstetrics and Gynaecology.* 55(2):123-30.

van der Deen, F.S., Carter, K.N., McKenzie, S.K., Blakely, T. (2014) Do changes in social and economic factors lead to changes in drinking behavior in young adults? Findings from three waves of a population based panel study. *BMC Public Health*, 14: 928.

F&V and marital and cohabitation status

Hartmann C, Dohle S, Siegrist M (2014) Time for change? Food choices in the transition to cohabitation and parenthood. *Public Health Nutrition.* 17(12):2730-9.

Smith KJ, McNaughton SA, Gall SL, Otahal P, Dwyer T, Venn AJ. (2017) Associations between Partnering and Parenting Transitions and Dietary Habits in Young Adults. *Journal of Academy of Nutrition and Dietetics.* 117(8):1210-1221.

Vinther JL, Conklin AI, Wareham NJ, Monsivais P. (2016) Marital transitions and associated changes in fruit and vegetable intake: Findings from the population-based prospective EPIC-Norfolk cohort, UK. *Social Science and Medicine,* 157:120-6.

F&V and income

Skafida V, Treanor MC. (2014). Do changes in objective and subjective family income predict change in children's diets over time? Unique insights using a longitudinal cohort study and fixed effects analysis. *Journal of Epidemiology and Community Health*, 68(6):534-41.

F&V and children

Hartmann C, Dohle S, Siegrist M (2014) Time for change? Food choices in the transition to cohabitation and parenthood. *Public Health Nutrition.* 17(12):2730-9.

Laroche HH, Wallace RB, Snetselaar L, Hillis SL, Steffen LM. (2012) Changes in diet behavior when adults become parents. *Journal of the Academy of Nutrition and Dietetics*, 112(6):832-9.

PA and marital and cohabitation status

Allender, S., Hutchinson, L., Foster, C. (2008) Life-change events and participation in physical activity: a systematic review. *Health Promotion International*, 23(2): 160–172.

Brown WJ, Heesch KC, Miller YD. (2009) Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioural Medicine.* 37(3):294-305.

Engberg E, Alen M, Kukkonen-Harjula K, Peltonen JE, Tikkanen HO, Pekkarinen H. (2012) Life events and change in leisure time physical activity: a systematic review. Sports Medicine. 42(5):433-47.

Hull EE, Rofey DL, Robertson RJ, Nagle EF, Otto AD, Aaron DJ. (2010) Influence of marriage and parenthood on physical activity: a 2-year prospective analysis. *Journal of Physical Activity and Health,* 7(5):577-83.

Koeneman, M., Chinapaw, MJM., Verheijden, M.W., van Tilburg, T.G., Visser, M., Deeg, DJH., Hopman-Rock, M. (2012) Do major life events influence physical activity among older adults: the *Longitudinal Aging Study Amsterdam. International Journal of Behavioral Nutrition and Physical Activity*, 9:147.

PA and employment status

Allender, S., Hutchinson, L., Foster, C. (2008) Life-change events and participation in physical activity: a systematic review. *Health Promotion International*, 23(2): 160–172.

Barnett, I., van Sluijs, E., Ogilvie, D., Wareham, N.J. (2014) Changes in household, transport and recreational physical activity and television viewing time across the transition to retirement:

longitudinal evidence from the EPIC-Norfolk cohort. *Journal of Epidemiology & Community Health*, 68: 701-702.

Brown WJ, Heesch KC, Miller YD. (2009) Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioural Medicine.* 37(3):294-305.

Engberg E, Alen M, Kukkonen-Harjula K, Peltonen JE, Tikkanen HO, Pekkarinen H. (2012) Life events and change in leisure time physical activity: a systematic review. Sports Medicine. 42(5):433-47.

Hirvensalo, M., Lintunen, T. (2011) Life-course perspective for physical activity and sports participation. *European Review of Aging and Physical Activity*, 8 (1): 13-22.

Koeneman, M., Chinapaw, MJM., Verheijden, M.W., van Tilburg, T.G., Visser, M., Deeg, DJH., Hopman-Rock, M. (2012) Do major life events influence physical activity among older adults: the *Longitudinal Aging Study Amsterdam. International Journal of Behavioral Nutrition and Physical Activity*, 9:147.

Feng, X., Croteau, K., Kolt, G.S., Astell-Burt, T (2016) Does retirement mean more physical activity? A longitudinal study. *BMC Public Health*, 16: 605.

Virtanen, P., Vahtera, J., Broms, U., Sillanmäki, L., Kivimäki, M., Koskenvuo, M. (2008) Employment trajectory as determinant of change in health-related lifestyle: the prospective HeSSup study. *European Journal of Public Health*, 18(5): 504-8.

PA and Income

Brown WJ, Heesch KC, Miller YD. (2009) Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioural Medicine.* 37(3):294-305.

Engberg E, Alen M, Kukkonen-Harjula K, Peltonen JE, Tikkanen HO, Pekkarinen H. (2012) Life events and change in leisure time physical activity: a systematic review. Sports Medicine. 42(5):433-47.

PA and children

Bellows-Riecken KH, Rhodes RE. (2007) A birth of inactivity? A review of physical activity and parenthood. *Journal of Preventative Medicine.* 46(2):99-110.

Brown WJ, Heesch KC, Miller YD. (2009) Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioural Medicine.* 37(3):294-305.

Engberg E, Alen M, Kukkonen-Harjula K, Peltonen JE, Tikkanen HO, Pekkarinen H. (2012) Life events and change in leisure time physical activity: a systematic review. Sports Medicine. 42(5):433-47.

Garfield, C., Isacco, A., Bartl, W.D. (2010) Men's Health and Fatherhood in the Urban Midwestern United States. *International Journal of Men's Health*, 9(3):161-174.

Hamilton, K., White, K.M. (2010) Understanding parental physical activity: Meanings, habits, and social role influence. *Psychology of Sport and Exercise*. 11(4): 275-285.

Hull EE, Rofey DL, Robertson RJ, Nagle EF, Otto AD, Aaron DJ. (2010) Influence of marriage and parenthood on physical activity: a 2-year prospective analysis. *Journal of Physical Activity and Health,* 7(5):577-83.

Appendix A: Method details

About the 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.[22] Health behaviour data were gathered in the second (2010/11) and fifth (2013/14) waves. In English households, data were collected from around 38,000 adults at wave two, and from around 31,000 at wave five. Nearly 26,000 adults in English households participated at both waves. Participants included in these analyses are from English households, had fully productive face-to-face interviews and were aged 16 or over at wave two.

More information about the UKHLS is available at https://www.understandingsociety.ac.uk/

Health behaviour measures

We used government recommendations available at the time of data collection for the four health behaviours (Box 1 in Chapter 1) to categorise responses to the health behaviour questions. For most of the analysis included in this report, the measures are therefore simple binary ones (meeting/not meeting the relevant recommendation); we classified 'not meeting the recommendation' as a risk behaviour. These binary measures were used in Chapters 4, 5 and 6.

For UKHLS adults, smoking, fruit and vegetable consumption and physical activity participation were collected by a main CAPI questionnaire (Computer Assisted Personal Interview, administered face-to-face by an interviewer), whereas alcohol consumption was collected by a separate confidential self-completion questionnaire.

Smoking

Smoking one or more cigarettes per day was classed as not meeting government guidelines and was categorised as a risk behaviour (DoH, 2013a). Other patterns of smoking behaviour, including occasional smoking of cigarettes, were categorised as non-risk in this analysis. Regular cigar and/or pipe smoking were not measured in the UKHLS questionnaire but these are very low prevalence behaviours (Booth et al, 2013) and their exclusion will have made minimal difference to the analysis.

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).

Alcohol intake

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

[22] The household structure of the UKHLS means that children are also included in the survey. Our analysis focuses on adults only

'…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 our analyses, these were converted into units of alcohol intake using values of 2 units per pint (based on normal strength beer, larger, 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 based on the General Household Survey (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.

Government guidelines on alcohol consumption were revised in 2015. It was not possible with UKHLS questions to produce measures for the now-current lower-risk guidelines for alcohol (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). We used the recommendations in place at the time of data collection pertaining to binge drinking: 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 and therefore engaging in a 'risk behaviour'.

Unlike the other three health behaviours, the UKHLS alcohol data were gathered by self-completion questionnaire. Other studies suggest that interviewer-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 (Tipping et al, 2010; Graham et al, 2016a). For example, in Tipping et al's analysis, 44% of women in a self-completion sample who reported that they had drunk alcohol in the previous week had exceeded the thresholds for binge drinking, compared with 33% of women in an interviewer-led sample.

Fruit and vegetable intake

The UKHLS 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 though interviewers were instructed "IF QUERIED, FRUIT JUICE IS NOT TO BE INCLUDED"

1) *Including tinned, frozen, dried and fresh fruit, on how many days in a **usual** week do you eat fruit?*
2) *Including tinned, frozen and fresh vegetables, on how many days in a **usual** week do you eat vegetables? Do not include potatoes, crisps or chips*
   Never,
   1 - 3 Days,
   4 - 6 Days,
   Every day
3) *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.*
   0 through high

Individuals who did not report consuming five portions of fruit and vegetables a day for seven days in a usual week in the UKHLS were classed as not meeting government recommendations (DoH, 2003) i.e. as having a risk behaviour.

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 frequency category was three or more days a week. Therefore, an approximation to meeting government guidelines had to be used for the analyses as follows:

- 30 minutes or more of brisk or fast walking in a day 20 times in the past four weeks, or 3 days or more a week moderate to vigorous sporting activity, or 1-2 times a week moderate to vigorous sporting activity and 4 days a week brisk or fast walking for 30 minutes or more.

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; ski-ing; 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. In the past four weeks, have you done a continuous walk that lasted at least 10 minutes?

During the past four weeks, on how many days did you do a walk of at least 10 minutes?

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 (e.g.. None of these).

UKHLS does include a question about physical activity in the workplace but this is a broad and subjective measure which did not allow us to include it in our measure of PA:

Thinking about the type of work that you do, in general would you say that you are...
Very physically active
Fairly physically active
Not very physically active
Or not at all physically active in your job?

Therefore our measure of PA excludes workplace activity, which may under-represent the activity levels of certain groups, for example manual labourers.

Health behaviour change over time

For objective 2 and 3, we looked at stability and change in each health behaviour over time. To be included in analysis for objective 2 and 3, individuals had to have valid health behaviour data in both 2010/11 and 2013/4. For each health behaviour, the following groups were identified:

- Stable: did not meet health behaviour recommendations in both 2010/11 and 2013/4
- Stable: met health behaviour recommendations in both 2010/11 and 2013/14
- Change: Met health behaviour recommendations in 2013/4 but not 2010/11
- Change: Met health behaviour recommendations in 2010/11 but no longer did so in 2013/14

No survey is without measurement error, but the measures we have used to look at change over time are likely to be reflective of real change. Overall, we measure a simple dichotomy – whether the individual is meeting or not meeting each health behaviour recommendation. For the longitudinal analysis, these are categorised into simple groups of stability or change. Such groupings are clear-cut and likely to be more robust than if we were attempting to measure finer degrees of change.

The questions themselves are designed to measure typical behaviour and change. F&V and physical activity questions refer to "usual" amounts consumed, and "usual" intensities for walking; and the sports frequency question asks respondents to consider 'peak season' when answering. Walking questions refer to the last four weeks, which is a period likely to be well-recalled by respondents. Similarly, drinking questions refer to the last seven days. The measure of smoking is based on whether the individual regularly smokes at least one cigarette per day.

For objective 2 an additional four groups were created to examine worsening and improving health behaviour among persistent smokers and binge drinkers. These were:

- Improving smokers: persistent smokers who improved their smoking behaviour by smoking fewer cigarettes than previously;

- Worsening smokers: persistent smokers whose smoking behaviour worsened by smoking more cigarettes than previously;
- Improving drinkers: persistent binge drinkers who improved their drinking behaviour by consuming fewer units of alcohol on their heaviest drinking day than previously;
- Worsening drinkers: persistent binge drinkers whose drinking behaviour worsened by consuming more units of alcohol on their heaviest drinking day than previously.

There were 3256 persistent smokers in our sample and 2535 persistent binge-drinkers (unweighted numbers). For those who were smokers at both waves we calculated the change in number of cigarettes smoked each day; and likewise for persistent drinkers using number of units consumed. To set boundaries for 'improving' and 'worsening' that were likely to capture real change, we based our analyses on a change of five cigarettes per day for smoking and one standard deviation from the mean change in units drunk for drinking. For both persistent smokers and binge-drinkers, the distribution of change approximated a normal distribution closely, and had a mean very close to zero.

The level of change for cigarettes was set as there was of 'heaping' of reported numbers of cigarettes smoked at multiples of five in the distribution – i.e. spikes in number of people at five, and then especially ten, fifteen, twenty and above cigarettes smoked per day – as respondents appeared to round to the nearest five when reporting. A change of five cigarettes therefore seemed to be a plausible threshold to set for real change – if, for example, a respondent reported smoking 15 cigarettes in 2010/11 and 10 in 2013/14. There is an established dose response relationship between cigarette consumption and health, so it was deemed less important whether a change was from a higher or lower starting point e.g. whether a reduction from 10 to 5 cigarettes is equivalent to a reduction from 25 to 20. The +/-5 cigarettes threshold gave us 704 respondents whose smoking behaviour 'improved' and 541 whose behaviour 'worsened'.

There was no evidence of heaping in the distribution of reported units drunk to help inform a threshold for change in binge drinking behaviour, and there is no established threshold to help guide this. The change in units drunk for persistent binge drinkers between 2010/11 and 2013/4 could be modelled very well by a normal distribution and the mean change was close to 0 for both men and women. Therefore the level for alcohol consumption was set at one standard deviation from the mean change in units consumed by persistent binge drinkers, calculated separately for men and women. This figure was 6.3 units for men, and 6.6 for women. This may seem like a large number but this is among persistent binge drinkers who have higher levels of alcohol consumption and this equates to reducing/increasing alcohol consumption by approximately 3 glasses of wine or 3 pints on the heaviest drinking day. This gave us 254 respondents whose drinking behaviour 'improved' and 293 whose behaviour 'worsened'.

It was not possible to create robust measures for improvement or worsening for F&V and PA due to the way the UKHLS questions are constructed. There are two dimensions to F&V recommendations – eating five or more portions and eating this number every day. Improvement/worsening in behaviour could be achieved either through a change in: number of portions eaten; number of days on which f&/v eaten; or both. Creating a count of weekly portions eaten would be one way to take this into account to measure improving/worsening behaviour. However, the structure of the UKHLS questions does not lend itself to this relatively fine calculation.

As indicated in the box on F&V consumption above, the UKHLS questions ask about number of days eaten for fruit and vegetables separately in categories of 0, 1-3 days, 4-6 days and every day; the number of portions is then asked in a single question, combining responses for F&V together, and this is recorded in whole numbers, range 0 to maximum. Because of this, we cannot calculate the number of portions of fruit consumed per week and then the number of portions of vegetables consumed per week as the data do not specify what the portions were – fruit or vegetables. To create a weekly portion index, this information would need to be captured separately and multiplied by frequency of consumption; using the existing data to attempt this risks significant over-counting. It is also not clear what types of behaviour would count as improvement. For example, someone may increase the number of days that they consumed fruit but not vegetables (or vice versa) whilst reducing their portions on the average day. Depending on the relative size of these values, someone may actually be consuming more F&V than previously or might be consuming less. This is very difficult to determine using the UKHLS data.

Similarly, changing levels of PA are difficult to measure finely using the UKHLS questions. There are several dimensions to our measure – frequency of sports participation, and walking frequency as well as pace. The categorical frequency measure used in the questions on sport especially makes it problematic to even approximate fine change (as the response options are very blunt, ranging from once in the last 12 months to 3 or more times a week) and no information is captured about duration or intensity of PA. It is very difficult to use this information to determine mutually exclusive groups of people who have increased or decreased their PA, once their combination of activities are taken into account. It is also not clear what thresholds would constitute an improvement or vice versa. Therefore, analyses looking at improving and worsening health behaviours were restricted to persistent smokers and binge drinkers only where we could be more confident that changes in the data represent real behaviour change.

Analysis techniques

For each objective, bi-variate and multivariate analyses were performed to explore associations between each health behaviour (and change thereof) and a standard set of explanatory covariates (see below for further information about covariates). Simple cross tabulations were produced to describe the basic relationships between each health behaviour and each covariate, and multivariate logistic regressions run to explore the relationships once other factors were taken into account. Results of these analyses are reported as Average Marginal Effects and Odds Ratios and are shown in Appendices C to E. All analyses were produced using Stata v14.

Average Marginal Effects

Average Marginal Effects (AMEs) are predicted values from non-linear multivariate analysis (i.e. from multiple logistic regression). They can be interpreted in a similar way to odds ratios from multiple logistic regression.

AMEs take all variables entered into the model into account to derive the predicted proportion of a given behaviour (in the example below, cigarette smoking) for each variable. Table A1 below shows the predicted prevalence of smoking among men of different ages. Like odds ratios, AMEs are presented relative to a reference category and show how much (if at all) the predicted prevalence varies from the reference group.

For example, taking a number of other factors into account (in this case educational attainment, ethnic group, employment, general health status, area deprivation, marital and cohabitation status and income), the predicted prevalence of smoking among men aged 16-24 was 21%. Current smoking

varied by age and was lower among those aged 55 and over than those aged 16-24. For those aged 55-64, the predicted prevalence was 5 percentage points lower than those aged 16-24 (i.e., 16%; calculated as 0.21 – 0.05). Among those aged 65 and over, the predicted prevalence was 11 percentage points lower than those aged 16-24 (i.e., 10%, calculated as 0.21 – 0.11).

As with odds ratios, the confidence intervals indicate whether the differences are statistically significant. If the confidence intervals include the value of 0, the difference from the reference category is not significant at conventional levels. In this example, those aged 55 and over had significantly different predicted smoking prevalence than those aged 16-24.

AMEs have advantages over odds ratios as results represent a predicted prevalence of behaviour which can be easier to interpret and understand than odds ratios. This predicted prevalence rate helps to highlight the magnitude of differences from the reference group in a meaningful way. For example, we can see that predicted smoking rates among those aged 65 and over were broadly half that of those aged 16-24 (21% vs 11%).

TABLE A1: Prevalence of cigarette smoking and average marginal effects of being a current cigarette smoker: Men

	Unadjusted prevalence of cigarette smoking	Bases		Average Marginal Effect* (change in proportion from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*N*			
Age[a,b]						
16-24	20	*2271*	*1704*	**REF: 0.21**		
25-34	24	*2087*	*1537*	+0.03	-0.00	+0.07
35-44	20	*2339*	*2048*	+0.02	-0.02	+0.05
45-54	22	*2563*	*2267*	+0.01	-0.03	+0.05
55-64	18	*2262*	*1965*	-0.05	-0.08	-0.01
65+	10	*3316*	*2969*	-0.11	-0.15	-0.06

[a] Unadjusted prevalence varies significantly by this characteristic, p<0.05

[b] Characteristic significant in regression model, p<0.05

*Average Marginal Effects take into account other characteristics entered into the model, in this case educational attainment, ethnic group, employment, general health, area deprivation, marital status and income (data not shown).

Multivariate logistic regression

Logistic regression models were produced for all objectives. For each model, a standard set of covariates was entered into the model, using the enter method. The set of covariates used were carefully selected by the team, representing individual, household and area characteristics and were initially chosen because they were important dimensions of an individual's identity and everyday circumstances and/or had a known relationship with health behaviours. All covariates were carefully checked for collinearity. Unless noted below, the covariate measure was based on data collected in 2010/11.

The covariates included in the models were[23]:

Age: grouped in 10-year age bands, starting with 16-24 year-olds and with the oldest category as aged 65 and above
Sex: Men and women
Ethnic group: This was derived from the UKHLS variable and categories combined to create useable analysis groups. For chapters 5 and 6, responses were grouped into the following categories: White British; South Asian (any Indian, Bangladeshi or Pakistani groups); Black Caribbean/Black African; other (all other ethnicities, including mixed and White - other).
Marital and cohabitation status: The 10-category UKHLS derived variable *De facto marital status* was recoded into four categories, but still reflecting living arrangements: "married or civil partner" (from "married" and "civil partnership" categories); "single, never married" (retained as a one category); "separated, divorced, widowed" (from six original categories covering these statuses with respect to marriage or civil partnership); and "cohabiting" (from "living as a couple").
Educational attainment: This was derived from the highest level of educational attainment variable. This was recoded as: degree or higher, A-levels or equivalent; O-levels or equivalent; other educational qualifications; none. Because of high levels of missing data in 2010/11, data for this covariate was taken from 2013/14.
Equivalised household income: quintiles were calculated with weighted data: the UKHLS derived variable for gross household income in the month before interview (which includes imputed values) and the variable for the modified OECD equivalence scale.
Economic activity in past 7 days: The 11-category UKHLS variable *current economic activity* was recoded into four categories: "self-employed" and "paid employment (ft/pt)" were coded into "employed"; "unemployed", "retired" and full-time student" were retained as single categories; all other activities (including "on maternity leave", "family care or home" and "long-term sick or disabled") were coded as "other".
Area deprivation: Area deprivation data in the form of IMD quintiles was matched to the respondent data.
General health status: The 5-category UKHLS question on self-assessed general health, which was adapted from the SF1 questionnaire, was collapsed into a three-category variable: "excellent/very good/good", "fair", and "poor".

Life events and transitions
Chapter 6 of this report focuses on exploring the relationship between changing health behaviours and four main life transitions. These are:

- Changing relationship status
- Changing employment
- Changing income
- Adding children to the household.

These were created as follows.

Changing relationship status: The transitions were moving into or out of a relationship. Using our marital/cohabitation status variable, those who were single (never married) or single (separated/widowed/divorced) in 2010/11 and then married or cohabiting in 2013/4 were classed as

[23] The AMEs presented in Chapter 4 use fuller versions of these covariates as there were larger base sizes for these analyses.

having moved into a relationship; those who were married or cohabiting in 2010/11 and single (either never married, separated, widowed or divorced) in 2013/4 were classed as having moved out of a relationship.

Changing employment: calculated from the economic activity status variable at each wave, binary variables were created for key employment pathways: moved into employment (including part time and self-employment) from unemployment; moved into unemployment from full time, part time or self-employment; moved from full time education to employment (full time, part time or self-employment); moved from full time education to unemployment; moved from employment (full time, part time or self-employment) to retirement.

Changing income: The percentage increase or decrease in income was calculated from equivalised income at each wave. The small number of households (n=86) that recorded zero or negative equivalised income at either wave were excluded from the variable. An "increase or decrease" was classified as more than a 20% difference between waves, and differences less than this were classified as having stable household income between 2010/11 and 2013/14.

Adding children to the household: Those households where the number of children recorded in the household was zero at 2010/11 and was greater than 0 in 2013/14 were coded as "1 or more children added to household". This is deliberately termed "adding a child to the household" rather than "having children" as the data include those who may have added a child through adoption or through cohabiting with someone who already had a child.

Weighting

Analyses were adjusted for the complex survey design of the survey and all values presented in the tables are weighted. Weighting takes into account non-response and over-sampling to produce nationally representative results. The UKHLS 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 (Knies, 2017). Additionally, data on drinking behaviours was gathered by self-completion questionnaire; fewer respondents answered this than the UKHLS interviewer-led questionnaire and a separate self-completion weight was used for this analysis.

For objective 1, all analyses were conducted using the 2013/4 cross-sectional weights (main weight, e_indinub_xw, for smoking, fruit and vegetable consumption and physical activity; self-completion weight, e_indscub_xw, for drinking).

For objectives 2 and 3 (changing health behaviour over time), the following issues were considered:

- Whether use of the longitudinal weights was appropriate: it was agreed that these weights were not appropriate as these weights are for respondents present in all waves of data collection (not just 2010/11 and 2013/5, the focus of our study). Using these weights would have meant we would have lost cases, which was not optimum when we already had relatively small base sizes for some of our analysis;
- Whether we should use the design weight only: this would correct for unequal probability of selection at a number of levels and arguably control for the relevant covariates that effect non-response – but would not account for attrition between waves and therefore was not the preferred option;
- Whether to use the wave 5 cross-sectional weights: these adjust for sampling error and non-response; this is appropriate since people are only included in the analysis if they are present in wave 5, and we take into account non-response at wave 5. In this way, we treated the analysis as cross-sectional even though we are looking a behaviour change. As there is no specific non-response weight for those who responded specifically in 2010/11 and 2013/4, we determined that using the 2013/4 cross-sectional weight was the best option.

We explored the impact of using cross-sectional weights compared with the other options available for some key tables/regressions. Minimal differences in the results were found.

Appendix B: Summary of strengths and limitations of the analysis

The main strength of this project was its focus on a gap in longitudinal research on changing health behaviours among the general population, exploring the extent to which these behaviours are socially patterned and their relationship with key life transitions. A further strength is the use of the UKHLS as a large nationally representative survey. However it should be noted that the numbers available for our analysis were of modest size and power.

Like the majority of previous research on health behaviours, the analyses in this report rely on self-reporting of behaviours; these are generally less reliable than objective measures which are either not available for these health behaviours or require large resources to employ (Gorber et al, 2009). In addition, the responses were given to interviewers (except for alcohol intake) and 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 is given on the confidential self-completion questionnaire. In a previous project of parental health behaviours undertaken by the team, we compared responses to questions on alcohol consumption in the UKHLS and the HSE. We found that consumption in the UKHLS self-completed questionnaire was, on average, higher than the HSE interview-led responses suggesting that the UKHLS answers were possibly less subject to social desirability bias (Graham et al, 2016a et al, see also Graham et al 2016b;).[24]

A further limitation is that we only measure behaviour change at two specific time points – in 2010/11 and 2013/4. If people met recommendations at both time periods, they were classed as having stable health behaviours. However, this masks a variety of potential changes in the intervening period which is not captured in our analysis. The likelihood of this is minimised for F&V and PA, which ask about usual behaviour. Being a smoker is more tightly defined; the individual is asked whether they regularly smoke one or more cigarettes a day. Nonetheless, we acknowledge that people can have variable and transient smoking behaviours. The greatest potential fluctuation of behaviour between time points may be for alcohol consumption as our measures are based on alcohol consumed on the heaviest drinking day in the past 7 days. This may mask a range of other alcohol behaviour change in the intervening three years.

The same limitation applies to our measures of life transitions. We compare status at two time points only, which may conceal a range of other key events within the three year period. For example, someone may have been married in 2010/11, got divorced and remarried by 2013/4. In our exploratory analyses, these people would be classified as being stably married throughout. It is possible that using intervening waves of data from UKHLS could help to explore these patterns further. This was beyond this scope of this study as our aim was to produce the first exploratory analysis of the relationship between life transitions and health behaviours. Furthermore, the relative stasis in health behaviours and the low numbers of people experiencing each life transition within the three year time period means it is unlikely that sufficient number of people would have experienced these multiple and more complex transitions to allow analysis to be undertaken.

[24] A more detailed comparison of the HSE and UKHLS measures of alcohol consumption has been undertaken by NatCen to examine factors that may explain the higher levels of binge drinking in the UKHLS. See Connolly, 2016

Appendix C: Tables for Chapter 4 – prevalence and social patterning of individual risk behaviours in 2013/14

Table C1: Prevalence of cigarette smoking and average marginal effects of being a current cigarette smoker: Men						
	Unadjusted prevalence of cigarette smoking	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age*						
16-24	20	*2271*	*1704*	**Ref. 0.21**		
25-34	24	*2087*	*1537*	+0.03	-0.00	+0.07
35-44	20	*2339*	*2048*	+0.02	-0.02	+0.05
45-54	22	*2563*	*2267*	+0.01	-0.03	+0.05
55-64	18	*2262*	*1965*	-0.05	-0.08	-0.01
65+	10	*3316*	*2969*	-0.11	-0.15	-0.06
Educational attainment*						
Degree or higher	8	*3489*	*2954*	**Ref. 0.10**		
A-levels or equivalent	16	*2701*	*2214*	+0.06	+0.04	+0.08
O-levels or equivalent	24	*3266*	*2633*	+0.10	+0.08	+0.12
Other	23	*934*	*789*	+0.11	+0.08	+0.14
None	25	*3206*	*2754*	+0.14	+0.12	+0.17
Missing	N/A			+0.07	+0.04	+0.10
Employment*						
Paid employment	18	*7313*	*6014*	**Ref. 0.19**		
Self employed	18	*1606*	*1366*	+0.01	-0.02	+0.04
Unemployed	44	*804*	*649*	+0.09	+0.06	+0.13
Retired	10	*3375*	*3017*	-0.05	-0.08	-0.01
Looking after family/home	36	*107*	*97*	+0.05	-0.03	+0.13
Student	11	*1037*	*867*	-0.10	-0.13	-0.07
Long-term sick	46	*481*	*390*	+0.04	-0.01	+0.08
Other	31	*110*	*87*	+0.05	-0.04	+0.14
Ethnic group*						
White British	18	*12737*	*9996*	**Ref. 0.18**		
White other	22	*548*	*372*	+0.05	-0.00	+0.09
Mixed	21	*166*	*213*	+0.00	-0.05	+0.04
Indian	10	*370*	*478*	-0.07	-0.10	-0.03
Pakistani	18	*202*	*348*	-0.04	-0.08	-0.00
Bangladeshi	26	*81*	*218*	+0.01	-0.06	+0.08
Black Caribbean	26	*107*	*191*	-0.02	-0.06	+0.03
Black African	11	*175*	*240*	-0.07	-0.11	-0.03
Other	12	*259*	*309*	-0.06	-0.10	-0.01
Missing	N/A			+0.06	-0.02	+0.14
Marital and cohabitation status*						
Married, civil partner	23	*4066*	*2874*	**Ref. 0.14**		
Single: never married	12	*7845*	*6953*	+0.07	+0.05	+0.09
Single: widowed, divorced, separated	25	*1309*	*1157*	+0.10	+0.07	+0.12

Cohabiting	29	*1584*	*1482*	+0.09	+0.06	+0.11
Area deprivation*						
Lowest quintile (least deprived)	12	*3007*	*2515*	**Ref. 0.16**		
2nd	13	*3046*	*2486*	-0.01	-0.03	+0.01
3rd	17	*3039*	*2512*	+0.02	-0.00	+0.04
4th	22	*2859*	*2341*	+0.03	+0.01	+0.06
Highest quintile (most deprived)	31	*2474*	*2249*	+0.07	+0.04	+0.10
Missing	N/A			+0.02	-0.03	+0.06
General health*						
Excellent	9	*3489*	*2954*	**Ref. 0.09**		
Very good	15	*2701*	*2214*	+0.07	+0.05	+0.08
Good	21	*3266*	*2633*	+0.11	+0.09	+0.13
Fair	25	*934*	*789*	+0.15	+0.12	+0.17
Poor	34	*3206*	*2754*	+0.19	+0.14	+0.23
Equivalised household income quintile*						
Highest	11	*3535*	*2962*	**Ref. 0.15**		
2nd	16	*3401*	*2822*	+0.03	+0.00	+0.05
3rd	20	*3056*	*2535*	+0.04	+0.02	+0.06
4th	23	*2252*	*2207*	+0.06	+0.03	+0.09
Lowest	26	*2592*	*1964*	+0.07	+0.04	+0.09

*Denotes variable significant in the regression model; P<0.05

Table C2: Prevalence of cigarette smoking and average marginal effects of being a current cigarette smoker: Women						
	Unadjusted prevalence of cigarette smoking	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age*						
16-24	17	*1931*	*1849*	**Ref. 0.18**		
25-34	22	*2310*	*2132*	+0.03	-0.00	+0.06
35-44	19	*2507*	*2683*	+0.03	-0.00	+0.06
45-54	19	*2858*	*2893*	+0.01	-0.02	+0.04
55-64	15	*2348*	*2371*	-0.04	-0.07	-0.00
65+	9	*3798*	*3433*	-0.10	-0.14	-0.06
Educational attainment*						
Degree or higher	7	*3311*	*3336*	**Ref. 0.08**		
A-levels or equivalent	13	*3279*	*3266*	+0.05	+0.04	+0.07
O-levels or equivalent	22	*3325*	*3182*	+0.10	+0.09	+0.12
Other	19	*944*	*890*	+0.10	+0.07	+0.13
None	22	*3396*	*3220*	+0.15	+0.12	+0.17
Missing	N/A			+0.08	+0.05	+0.10
Employment*						
Paid employment	17	*7276*	*7111*	**Ref. 0.17**		
Self employed	13	*784*	*775*	-0.01	-0.04	+0.02
Unemployed	37	*579*	*557*	+0.06	0.02	+0.10
Retired	9	*4154*	*3819*	-0.05	-0.08	-0.02
Looking after family/home	24	*1278*	*1427*	+0.02	-0.01	0.04
Student	8	*950*	*968*	-0.11	-0.13	-0.08
Long-term sick	38	*477*	*451*	+0.04	+0.00	+0.08
Other	22	*100*	*104*	-0.02	-0.07	+0.03
Ethnic group*						
White British	17	*13522*	*12143*	**Ref. 0.17**		
White other	16	*678*	*523*	+0.02	-0.02	+0.06
Mixed	19	*205*	*312*	-0.02	-0.06	+0.03
Indian	3	*311*	*510*	-0.14	-0.16	-0.13
Pakistani	4	*191*	*410*	-0.15	-0.16	-0.13
Bangladeshi	6	*75*	*276*	-0.14	-0.16	-0.11
Black Caribbean	19	*159*	*337*	-0.05	-0.08	-0.01
Black African	4	*202*	*335*	-0.14	-0.16	-0.12
Other	10	*263*	*388*	-0.08	-0.11	-0.04
Missing	N/A			-0.05	-0.11	+0.01
Marital and cohabitation status*						
Married, civil partner	11	*7551*	*7690*	**Ref. 0.12**		
Single: never married	21	*3501*	*3092*	+0.08	+0.06	+0.10
Single: widowed, divorced, separated	19	*3080*	*2865*	+0.07	+0.05	+0.09
Cohabiting	27	*1584*	*1679*	+0.09	+0.07	+0.11
Area deprivation*						
Lowest quintile (least deprived)	9	*3153*	*2980*	**Ref. 0.12**		

2nd	12	*3226*	*3042*	+0.02	-0.00	+0.04
3rd	15	*3244*	*3061*	+0.04	+0.02	+0.06
4th	21	*2961*	*2883*	+0.06	+0.04	+0.08
Highest quintile (most deprived)	26	*2703*	*2900*	+0.08	+0.05	+0.10
Missing	N/A			+0.06	+0.02	+0.10
General health*						
Excellent	9	*3311*	*3336*	**Ref. 0.11**		
Very good	14	*3279*	*3266*	+0.03	+0.02	+0.05
Good	18	*3325*	*3182*	+0.07	+0.05	+0.09
Fair	21	*944*	*890*	+0.08	+0.06	+0.11
Poor	25	*3396*	*3220*	+0.10	+0.06	+0.13
Equivalised household income quintile*						
Highest	9	*3245*	*3196*	**Ref. 0.12**		
2nd	13	*3274*	*3201*	+0.02	-0.00	+0.04
3rd	17	*3277*	*3176*	+0.04	+0.02	+0.06
4th	21	*3143*	*3046*	+0.06	+0.04	+0.09
Lowest	22	*2813*	*2742*	+0.07	+0.05	+0.09

*Denotes variable significant in the regression model; P<0.05

Table C3: Prevalence of binge drinking and average marginal effects of being a binge drinker: Men						
	Unadjusted prevalence of binge drinking	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age*						
16-24	30	*1944*	*1506*	**Ref. 0.31**		
25-34	34	*1840*	*1391*	+0.02	-0.03	+0.07
35-44	32	*2093*	*1821*	+0.01	-0.04	+0.06
45-54	32	*2235*	*1996*	-0.01	-0.06	+0.04
55-64	28	*2028*	*1757*	-0.03	-0.08	+0.02
65+	16	*2985*	*2508*	-0.13	-0.19	-0.08
Educational attainment						
Degree or higher	30	*3142*	*2670*	**Ref. 0.28**		
A-levels or equivalent	31	*2378*	*1994*	+0.01	-0.01	+0.04
O-levels or equivalent	30	*2885*	*2345*	+0.01	-0.02	+0.03
Other	26	*831*	*678*	+0.00	-0.05	+0.04
None	20	*2785*	*2263*	-0.03	-0.06	-0.00
Missing	N/A			+0.00	-0.03	+0.04
Employment*						
Paid employment	33	*6442*	*5438*	**Ref. 0.29**		
Self employed	31	*1380*	*1191*	+0.01	-0.03	+0.04
Unemployed	25	*722*	*543*	-0.04	-0.08	+0.01
Retired	17	*3056*	*2573*	-0.02	-0.06	+0.03
Looking after family/home	21	*97*	*84*	-0.08	-0.17	+0.02
Student	26	*914*	*761*	-0.04	-0.09	+0.01
Long-term sick	14	*413*	*311*	-0.11	-0.17	-0.05
Other	28	*99*	*75*	-0.02	-0.13	+0.10
Ethnic group*						
White British	30	*11276*	*8971*	**Ref. 0.30**		
White other	22	*487*	*325*	-0.09	-0.15	-0.04
Mixed	18	*151*	*184*	-0.13	-0.21	-0.06
Indian	10	*325*	*382*	-0.21	-0.24	-0.17
Pakistani	2	*180*	*257*	-0.28	-0.30	-0.26
Bangladeshi	3	*78*	*154*	-0.27	-0.31	-0.23
Black Caribbean	12	*90*	*157*	-0.17	-0.23	-0.10
Black African	5	*164*	*199*	-0.25	-0.28	-0.22
Other	12	*222*	*250*	-0.19	-0.23	-0.15
Missing	N/A			+0.02	-0.08	+0.11
Marital and cohabitation status						
Married, civil partner	26	*6977*	*6069*	**Ref. 0.27**		
Single: never married	29	*3546*	*2549*	+0.01	-0.02	+0.04
Single: widowed, divorced, separated	21	*1193*	*997*	+0.00	-0.03	+0.04
Cohabiting	35	*1377*	*1342*	+0.04	+0.01	+0.07
Area deprivation						
Lowest quintile (least deprived)	28	*2594*	*2264*	**Ref. 0.26**		

2nd	31	*2708*	*2236*	+0.03	+0.01	+0.06
3rd	28	*2705*	*2245*	+0.02	-0.01	+0.04
4th	25	*2535*	*2042*	+0.00	-0.03	+0.03
Highest quintile (most deprived)	24	*2221*	*1843*	+0.02	-0.02	+0.05
Missing	N/A			+0.00	-0.06	+0.05
General health*						
Excellent	30	*2185*	*1827*	**Ref. 0.27**		
Very good	30	*4588*	*3864*	+0.01	-0.02	+0.03
Good	29	*3848*	*3264*	+0.02	-0.00	+0.05
Fair	22	*1802*	*1470*	-0.01	-0.05	+0.02
Poor	15	*702*	*554*	-0.05	-0.10	-0.00
Equivalised household income quintile*						
Highest	36	*3113*	*2713*	**Ref. 0.32**		
2nd	31	*2957*	*2534*	-0.03	-0.06	-0.01
3rd	23	*2721*	*2228*	-0.09	-0.12	-0.06
4th	23	*2293*	*1876*	-0.07	-0.10	-0.04
Lowest	21	*2041*	*1628*	-0.08	-0.11	-0.04

*Denotes variable significant in the regression model; P<0.05

Table C4: Prevalence of binge drinking and average marginal effects of being a binge drinker: women						
	Unadjusted prevalence of binge drinking	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweigh-ted			
	%	*n*	*n*			
Age*						
16-24	29	*1738*	*1666*	**Ref. 0.29**		
25-34	24	*2062*	*1938*	-0.05	-0.09	-0.01
35-44	26	*2254*	*2428*	-0.03	-0.07	+0.01
45-54	24	*2500*	*2581*	-0.06	-0.10	-0.02
55-64	18	*2065*	*2144*	-0.11	-0.15	-0.06
65+	7	*3185*	*2834*	-0.20	-0.25	-0.16
Educational attainment						
Degree or higher	24	*2939*	*3058*	**Ref. 0.19**		
A-levels or equivalent	24	*2922*	*2969*	+0.02	0.00	+0.04
O-levels or equivalent	23	*2993*	*2885*	+0.02	-0.01	+0.04
Other	16	*826*	*773*	+0.00	-0.04	+0.03
None	12	*2841*	*2589*	-0.01	-0.03	+0.02
Missing	N/A			+0.02	-0.01	+0.05
Employment*						
Paid employment	27	*6397*	*6518*	**Ref. 0.22**		
Self employed	28	*704*	*728*	+0.03	+0.00	+0.06
Unemployed	19	*526*	*473*	-0.04	-0.08	+0.00
Retired	9	*3535*	*3215*	-0.02	-0.06	+0.01
Looking after family/home	15	*1139*	*1172*	-0.07	-0.09	-0.04
Student	26	*874*	*877*	-0.05	-0.09	-0.02
Long-term sick	13	*406*	*384*	-0.04	-0.09	0.02
Other	21	*86*	*90*	-0.07	-0.12	-0.03
Ethnic group*						
White British	21	*11885*	*10984*	**Ref. 0.22**		
White other	20	*599*	*468*	-0.03	-0.07	+0.01
Mixed	20	*191*	*284*	-0.05	-0.11	-0.00
Indian	4	*267*	*403*	-0.18	-0.20	-0.15
Pakistani	1	*162*	*309*	-0.21	-0.23	-0.19
Bangladeshi	1	*62*	*178*	-0.21	-0.23	-0.19
Black Caribbean	13	*130*	*281*	-0.10	-0.14	-0.06
Black African	6	*179*	*273*	-0.16	-0.19	-0.13
Other	7	*214*	*310*	-0.16	-0.19	-0.12
Missing				-0.02	-0.09	0.06
Marital and cohabitation status						
Married, civil partner	19	*6606*	*6791*	**Ref. 0.20**		
Single: never married	26	*3117*	*2775*	+0.03	+0.00	+0.05
Single: widowed, divorced	13	*2645*	*2451*	+0.00	-0.02	+0.02
Cohabiting	24	*1404*	*1541*	+0.00	-0.02	+0.02
Area deprivation*						

Lowest quintile (least deprived)	23	*2764*	*2722*	**Ref. 0.21**		
2nd	21	*2843*	*2762*	-0.01	-0.03	+0.01
3rd	21	*2847*	*2748*	-0.01	-0.03	+0.02
4th	20	*2596*	*2528*	+0.00	-0.02	+0.02
Highest quintile (most deprived)	16	*2357*	*2397*	-0.03	-0.06	-0.01
Missing				0.04	-0.01	0.09
General health*						
Excellent	26	*2175*	*2178*	**Ref. 0.22**		
Very good	23	*4830*	*4804*	-0.01	-0.03	+0.01
Good	19	*4045*	*3983*	-0.01	-0.04	+0.01
Fair	15	*1919*	*1849*	-0.03	-0.06	-0.01
Poor	8	*832*	*774*	-0.11	-0.14	-0.07
Equivalised household income quintile*						
Highest	29	*2854*	*2945*	**Ref. 0.25**		
2nd	22	*2846*	*2894*	-0.04	-0.07	-0.02
3rd	18	*2898*	*2824*	-0.06	-0.09	-0.04
4th	16	*2795*	*2647*	-0.06	-0.08	-0.03
Lowest	15	*2412*	*2281*	-0.06	-0.09	-0.03

*Denotes variable significant in the regression model; P<0.05

Table C5: Prevalence of not meeting F&V recommendations and average marginal effects of not meeting F&V recommendations: Men						
	Unadjusted prevalence of not meeting F&V recommendations	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age*						
16-24	89	*2266*	*1699*	**Ref. 0.88**		
25-34	87	*2083*	*1535*	+0.00	-0.03	+0.03
35-44	82	*2335*	*2043*	-0.04	-0.08	-0.01
45-54	83	*2554*	*2259*	-0.04	-0.08	-0.01
55-64	78	*2255*	*1958*	-0.10	-0.14	-0.07
65+	76	*3303*	*2959*	-0.13	-0.18	-0.09
Educational attainment*						
Degree or higher	73	*3480*	*2945*	**Ref. 0.74**		
A-levels or equivalent	84	*2697*	*2209*	+0.08	+0.05	+0.11
O-levels or equivalent	86	*3255*	*2625*	+0.10	+0.07	+0.12
Other	84	*931*	*787*	+0.10	+0.07	+0.13
None	85	*3195*	*2743*	+0.13	+0.10	+0.15
Missing				+0.09	+0.06	+0.12
Employment						
Paid employment	82	*7300*	*6000*	**Ref. 0.82**		
Self employed	81	*1598*	*1358*	+0.00	-0.03	+0.02
Unemployed	92	*803*	*648*	+0.06	+0.02	+0.09
Retired	76	*3359*	*3005*	-0.02	-0.06	+0.01
Looking after family/home	82	*107*	*97*	-0.05	-0.15	+0.06
Student	89	*1036*	*866*	+0.00	-0.04	+0.05
Long-term sick	88	*481*	*389*	-0.01	-0.06	+0.05
Other	89	*110*	*87*	+0.05	-0.02	+0.11
Ethnic group*						
White British	81	*12706*	*9973*	**Ref. 0.81**		
White other	80	*548*	*372*	+0.00	-0.05	+0.04
Mixed	85	*166*	*213*	+0.00	-0.06	+0.07
Indian	87	*368*	*474*	+0.06	+0.02	+0.09
Pakistani	93	*200*	*344*	+0.10	+0.06	+0.14
Bangladeshi	93	*80*	*217*	+0.09	+0.01	+0.17
Black Caribbean	89	*107*	*190*	+0.05	-0.01	+0.10
Black African	89	*174*	*239*	+0.07	+0.01	+0.12
Other	84	*256*	*306*	+0.02	-0.03	+0.08
Missing				+0.01	-0.07	+0.09
Marital and cohabitation status						
Married, civil partner	78	*7819*	*6930*	**Ref. 0.81**		
Single: never married	88	*4061*	*2868*	+0.02	-0.00	+0.05
Single: widowed, divorced, separated	82	*1305*	*1154*	+0.03	+0.00	+0.05
Cohabiting	84	*1579*	*1477*	+0.01	-0.01	+0.04
Area deprivation						

Lowest quintile (least deprived)	79	*3002*	*2511*	**Ref. 0.82**		
2nd	80	*3041*	*2482*	+0.00	-0.03	+0.02
3rd	82	*3027*	*2500*	+0.00	-0.02	+0.02
4th	83	*2849*	*2334*	-0.01	-0.04	+0.01
Highest quintile (most deprived)	87	*2467*	*2239*	+0.01	-0.02	+0.04
Missing				+0.01	-0.04	+0.05
General health*						
Excellent	77	*2481*	*2035*	**Ref. 0.76**		
Very good	80	*5149*	*4291*	+0.04	+0.02	+0.07
Good	84	*4332*	*3707*	+0.08	+0.05	+0.10
Fair	86	*2017*	*1723*	+0.10	+0.08	+0.13
Poor	86	*818*	*697*	+0.10	+0.06	+0.14
Equivalised household income quintile						
Highest	78	*3531*	*2958*	**Ref. 0.81**		
2nd	81	*3393*	*2814*	+0.01	-0.01	+0.03
3rd	84	*3048*	*2528*	+0.02	-0.01	+0.04
4th	84	*2580*	*2196*	+0.02	-0.01	+0.04
Lowest	85	*2245*	*1957*	+0.02	-0.01	+0.05

*Denotes variable significant in the regression; P<0.05

Table C6: Prevalence of not meeting F&V recommendations and average marginal effects of not meeting F&V recommendations: women						
	Unadjusted prevalence of not meeting F&V recommendations	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age*						
16-24	88	*1932*	*1850*	**Ref. 0.89**		
25-34	81	*2304*	*2127*	-0.06	-0.09	-0.03
35-44	75	*2505*	*2679*	-0.12	-0.15	-0.09
45-54	73	*2856*	*2890*	-0.16	-0.19	-0.12
55-64	68	*2344*	*2367*	-0.22	-0.25	-0.18
65+	69	*3783*	*3421*	-0.23	-0.28	-0.19
Educational attainment*						
Degree or higher	65	*3306*	*3331*	**Ref. 0.66**		
A-levels or equivalent	73	*3279*	*3265*	+0.05	+0.02	+0.07
O-levels or equivalent	80	*3321*	*3177*	+0.11	+0.08	+0.13
Other	78	*942*	*889*	+0.13	+0.10	+0.17
None	79	*3382*	*3206*	+0.15	+0.12	+0.17
Missing	N/A			+0.11	+0.07	+0.14
Employment*						
Paid employment	74	*7267*	*7100*	**Ref. 0.76**		
Self employed	66	*783*	*774*	-0.04	-0.07	-0.01
Unemployed	88	*579*	*557*	+0.05	+0.01	+0.10
Retired	69	*4137*	*3805*	-0.03	-0.06	-0.00
Looking after family/home	79	*1279*	*1428*	-0.02	-0.05	+0.01
Student	86	*951*	*969*	-0.04	-0.10	+0.02
Long-term sick	86	*475*	*448*	+0.04	-0.01	+0.09
Other	78	*100*	*104*	+0.02	-0.04	+0.08
Ethnic group*						
White British	74	*13502*	*12128*	**Ref. 0.74**		
White other	69	*678*	*523*	-0.02	-0.06	+0.02
Mixed	80	*205*	*311*	+0.02	-0.04	+0.08
Indian	86	*310*	*507*	+0.10	+0.06	+0.15
Pakistani	91	*191*	*409*	+0.13	+0.08	+0.18
Bangladeshi	91	*74*	*274*	+0.11	+0.05	+0.17
Black Caribbean	83	*158*	*336*	+0.06	+0.01	+0.11
Black African	87	*200*	*333*	+0.11	+0.06	+0.16
Other	76	*261*	*386*	+0.01	-0.04	+0.07
Missing				-0.05	-0.15	+0.05
Marital and cohabitation status*						
Married, civil partner	70	*7542*	*7679*	**Ref. 0.73**		
Single: never married	83	*3497*	*3087*	+0.03	-0.00	+0.05
Single: widowed, divorced, separated	75	*3070*	*2857*	+0.03	+0.01	+0.06
Cohabiting	78	*1581*	*1676*	+0.02	-0.00	+0.05
Area deprivation						

Lowest quintile (least deprived)	70	*3152*	*2979*	**Ref. 0.75**		
2nd	71	*3222*	*3040*	-0.01	-0.03	+0.02
3rd	74	*3233*	*3051*	+0.00	-0.02	+0.03
4th	76	*2955*	*2878*	-0.01	-0.04	+0.01
Highest quintile (most deprived)	83	*2699*	*2892*	+0.02	-0.00	+0.05
Missing				-0.02	-0.07	+0.02
General health*						
Excellent	66	*2405*	*2359*	**Ref. 0.66**		
Very good	73	*5441*	*5286*	+0.07	+0.04	+0.09
Good	78	*4596*	*4509*	+0.11	+0.08	+0.13
Fair	79	*2277*	*2219*	+0.12	+0.09	+0.15
Poor	82	*1002*	*957*	+0.14	+0.11	+0.18
Equivalised household income quintile*						
Highest	67	*3241*	*3192*	**Ref. 0.72**		
2nd	73	*3268*	*3195*	+0.02	-0.00	+0.05
3rd	76	*3276*	*3174*	+0.04	+0.01	+0.06
4th	78	*3136*	*3039*	+0.04	+0.02	+0.07
Lowest	80	*2803*	*2734*	+0.06	+0.03	+0.08

*Denotes variable significant in the regressionRegression model; P<0.05

Table C7: Prevalence of not meeting PA recommendations and average marginal effects of not meeting PA recommendations: Men						
	Unadjusted prevalence of not meeting PA recommendations	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age*						
16-24	52	*2251*	*1694*	**Ref. 0.61**		
25-34	60	*2081*	*1533*	+0.03	-0.02	+0.08
35-44	67	*2332*	*2041*	+0.07	+0.02	+0.12
45-54	73	*2557*	*2261*	+0.11	+0.06	+0.16
55-64	78	*2254*	*1958*	+0.14	+0.09	+0.19
65+	83	*3307*	*2961*	+0.19	+0.13	+0.24
Educational attainment*						
Degree or higher	64	*3475*	*2944*	**Ref. 0.67**		
A-levels or equivalent	62	*2694*	*2209*	+0.01	-0.02	+0.04
O-levels or equivalent	67	*3248*	*2621*	+0.03	+0.01	+0.06
Other	79	*933*	*788*	+0.07	+0.03	+0.11
None	82	*3195*	*2744*	+0.08	+0.05	+0.11
Missing	N/A			+0.04	+0.01	+0.08
Employment						
Paid employment	66	*7296*	*6000*	**Ref. 0.71**		
Self employed	71	*1600*	*1360*	+0.01	-0.02	+0.03
Unemployed	72	*799*	*646*	+0.02	-0.02	+0.06
Retired	83	*3366*	*3008*	-0.03	-0.07	+0.02
Looking after family/home	66	*103*	*95*	-0.10	-0.20	+0.01
Student	49	*1027*	*861*	-0.04	-0.08	+0.01
Long-term sick	88	*478*	*388*	+0.03	-0.04	+0.11
Other	62	*110*	*87*	-0.04	-0.16	+0.07
Ethnic group*						
White British	70	*12701*	*9972*	**Ref. 0.70**		
White other	70	*547*	*371*	+0.00	-0.05	+0.06
Mixed	53	*166*	*212*	-0.09	-0.17	-0.01
Indian	73	*368*	*475*	+0.07	+0.02	+0.11
Pakistani	76	*198*	*344*	+0.09	+0.04	+0.14
Bangladeshi	71	*81*	*218*	+0.03	-0.04	+0.10
Black Caribbean	68	*107*	*190*	-0.02	-0.10	+0.05
Black African	66	*175*	*240*	+0.06	+0.00	+0.12
Other	69	*259*	*309*	+0.03	-0.02	+0.09
Missing	N/A			+0.05	-0.02	+0.13
Marital and cohabitation status						
Married, civil partner	75	*7822*	*6930*	**Ref. 0.67**		
Single: never married	59	*4040*	*2860*	-0.05	-0.08	-0.02
Single: widowed, divorced, separated	81	*1307*	*1156*	-0.01	-0.04	+0.02
Cohabiting	68	*1581*	*1479*	-0.02	-0.05	+0.01
Area deprivation						

Lowest quintile (least deprived)	68	*2996*	*2506*	**Ref. 0.70**		
2nd	70	*3039*	*2481*	+0.01	-0.02	+0.03
3rd	71	*3023*	*2501*	+0.01	-0.01	+0.04
4th	71	*2843*	*2329*	+0.01	-0.02	+0.04
Highest quintile (most deprived)	71	*2471*	*2245*	-0.01	-0.04	+0.02
Missing	N/A			-0.03	-0.08	+0.03
General health*						
Excellent	52	*2473*	*2029*	**Ref. 0.58**		
Very good	66	*5143*	*4289*	+0.10	+0.07	+0.13
Good	75	*4336*	*3713*	+0.16	+0.13	+0.19
Fair	84	*2016*	*1722*	+0.22	+0.19	+0.26
Poor	94	*813*	*695*	+0.33	+0.28	+0.37
Equivalised household income quintile*						
Highest	64	*3520*	*2952*	**Ref. 0.69**		
2nd	66	*3393*	*2816*	-0.01	-0.04	+0.01
3rd	73	*3050*	*2530*	+0.03	-0.00	+0.06
4th	74	*2581*	*2201*	+0.02	-0.01	+0.05
Lowest	77	*2237*	*1949*	+0.05	+0.02	+0.08

*Denotes variable significant in the regression model; P<0.05

Table C8: Prevalence of not meeting PA recommendations and average marginal effects of not meeting PA recommendations: women						
	Unadjusted prevalence of not meeting PA recommendations	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweigh-ted			
	%	*n*	*n*			
Age*						
16-24	69	*1922*	*1841*	**Ref. 0.76**		
25-34	73	*2305*	*2124*	-0.01	-0.05	+0.03
35-44	73	*2505*	*2679*	-0.03	-0.06	+0.01
45-54	75	*2852*	*2887*	-0.02	-0.06	+0.02
55-64	81	*2344*	*2367*	+0.04	-0.00	+0.08
65+	89	*3783*	*3420*	+0.11	+0.07	+0.16
Educational attainment*						
Degree or higher	70	*3308*	*3334*	**Ref. 0.76**		
A-levels or equivalent	73	*3272*	*3257*	+0.00	-0.02	+0.02
O-levels or equivalent	78	*3314*	*3172*	+0.03	+0.01	+0.05
Other	83	*944*	*888*	+0.04	+0.00	+0.07
None	88	*3382*	*3205*	+0.05	+0.03	+0.08
Missing	N/A			+0.04	+0.02	+0.07
Employment*						
Paid employment	73	*7260*	*7092*	**Ref. 0.78**		
Self employed	72	*783*	*774*	-0.01	-0.04	+0.02
Unemployed	80	*578*	*556*	+0.02	-0.02	+0.06
Retired	88	*4140*	*3807*	-0.02	-0.06	+0.01
Looking after family/home	87	*152*	*147*	+0.00	-0.03	+0.03
Student	79	*1274*	*1423*	-0.02	-0.06	+0.01
Long-term sick	66	*946*	*965*	+0.12	+0.08	+0.16
Other	96	*476*	*449*	+0.10	+0.06	+0.14
Ethnic group*						
White British	78	*13491*	*12116*	**Ref. 0.78**		
White other	71	*678*	*523*	-0.04	-0.08	+0.00
Mixed	76	*205*	*311*	+0.02	-0.03	+0.07
Indian	81	*311*	*510*	+0.04	+0.01	+0.08
Pakistani	85	*188*	*405*	+0.06	+0.02	+0.11
Bangladeshi	87	*75*	*276*	+0.09	+0.04	+0.14
Black Caribbean	79	*159*	*336*	+0.01	-0.04	+0.06
Black African	82	*202*	*335*	+0.07	+0.02	+0.11
Other	81	*263*	*388*	+0.05	+0.01	+0.09
Missing	N/A			-0.06	-0.14	+0.02
Marital and cohabitation status*						
Married, civil partner	79	*7530*	*7668*	**Ref. 0.79**		
Single: never married	71	*3490*	*3082*	-0.04	-0.07	-0.02
Single: widowed, divorced, separated	86	*3075*	*2861*	-0.01	-0.03	+0.01
Cohabiting	77	*1580*	*1672*	+0.00	-0.02	+0.03

Area deprivation						
Lowest quintile (least deprived)	76	*3152*	*2979*	**Ref. 0.78**		
2nd	76	*3215*	*3033*	-0.01	-0.03	+0.01
3rd	78	*3234*	*3053*	+0.00	-0.02	+0.02
4th	79	*2954*	*2874*	+0.00	-0.02	+0.02
Highest quintile (most deprived)	82	*2694*	*2886*	+0.01	-0.01	+0.03
Missing	N/A			-0.05	-0.09	-0.00
General health*						
Excellent	64	*2401*	*2354*	**Ref. 0.69**		
Very good	74	*5432*	*5278*	+0.07	+0.05	+0.09
Good	82	*4589*	*4501*	+0.12	+0.10	+0.15
Fair	89	*2279*	*2221*	+0.17	+0.14	+0.20
Poor	95	*1007*	*961*	+0.22	+0.19	+0.26
Equivalised household income quintile*						
Highest	69	*3236*	*3189*	**Ref. 0.75**		
2nd	76	*3272*	*3197*	+0.03	+0.01	+0.05
3rd	79	*3271*	*3168*	+0.04	+0.02	+0.06
4th	84	*3133*	*3036*	+0.06	+0.04	+0.09
Lowest	84	*2798*	*2728*	+0.05	+0.03	+0.08

*Denotes variable significant in the regression model; P<0.05

Tables for Chapter 4 – Odds ratios for social patterning of individual risk behaviours in 2013/14

Table C9: Odds of being a current cigarette smoker: Men			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age*			
16-24	**1**		
25-34	1.25	0.97	1.61
35-44	1.12	0.86	1.45
45-54	1.08	0.83	1.40
55-64	0.70	0.53	0.93
65+	0.37	0.25	0.56
Educational attainment*			
Degree or higher	**1**		
A-levels or equivalent	1.82	1.48	2.23
O-levels or equivalent	2.48	2.04	3.00
Other	2.60	2.01	3.37
None	3.28	2.69	4.01
Missing	1.95	1.52	2.51
Employment*			
Paid employment	**1**		
Self employed	1.07	0.88	1.29
Unemployed	1.83	1.47	2.28
Retired	0.69	0.51	0.95
Looking after family/home	1.41	0.85	2.34
Student	0.39	0.28	0.55
Long-term sick	1.29	0.97	1.73
Other	1.39	0.78	2.46
Ethnic group*			
White British	**1**		
White other	1.39	1.00	1.93
Mixed	0.96	0.65	1.42
Indian	0.55	0.37	0.80
Pakistani	0.70	0.48	1.01
Bangladeshi	1.06	0.63	1.79
Black Caribbean	0.88	0.59	1.30
Black African	0.53	0.33	0.85
Other	0.59	0.38	0.93
Missing	1.51	0.89	2.56
Marital status*			
Married, civil partner	**1**		
Single: never married	1.74	1.46	2.07
Single: widowed, divorced	2.06	1.72	2.48
Cohabiting	1.94	1.64	2.29
Area deprivation*			
Lowest quintile (least deprived)	**1**		
2nd	0.90	0.74	1.10

3rd	1.17	0.97	1.42
4th	1.29	1.06	1.57
Highest quintile (most deprived)	1.66	1.36	2.03
Missing	1.14	0.81	1.61
General health*			
Excellent	**1**		
Very good	1.94	1.58	2.38
Good	2.82	2.30	3.45
Fair	3.46	2.74	4.37
Poor	4.43	3.29	5.95
Equivalised household income quintile*			
Highest	**1**		
2nd	1.25	1.04	1.51
3rd	1.37	1.13	1.67
4th	1.61	1.32	1.98
Lowest	1.69	1.37	2.08

*Denotes variable significant in the regression model; P<0.05

Table C10: Odds of being a current cigarette smoker: women			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age*			
16-24	**1**		
25-34	1.25	0.99	1.57
35-44	1.22	0.96	1.55
45-54	1.05	0.83	1.33
55-64	0.74	0.56	0.97
65+	0.37	0.26	0.54
Educational attainment*			
Degree or higher	**1**		
A-levels or equivalent	1.86	1.52	2.26
O-levels or equivalent	2.81	2.32	3.40
Other	2.70	2.08	3.50
None	3.75	3.06	4.61
Missing	2.28	1.78	2.92
Employment*			
Paid employment	**1**		
Self employed	0.93	0.72	1.18
Unemployed	1.50	1.17	1.92
Retired	0.63	0.48	0.83
Looking after family/home	1.14	0.94	1.38
Student	0.31	0.22	0.44
Long-term sick	1.34	1.03	1.75
Other	0.87	0.58	1.30
Ethnic group*			
White British	**1**		
White other	1.14	0.84	1.54
Mixed	0.86	0.58	1.28
Indian	0.11	0.06	0.20
Pakistani	0.11	0.06	0.21
Bangladeshi	0.15	0.08	0.28
Black Caribbean	0.65	0.45	0.93
Black African	0.14	0.08	0.27
Other	0.45	0.29	0.70
Missing	0.62	0.32	1.20
Marital status*			
Married, civil partner	**1**		
Single: never married	1.95	1.64	2.31
Single: widowed, divorced, separated	1.90	1.62	2.21
Cohabiting	2.14	1.83	2.51
Area deprivation*			
Lowest quintile (least deprived)	**1**		
2nd	1.21	1.00	1.46
3rd	1.43	1.18	1.72
4th	1.75	1.45	2.12
Highest quintile (most deprived)	1.95	1.60	2.37

Missing	1.72	1.25	2.38
General health*			
Excellent	**1**		
Very good	1.42	1.18	1.72
Good	1.85	1.53	2.25
Fair	2.14	1.72	2.67
Poor	2.32	1.77	3.04
Equivalised household income quintile*			
Highest	**1**		
2nd	1.18	0.97	1.43
3rd	1.46	1.21	1.77
4th	1.77	1.45	2.15
Lowest	1.81	1.48	2.22

*Denotes variable significant in the regression model; P<0.05

Table C11 Odds of being a binge drinker: Men			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	1.09	0.86	1.40
35-44	1.04	0.81	1.33
45-54	0.95	0.75	1.22
55-64	0.85	0.66	1.10
65+	0.46	0.33	0.64
Educational attainment			
Degree or higher	**1**		
A-levels or equivalent	1.08	0.93	1.26
O-levels or equivalent	1.04	0.90	1.20
Other	0.98	0.78	1.22
None	0.85	0.72	1.00
Missing	1.02	0.85	1.24
Employment*			
Paid employment	**1**		
Self employed	1.03	0.88	1.20
Unemployed	0.81	0.63	1.04
Retired	0.92	0.73	1.15
Looking after family/home	0.64	0.35	1.18
Student	0.80	0.62	1.04
Long-term sick	0.51	0.34	0.79
Other	0.92	0.50	1.68
Ethnic group**			
White British	**1**		
White other	0.60	0.43	0.84
Mixed	0.45	0.25	0.79
Indian	0.23	0.16	0.33
Pakistani	0.03	0.01	0.11
Bangladeshi	0.06	0.01	0.25
Black Caribbean	0.35	0.20	0.59
Black African	0.11	0.06	0.20
Other	0.28	0.19	0.42
Missing	1.08	0.68	1.71
Marital status			
Married, civil partner	**1**		
Single: never married	1.08	0.92	1.27
Single: widowed, divorced, separated	1.01	0.85	1.21
Cohabiting	1.21	1.05	1.41
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	1.20	1.04	1.39
3rd	1.09	0.94	1.26
4th	1.01	0.86	1.19
Highest quintile (most deprived)	1.09	0.91	1.30

Missing	0.97	0.73	1.29
General health*			
Excellent	**1**		
Very good	1.03	0.90	1.19
Good	1.14	0.98	1.32
Fair	0.94	0.78	1.13
Poor	0.74	0.55	1.01
Equivalised household income quintile**			
Highest	**1**		
2nd	0.84	0.74	0.96
3rd	0.63	0.54	0.73
4th	0.69	0.59	0.82
Lowest	0.67	0.55	0.81

*Denotes variable significant in the regression model; P<0.05

**P<0.01

Table C12: Odds of being a binge drinker: women			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.76	0.61	0.95
35-44	0.87	0.70	1.08
45-54	0.71	0.57	0.89
55-64	0.53	0.41	0.68
65+	0.22	0.16	0.31
Educational attainment			
Degree or higher	**1**		
A-levels or equivalent	1.16	1.00	1.33
O-levels or equivalent	1.11	0.96	1.27
Other	0.97	0.77	1.23
None	0.95	0.79	1.13
Missing	1.15	0.95	1.40
Employment**			
Paid employment	**1**		
Self employed	1.19	0.98	1.45
Unemployed	0.77	0.58	1.02
Retired	0.86	0.68	1.09
Looking after family/home	0.62	0.50	0.76
Student	0.69	0.53	0.89
Long-term sick	0.79	0.54	1.16
Other	0.59	0.40	0.88
Ethnic group**			
White British	**1**		
White other	0.81	0.62	1.06
Mixed	0.69	0.46	1.04
Indian	0.14	0.08	0.26
Pakistani	0.03	0.01	0.14
Bangladeshi	0.04	0.01	0.20
Black Caribbean	0.47	0.31	0.70
Black African	0.20	0.11	0.35
Other	0.23	0.13	0.38
Missing	0.90	0.55	1.49
Marital status			
Married, civil partner	**1**		
Single: never married	1.19	1.01	1.39
Single: widowed, divorced, separated	1.01	0.86	1.18
Cohabiting	1.01	0.87	1.18
Area deprivation*			
Lowest quintile (least deprived)	**1**		
2nd	0.93	0.80	1.07
3rd	0.95	0.81	1.11
4th	1.00	0.85	1.17
Highest quintile (most deprived)	0.80	0.67	0.96

Missing	1.26	0.95	1.68
General health**			
Excellent	**1**		
Very good	0.95	0.83	1.08
Good	0.92	0.79	1.06
Fair	0.79	0.66	0.96
Poor	0.43	0.31	0.60
Equivalised household income quintile**			
Highest	**1**		
2nd	0.76	0.67	0.88
3rd	0.67	0.58	0.78
4th	0.70	0.60	0.83
Lowest	0.68	0.56	0.81

*Denotes variable significant in the regression model; P<0.05

**P<0.01

Table C13: Odds of not meeting fruit and vegetable recommendations: Men			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.98	0.72	1.34
35-44	0.69	0.51	0.93
45-54	0.69	0.51	0.93
55-64	0.47	0.34	0.63
65+	0.39	0.27	0.55
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	1.63	1.37	1.93
O-levels or equivalent	1.85	1.57	2.18
Other	1.94	1.54	2.44
None	2.36	2.00	2.77
Missing	1.75	1.42	2.16
Employment			
Paid employment	**1**		
Self employed	0.98	0.82	1.16
Unemployed	1.58	1.13	2.21
Retired	0.85	0.68	1.05
Looking after family/home	0.73	0.39	1.38
Student	1.03	0.73	1.46
Long-term sick	0.96	0.66	1.42
Other	1.46	0.81	2.63
Ethnic group**			
White British	**1**		
White other	0.98	0.73	1.31
Mixed	1.02	0.66	1.59
Indian	1.57	1.10	2.22
Pakistani	2.53	1.50	4.25
Bangladeshi	2.15	0.86	5.33
Black Caribbean	1.44	0.87	2.37
Black African	1.71	1.04	2.83
Other	1.19	0.78	1.81
Missing	1.07	0.59	1.95
Marital status			
Married, civil partner	**1**		
Single: never married	1.18	0.98	1.42
Single: widowed, divorced, separated	1.21	1.01	1.45
Cohabiting	1.08	0.90	1.29
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.97	0.83	1.13
3rd	1.02	0.87	1.19
4th	0.92	0.78	1.10
Highest quintile (most deprived)	1.07	0.87	1.32

Missing	1.05	0.76	1.44
General health**			
Excellent	**1**		
Very good	1.30	1.12	1.50
Good	1.66	1.42	1.94
Fair	2.07	1.70	2.53
Poor	2.05	1.52	2.76
Equivalised household income quintile			
Highest	**1**		
2nd	1.05	0.90	1.22
3rd	1.13	0.96	1.34
4th	1.11	0.93	1.34
Lowest	1.14	0.94	1.39

*Denotes variable significant in the regression model; P<0.05

**P<0.01

Table C14: Odds of not meeting fruit and vegetable recommendations: women			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.58	0.44	0.76
35-44	0.41	0.31	0.54
45-54	0.33	0.25	0.44
55-64	0.24	0.18	0.32
65+	0.22	0.16	0.31
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	1.26	1.11	1.42
O-levels or equivalent	1.78	1.56	2.04
Other	2.06	1.67	2.55
None	2.27	1.96	2.63
Missing	1.74	1.48	2.06
Employment**			
Paid employment	**1**		
Self employed	0.81	0.67	0.96
Unemployed	1.40	1.05	1.88
Retired	0.84	0.71	1.00
Looking after family/home	0.91	0.77	1.08
Student	0.80	0.58	1.11
Long-term sick	1.29	0.94	1.76
Other	1.11	0.78	1.58
Ethnic group**			
White British	**1**		
White other	0.90	0.73	1.12
Mixed	1.12	0.77	1.60
Indian	1.96	1.38	2.77
Pakistani	2.41	1.56	3.73
Bangladeshi	2.06	1.23	3.45
Black Caribbean	1.48	1.06	2.07
Black African	2.00	1.35	2.98
Other	1.09	0.79	1.49
Missing	0.77	0.47	1.26
Marital status**			
Married, civil partner	**1**		
Single: never married	1.16	0.99	1.36
Single: widowed, divorced, separated	1.21	1.07	1.37
Cohabiting	1.13	0.98	1.31
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.96	0.85	1.09
3rd	1.01	0.89	1.16
4th	0.94	0.82	1.08
Highest quintile (most deprived)	1.14	0.97	1.34

Missing	0.87	0.68	1.12
General health**			
Excellent	**1**		
Very good	1.41	1.25	1.58
Good	1.79	1.58	2.04
Fair	1.95	1.66	2.28
Poor	2.25	1.78	2.83
Equivalised household income quintile**			
Highest	**1**		
2nd	1.14	1.00	1.29
3rd	1.22	1.06	1.39
4th	1.27	1.10	1.47
Lowest	1.38	1.18	1.61

*Denotes variable significant in the regression model; P<0.05

**P<0.01

Table C15: Odds of not meeting exercise recommendations: Men			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	1.14	0.92	1.41
35-44	1.37	1.09	1.72
45-54	1.68	1.34	2.10
55-64	2.04	1.60	2.61
65+	2.63	1.94	3.56
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	1.07	0.92	1.23
O-levels or equivalent	1.19	1.04	1.37
Other	1.44	1.15	1.80
None	1.55	1.33	1.81
Missing	1.25	1.04	1.51
Employment			
Paid employment	**1**		
Self employed	1.03	0.89	1.20
Unemployed	1.13	0.89	1.43
Retired	0.87	0.70	1.09
Looking after family/home	0.62	0.37	1.03
Student	0.81	0.65	1.02
Long-term sick	1.20	0.77	1.87
Other	0.79	0.44	1.44
Ethnic group**			
White British	**1**		
White other	1.02	0.78	1.35
Mixed	0.63	0.44	0.91
Indian	1.46	1.12	1.92
Pakistani	1.67	1.19	2.34
Bangladeshi	1.16	0.80	1.69
Black Caribbean	0.88	0.59	1.31
Black African	1.39	0.98	1.98
Other	1.19	0.87	1.62
Missing	1.33	0.86	2.06
Marital status**			
Married, civil partner	**1**		
Single: never married	0.77	0.66	0.89
Single: widowed, divorced, separated	0.94	0.79	1.12
Cohabiting	0.91	0.79	1.06
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	1.04	0.91	1.19
3rd	1.08	0.93	1.24
4th	1.05	0.90	1.22
Highest quintile (most deprived)	0.96	0.81	1.13

Missing	0.87	0.66	1.15
General health**			
Excellent	**1**		
Very good	1.60	1.41	1.82
Good	2.13	1.85	2.44
Fair	3.12	2.59	3.77
Poor	7.55	4.88	11.69
Equivalised household income quintile**			
Highest	**1**		
2nd	0.94	0.83	1.07
3rd	1.17	1.01	1.34
4th	1.13	0.96	1.32
Lowest	1.31	1.10	1.57

*Denotes variable significant in the regression model; P<0.05

**P<0.01

Table C16: Odds of not meeting exercise recommendations: women			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.94	0.76	1.18
35-44	0.86	0.69	1.08
45-54	0.89	0.71	1.11
55-64	1.27	0.99	1.63
65+	2.23	1.63	3.05
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	1.00	0.87	1.14
O-levels or equivalent	1.20	1.04	1.38
Other	1.27	1.02	1.58
None	1.40	1.18	1.65
Missing	1.32	1.10	1.59
Employment**			
Paid employment	**1**		
Self employed	0.92	0.77	1.12
Unemployed	1.11	0.86	1.44
Retired	0.86	0.69	1.07
Looking after family/home	1.00	0.84	1.19
Student	0.86	0.69	1.08
Long-term sick	2.85	1.74	4.65
Other	2.25	1.47	3.44
Ethnic group**			
White British	**1**		
White other	0.79	0.62	1.00
Mixed	1.13	0.80	1.61
Indian	1.34	1.02	1.76
Pakistani	1.56	1.11	2.20
Bangladeshi	1.99	1.28	3.10
Black Caribbean	1.09	0.77	1.53
Black African	1.61	1.10	2.35
Other	1.45	1.06	1.98
Missing	0.69	0.45	1.08
Marital status**			
Married, civil partner	**1**		
Single: never married	0.76	0.65	0.89
Single: widowed, divorced, separated	0.96	0.83	1.10
Cohabiting	1.03	0.88	1.19
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.93	0.81	1.06
3rd	1.02	0.89	1.17
4th	0.99	0.86	1.15
Highest quintile (most deprived)	1.07	0.91	1.25

Missing	0.76	0.59	0.99
General health**			
Excellent	**1**		
Very good	1.44	1.29	1.62
Good	2.01	1.76	2.28
Fair	2.87	2.40	3.44
Poor	5.03	3.59	7.05
Equivalised household income quintile**			
Highest	**1**		
2nd	1.22	1.07	1.38
3rd	1.28	1.12	1.47
4th	1.47	1.27	1.70
Lowest	1.38	1.17	1.63

*Denotes variable significant in the regression model; P<0.05

**P<0.01

Appendix D: Tables for Chapter 5 – changing and stability in health behaviours between 2010/11 and 2013/4

Table D1: Change in cigarette smoking status, by sex			
	Men	**Women**	**All**
	%	%	%
All			
Stable – current cigarette smoker in 2010/11 and 2013/4	15	14	15
Stable – non-smoker in 2010/11 and 2013/4	78	79	79
Change – non-smoker to smoker	2	2	2
Change - smoker to non-smoker	5	4	5
% of smokers in 2010/11 who were non-smokers in 2013/4	*24*	*23*	*24*
Bases			
Weighted - all	*12608*	*14219*	*26827*
Unweighted - all	*10470*	*13608*	*24078*

Table D2: Change in drinking, by sex			
	Men	**Women**	**All**
	%	%	%
All			
Stable – binge drinker in 2010/11 and 2013/4	17	10	13
Stable – non-binge drinker in 2010/11 and 2013/4	61	70	66
Change – non-binge drinker to binge drinker**	11	10	10
Change - binge drinker in 2010/11 to non-binge drinker 2013/4**	11	10	10
*% of binge drinkers in 2010/11 who were not binge drinkers in 2013/4**	*41*	*49*	*44*
Bases			
Weighted - all	*10121*	*11263*	*21384*
Unweighted - all	*8330*	*10874*	*19204*

*p<0.05 **p<0.01

Table D3: Change in meeting F&V recommendations by sex			
	Men	**Women**	**All**
	%	%	%
All			
Stable – did not meet F&V recommendations in 2010/11 and 2013/4	73	64	68
Stable – did meet F&V recommendations in 2010/11 and 2013/4	9	14	12
Change – met F&V recommendations in 2010/11 but not in 2013/4**	8	10	9
Change - did not meet F&V recommendations in 2010/11 but met recommendations in 2013/4**	10	12	11
*% of those not meeting F&V recommendations in 2010/11 meeting them in 2013/4**	*13*	*16*	*14*
Bases			
Weighted – all	*12564*	*14182*	*26746*
Unweighted – men	*10430*	*13568*	*23998*

*p<0.05 **p<0.01

Table D4: Change in meeting PA recommendations, by sex			
	Men	**Women**	**All**
	%	%	%
All			
Stable – did not meet PA recommendations in 2010/11 and 2013/4	60	68	64
Stable – did meet PA recommendations in 2010/11 and 2013/4	15	10	12
Change – met PA recommendations in 2010/11 but not in 2013/4**	12	11	12
Change - did not meet PA recommendations in 2010/11 but met recommendations in 2013/4**	13	11	12
*% of those not meeting PA recommendations in 2010/11 meeting them in 2013/4**	*18*	*14*	*16*
Bases			
Weighted - all	*12532*	*14136*	*26668*
Unweighted - all	*10406*	*13535*	*23941*

*p<0.05 **p<0.01

Table D5: Prevalence and average marginal effects of stopping smoking cigarettes						
	Unadjusted prevalence of stopping cigarette smoking	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age*						
16-24	27	*663*	*464*	**Ref. 0.28**		
25-34	28	*1033*	*823*	-0.01	-0.07	+0.06
35-44	23	*1083*	*976*	-0.05	-0.12	+0.01
45-54	19	*1068*	*930*	-0.08	-0.15	-0.02
55-64	21	*803*	*715*	-0.05	-0.12	+0.02
65+	25	*500*	*417*	-0.02	-0.11	+0.08
Sex						
Male	24	*12608*	*10470*	**Ref. 0.23**		
Female	23	*14219*	*13608*	+0.01	-0.02	+0.03
Educational attainment**						
Degree or higher	38	*550*	*476*	**Ref. 0.35**		
A-levels or equivalent	31	*782*	*690*	-0.07	-0.12	-0.01
O-levels or equivalent	22	*1344*	*1072*	-0.13	-0.19	-0.08
Other/none	17	*1919*	*1554*	-0.16	-0.22	-0.11
Missing	N/A			-0.12	-0.19	-0.06
Employment**						
Paid employment/self employed	28	*2821*	*2432*	**Ref. 0.26**		
Unemployed	14	*608*	*477*	-0.08	-0.13	-0.04
Retired	24	*659*	*563*	+0.00	-0.06	+0.07
Student	34	*194*	*156*	+0.05	-0.05	+0.14
Other	14	*867*	*697*	-0.09	-0.13	-0.04
Ethnic group						
White British	23	*4572*	*3651*	**Ref. 0.24**		
South Asian (Indian, Pakistani, Bangladeshi)	33	*105*	*189*	+0.05	-0.03	+0.13
Black African/Caribbean	25	*76*	*132*	+0.03	-0.06	+0.13
Other (includes mixed and White other)	24	*359*	*328*	-0.02	-0.07	+0.04
Marital and cohabitation status**						
Married, civil partner	27	*1921*	*1702*	**Ref. 0.27**		
Single: never married	23	*1425*	*1080*	-0.06	-0.10	-0.02
Single: widowed, divorced, separated	17	*885*	*792*	-0.08	-0.12	-0.04
Cohabiting	24	*918*	*751*	-0.05	-0.09	-0.00
Area deprivation						
Lowest quintile (least deprived)	30	*630*	*541*	**Ref. 0.26**		
2nd	27	*745*	*637*	-0.01	-0.06	+0.05

3rd	25	*1009*	*850*	-0.03	-0.08	+0.02
4th	22	*1152*	*946*	-0.04	-0.09	+0.01
Highest quintile (most deprived)	19	*1449*	*1202*	-0.05	-0.10	+0.00
Missing	N/A			-0.02	-0.11	+0.07
General health						
Excellent/very good/good	26	*3656*	*3095*	**Ref. 0.24**		
Fair	20	*1042*	*850*	-0.02	-0.05	+0.02
Poor	15	*452*	*380*	-0.02	-0.07	+0.04
Equivalised household income quintile						
Highest	32	*705*	*622*	**Ref. 0.25**		
2nd	28	*929*	*823*	-0.00	-0.05	+0.05
3rd	24	*1126*	*933*	-0.02	-0.07	+0.03
4th	21	*1222*	*1000*	-0.02	-0.08	+0.03
Lowest	17	*1167*	*947*	-0.03	-0.09	+0.02

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D6: Prevalence and average marginal effects of starting smoking cigarettes						
	Unadjusted prevalence of starting cigarette smoking	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age**						
16-24	7	*2406*	*1848*	**Ref. 0.06**		
25-34	5	*3083*	*2719*	-0.00	-0.02	+0.02
35-44	3	*3743*	*3715*	-0.02	-0.04	+0.00
45-54	2	*3885*	*3667*	-0.03	-0.06	-0.01
55-64	2	*3633*	*3487*	-0.04	-0.06	-0.02
65+	1	*4927*	*4317*	-0.05	-0.07	-0.03
Sex						
Male	3	*10094*	*8468*	**Ref. 0.03**		
Female	3	*11583*	*11285*	-0.00	-0.01	+0.00
Educational attainment**						
Degree or higher	2	*5018*	*4609*	**Ref. 0.02**		
A-levels or equivalent	3	*4008*	*3657*	+0.01	+0.00	+0.02
O-levels or equivalent	4	*4068*	*3587*	+0.02	+0.01	+0.02
Other/none	3	*5804*	*5275*	+0.03	+0.02	+0.03
Missing	N/A			+0.01	+0.00	+0.02
Employment						
Paid employment/self employed	3	*12190*	*11054*	**Ref. 0.03**		
Unemployed	8	*793*	*725*	+0.01	-0.00	+0.02
Retired	1	*5528*	*4966*	-0.00	-0.02	+0.01
Student	7	*1282*	*1066*	+0.00	-0.01	+0.01
Other	3	*1884*	*1941*	-0.00	-0.01	+0.00
Ethnic group						
White British	3	*18636*	*15792*	**Ref. 0.03**		
South Asian (Indian, Pakistani, Bangladeshi)	3	*886*	*1558*	-0.01	-0.02	-0.00
Black African/Caribbean	4	*448*	*777*	-0.01	-0.02	+0.00
Other (includes mixed and White other)	3	*1451*	*1443*	+0.00	-0.01	+0.01
Marital and cohabitation status**						
Married, civil partner	2	*12272*	*11660*	**Ref. 0.02**		
Single: never married	6	*4160*	*3303*	+0.01	+0.00	+0.02
Single: widowed, divorced, separated	2	*2989*	*2801*	+0.01	+0.00	+0.02
Cohabiting	5	*2255*	*1987*	+0.02	+0.01	+0.03
Area deprivation						
Lowest quintile (least deprived)	2	*4707*	*4241*	**Ref. 0.02**		
2nd	2	*4730*	*4168*	-0.00	-0.01	+0.01
3rd	2	*4508*	*3978*	+0.00	-0.01	+0.01

4th	3	*3920*	*3506*	+0.00	-0.01	+0.01
Highest quintile (most deprived)	5	*3200*	*3264*	+0.01	+0.00	+0.02
Missing	N/A			-0.00	-0.02	+0.01
General health**						
Excellent/very good/good	3	*17729*	*16120*	**Ref. 0.02**		
Fair	3	*2877*	*2649*	+0.01	+0.00	+0.02
Poor	3	*1064*	*977*	+0.01	-0.00	+0.03
Equivalised household income quintile						
Highest	2	*5019*	*4549*	**Ref. 0.02**		
2nd	2	*4929*	*4444*	+0.00	-0.01	+0.01
3rd	3	*4416*	*3993*	+0.01	-0.00	+0.01
4th	3	*4027*	*3696*	+0.00	-0.01	+0.01
Lowest	4	*3280*	*3067*	+0.01	-0.00	+0.02

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D7: Prevalence and average marginal effects of stopping binge drinking						
	Unadjusted prevalence of stopping binge drinking	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age**						
16-24	48	*692*	*526*	**Ref. 0.47**		
25-34	45	*1033*	*855*	-0.02	-0.09	+0.05
35-44	40	*1065*	*1011*	-0.07	-0.14	+0.01
45-54	41	*1029*	*948*	-0.06	-0.14	+0.01
55-64	40	*769*	*725*	-0.07	-0.16	+0.01
65+	57	*485*	*428*	+0.07	-0.03	+0.18
Sex**						
Male	41	*10121*	*8330*	**Ref. 0.41**		
Female	49	*11263*	*10874*	+0.08	+0.05	+0.11
Educational attainment*						
Degree or higher	38	*1084*	*964*	**Ref. 0.41**		
A-levels or equivalent	44	*1003*	*882*	+0.04	-0.01	+0.09
O-levels or equivalent	45	*1250*	*1044*	+0.05	-0.00	+0.10
Other/none	51	*1108*	*943*	+0.07	+0.02	+0.12
Missing	N/A			-0.01	-0.06	+0.04
Employment						
Paid employment/self employed	40	*3423*	*3089*	**Ref. 0.43**		
Unemployed	53	*350*	*270*	+0.05	-0.02	+0.13
Retired	52	*627*	*577*	+0.02	-0.05	+0.09
Student	46	*294*	*234*	-0.01	-0.10	+0.08
Other	56	*380*	*323*	+0.07	+0.00	+0.14
Ethnic group**						
White British	43	*4670*	*4087*	**Ref. 0.43**		
South Asian (Indian, Pakistani, Bangladeshi)	60	*38*	*53*	+0.17	+0.02	+0.33
Black African/Caribbean	69	*30*	*53*	+0.23	+0.10	+0.37
Other (includes mixed and White other)	53	*300*	*275*	+0.10	+0.02	+0.18
Marital and cohabitation status						
Married, civil partner	42	*2502*	*2277*	**Ref. 0.44**		
Single: never married	47	*1244*	*985*	+0.00	-0.05	+0.06
Single: widowed, divorced, separated	49	*500*	*490*	-0.01	-0.06	+0.05
Cohabiting	42	*827*	*741*	-0.01	-0.06	+0.04
Area deprivation						
Lowest quintile (least deprived)	41	*1050*	*1005*	**Ref. 0.44**		
2nd	43	*1074*	*959*	-0.00	-0.05	+0.04
3rd	43	*1076*	*959*	-0.01	-0.05	+0.04

4th	43	*927*	*779*	-0.02	-0.07	+0.04
Highest quintile (most deprived)	53	*777*	*628*	+0.05	-0.01	+0.10
Missing	N/A			+0.05	-0.04	+0.14
General health*						
Excellent/very good/good	42	*4331*	*3864*	**Ref. 0.43**		
Fair	52	*592*	*501*	+0.06	+0.00	+0.11
Poor	58	*149*	*126*	+0.09	-0.01	+0.19
Equivalised household income quintile						
Highest	38	*1391*	*1307*	**Ref. 0.42**		
2nd	41	*1238*	*1125*	+0.00	-0.04	+0.05
3rd	45	*953*	*828*	+0.02	-0.03	+0.07
4th	49	*833*	*687*	+0.03	-0.02	+0.09
Lowest	56	*658*	*545*	+0.08	+0.02	+0.15

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D8: Prevalence and average marginal effects of starting binge drinking						
	Unadjusted prevalence of starting binge drinking	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age**						
16-24	24	*1714*	*1334*	**Ref. 0.20**		
25-34	17	*2206*	*1964*	-0.03	-0.07	+0.00
35-44	17	*2786*	*2751*	-0.04	-0.08	-0.00
45-54	15	*2930*	*2778*	-0.06	-0.10	-0.02
55-64	12	*2965*	*2784*	-0.09	-0.13	-0.05
65+	5	*3709*	*3100*	-0.14	-0.18	-0.10
Sex**						
Male	15	*7279*	*6008*	**Ref. 0.15**		
Female	12	*9031*	*8703*	-0.03	-0.04	-0.01
Educational attainment						
Degree or higher	14	*3472*	*3253*	**Ref. 0.13**		
A-levels or equivalent	16	*2889*	*2706*	+0.02	-0.00	+0.04
O-levels or equivalent	17	*3105*	*2738*	+0.02	+0.00	+0.04
Other/none	10	*4747*	*4006*	+0.00	-0.01	+0.02
Missing	N/A			+0.01	-0.01	+0.03
Employment*						
Paid employment/self employed	17	*8730*	*8118*	**Ref. 0.14**		
Unemployed	14	*761*	*624*	-0.00	-0.04	+0.03
Retired	6	*4267*	*3660*	-0.02	-0.04	+0.01
Student	26	*842*	*720*	+0.04	+0.00	+0.08
Other	11	*1709*	*1588*	-0.02	-0.04	+0.00
Ethnic group**						
White British	14	*14102*	*12089*	**Ref. 0.15**		
South Asian (Indian, Pakistani, Bangladeshi)	3	*617*	*922*	-0.12	-0.13	-0.11
Black African/Caribbean	8	*300*	*508*	-0.07	-0.10	-0.04
Other (includes mixed and White other)	10	*1093*	*1047*	-0.06	-0.08	-0.04
Marital and cohabitation status						
Married, civil partner	13	*8996*	*8446*	**Ref. 0.14**		
Single: never married	18	*3107*	*2487*	+0.00	-0.02	+0.02
Single: widowed, divorced, separated	8	*2519*	*2254*	-0.02	-0.03	+0.00
Cohabiting	17	*1687*	*1523*	+0.00	-0.02	+0.02
Area deprivation						
Lowest quintile (least deprived)	15	*3316*	*3063*	**Ref. 0.14**		
2nd	15	*3416*	*3079*	+0.01	-0.01	+0.03
3rd	13	*3365*	*2999*	-0.01	-0.03	+0.01
4th	14	*3085*	*2706*	-0.00	-0.02	+0.02

Highest quintile (most deprived)	11	*2717*	*2452*	-0.02	-0.04	-0.00
Missing	N/A			-0.02	-0.05	+0.02
General health**						
Excellent/very good/good	15	*12931*	*11786*	**Ref. 0.14**		
Fair	9	*2434*	*2121*	-0.03	-0.04	-0.01
Poor	7	*942*	*801*	-0.04	-0.07	-0.01
Equivalised household income quintile**						
Highest	18	*3311*	*3109*	**Ref. 0.16**		
2nd	16	*3488*	*3271*	-0.01	-0.03	+0.01
3rd	12	*3523*	*3142*	-0.03	-0.05	-0.01
4th	11	*3261*	*2849*	-0.03	-0.05	-0.00
Lowest	9	*2729*	*2340*	-0.04	-0.07	-0.02

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D9: Prevalence and average marginal effects of starting to eat 5 or more portions of fruit and vegetables per day						
	Unadjusted prevalence of starting to eat 5 or more portions per day	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age**						
16-24	10	*2785*	*2105*	**Ref. 0.11**		
25-34	12	*3505*	*3014*	+0.00	-0.02	+0.03
35-44	15	*3903*	*3809*	+0.04	+0.01	+0.06
45-54	14	*3922*	*3635*	+0.03	+0.01	+0.06
55-64	18	*3200*	*3017*	+0.07	+0.04	+0.10
65+	15	*3879*	*3344*	+0.06	+0.02	+0.10
Sex**						
Male	13	*12564*	*10430*	**Ref. 0.12**		
Female	16	*14182*	*13568*	+0.04	+0.03	+0.05
Educational attainment**						
Degree or higher	19	*3971*	*3636*	**Ref. 0.18**		
A-levels or equivalent	15	*3770*	*3387*	-0.03	-0.05	-0.01
O-levels or equivalent	13	*4520*	*3862*	-0.05	-0.07	-0.03
Other/none	12	*6335*	*5584*	-0.06	-0.08	-0.05
Missing	N/A			-0.06	-0.08	-0.03
Employment*						
Paid employment/self employed	15	*11946*	*10686*	**Ref. 0.14**		
Unemployed	8	*1265*	*1074*	-0.04	-0.07	-0.01
Retired	16	*4404*	*3893*	+0.00	-0.02	+0.02
Student	11	*1309*	*1088*	+0.03	-0.02	+0.07
Other	13	*2269*	*2182*	-0.01	-0.03	+0.01
Ethnic group**						
White British	14	*18196*	*15021*	**Ref. 0.14**		
South Asian (Indian, Pakistani, Bangladeshi)	9	*883*	*1559*	-0.05	-0.07	-0.03
Black African/Caribbean	11	*467*	*804*	-0.02	-0.05	+0.01
Other (includes mixed and White other)	16	*1399*	*1363*	+0.02	-0.01	+0.04
Marital and cohabitation status**						
Married, civil partner	16	*10694*	*10100*	**Ref. 0.15**		
Single: never married	10	*4850*	*3802*	-0.03	-0.05	-0.01
Single: widowed, divorced, separated	14	*2997*	*2758*	-0.02	-0.03	-0.00
Cohabiting	14	*2651*	*2263*	+0.00	-0.02	+0.02
Area deprivation						
Lowest quintile (least deprived)	16	*3955*	*3498*	**Ref. 0.14**		

2nd	15	*4125*	*3589*	-0.00	-0.02	+0.01
3rd	15	*4333*	*3754*	+0.00	-0.02	+0.02
4th	14	*4127*	*3621*	+0.01	-0.01	+0.03
Highest quintile (most deprived)	11	*4027*	*3859*	-0.02	-0.04	+0.00
Missing	N/A			+0.01	-0.03	+0.04
General health						
Excellent/very good/good	15	*16730*	*14952*	**Ref. 0.14**		
Fair	13	*3210*	*2852*	-0.01	-0.02	+0.01
Poor	12	*1247*	*1114*	-0.02	-0.04	+0.00
Equivalised household income quintile						
Highest	17	*4202*	*3774*	**Ref. 0.15**		
2nd	15	*4597*	*4117*	-0.01	-0.02	+0.01
3rd	14	*4430*	*3918*	-0.01	-0.03	+0.01
4th	12	*4293*	*3818*	-0.03	-0.05	-0.01
Lowest	12	*3666*	*3294*	-0.01	-0.04	+0.01

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D10: Prevalence and average marginal effects of stopping eating five or more portions of fruit and vegetables per day						
	Unadjusted prevalence of stopping eating 5 or more portions per day	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age**						
16-24	59	*277*	*201*	**Ref. 0.53**		
25-34	49	*605*	*522*	-0.01	-0.12	+0.11
35-44	46	*913*	*867*	-0.04	-0.15	+0.07
45-54	41	*1024*	*953*	-0.10	-0.20	+0.01
55-64	39	*1220*	*1168*	-0.14	-0.25	-0.02
65+	43	*1515*	*1363*	-0.13	-0.25	-0.01
Sex**						
Male	49	*2128*	*1802*	**Ref. 0.49**		
Female	40	*3425*	*3272*	-0.09	-0.12	-0.06
Educational attainment**						
Degree or higher	34	*1586*	*1436*	**Ref. 0.34**		
A-levels or equivalent	40	*1012*	*951*	+0.06	+0.02	+0.11
O-levels or equivalent	49	*875*	*781*	+0.14	+0.09	+0.19
Other/none	53	*1351*	*1210*	+0.20	+0.16	+0.25
Missing	N/A			+0.13	+0.08	+0.18
Employment						
Paid employment/self employed	42	*3036*	*2771*	**Ref. 0.43**		
Unemployed	55	*134*	*125*	+0.04	-0.06	+0.13
Retired	42	*1749*	*1606*	-0.00	-0.05	+0.05
Student	60	*161*	*129*	+0.05	-0.07	+0.17
Other	50	*474*	*443*	+0.05	-0.01	+0.11
Ethnic group**						
White British	42	*4954*	*4379*	**Ref. 0.43**		
South Asian (Indian, Pakistani, Bangladeshi)	66	*98*	*168*	+0.20	+0.10	+0.31
Black African/Caribbean	70	*54*	*100*	+0.23	+0.10	+0.35
Other (includes mixed and White other)	47	*402*	*397*	+0.05	-0.01	+0.11
Marital and cohabitation status						
Married, civil partner	42	*3459*	*3220*	**Ref. 0.43**		
Single: never married	52	*723*	*571*	+0.03	-0.02	+0.09
Single: widowed, divorced, separated	45	*858*	*815*	+0.04	-0.01	+0.08
Cohabiting	43	*512*	*467*	-0.00	-0.06	+0.05
Area deprivation						
Lowest quintile (least deprived)	40	*1378*	*1280*	**Ref. 0.43**		
2nd	41	*1331*	*1202*	-0.00	-0.04	+0.04
3rd	44	*1164*	*1054*	+0.01	-0.04	+0.05

4th	45	*920*	*812*	-0.00	-0.05	+0.05
Highest quintile (most deprived)	55	*608*	*584*	+0.06	-0.00	+0.12
Missing	N/A			-0.03	-0.13	+0.06
General health						
Excellent/very good/good	43	*4610*	*4217*	**Ref. 0.43**		
Fair	49	*683*	*623*	+0.03	-0.02	+0.08
Poor	46	*260*	*234*	-0.03	-0.10	+0.04
Equivalised household income quintile						
Highest	39	*1514*	*1390*	**Ref. 0.43**		
2nd	42	*1254*	*1140*	-0.01	-0.05	+0.03
3rd	46	*1085*	*985*	+0.02	-0.03	+0.07
4th	46	*941*	*862*	+0.00	-0.05	+0.05
Lowest	50	*757*	*696*	+0.03	-0.03	+0.09

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D11: Prevalence and average marginal effects of starting to meet physical activity recommendations						
	Unadjusted prevalence of starting to meet recommendations	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age**						
16-24	28	*1969*	*1489*	**Ref. 0.23**		
25-34	22	*2908*	*2552*	-0.03	-0.07	+0.01
35-44	19	*3545*	*3484*	-0.05	-0.09	-0.02
45-54	16	*3724*	*3478*	-0.07	-0.11	-0.04
55-64	12	*3565*	*3371*	-0.10	-0.14	-0.06
65+	7	*4549*	*3931*	-0.15	-0.19	-0.11
Sex**						
Male	**18**	*9113*	*7629*	**Ref. 0.18**		
Female	14	*11147*	*10676*	-0.04	-0.05	-0.02
Educational attainment**						
Degree or higher	21	*3811*	*3543*	**Ref. 0.18**		
A-levels or equivalent	20	*3459*	*3173*	-0.00	-0.02	+0.02
O-levels or equivalent	18	*4011*	*3504*	-0.02	-0.04	-0.00
Other/none	10	*6430*	*5678*	-0.05	-0.07	-0.03
Missing	N/A			-0.02	-0.05	-0.00
Employment						
Paid employment/self employed	19	*10921*	*9910*	**Ref. 0.16**		
Unemployed	19	*1063*	*916*	+0.01	-0.02	+0.04
Retired	7	*5136*	*4546*	-0.01	-0.04	+0.02
Student	29	*850*	*727*	+0.00	-0.03	+0.04
Other	12	*2289*	*2205*	-0.02	-0.04	+0.00
Ethnic group**						
White British	15	*17591*	*14758*	**Ref. 0.16**		
South Asian (Indian, Pakistani, Bangladeshi)	15	*787*	*1412*	-0.03	-0.06	-0.01
Black African/Caribbean	17	*397*	*704*	-0.02	-0.05	+0.01
Other (includes mixed and White other)	21	*1313*	*1307*	+0.02	-0.00	+0.05
Marital and cohabitation status**						
Married, civil partner	15	*10911*	*10337*	**Ref. 0.15**		
Single: never married	24	*3817*	*3008*	+0.03	+0.01	+0.05
Single: widowed, divorced, separated	9	*3231*	*2963*	-0.01	-0.03	+0.01
Cohabiting	18	*2299*	*1995*	-0.01	-0.02	+0.01
Area deprivation						

Lowest quintile (least deprived)	18	*3891*	*3481*	**Ref. 0.18**		
2nd	16	*4086*	*3584*	-0.02	-0.04	+0.00
3rd	15	*4176*	*3685*	-0.02	-0.04	-0.01
4th	15	*3838*	*3410*	-0.03	-0.05	-0.01
Highest quintile (most deprived)	15	*3701*	*3587*	-0.02	-0.04	+0.00
Missing	N/A			-0.01	-0.05	+0.03
General health**						
Excellent/very good/good	18	*15446*	*13996*	**Ref. 0.17**		
Fair	10	*3416*	*3053*	-0.05	-0.06	-0.03
Poor	5	*1393*	*1251*	-0.11	-0.13	-0.09
Equivalised household income quintile						
Highest	20	*3886*	*3549*	**Ref. 0.16**		
2nd	18	*4337*	*3928*	+0.00	-0.02	+0.02
3rd	16	*4262*	*3808*	-0.00	-0.02	+0.02
4th	13	*4212*	*3794*	-0.02	-0.04	+0.00
Lowest	12	*3556*	*3222*	-0.01	-0.04	+0.01

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D12: Prevalence and average marginal effects of stopping meeting physical activity recommendations						
	Unadjusted prevalence of stopping meeting recommendations	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age						
16-24	44	*1095*	*819*	**Ref. 0.46**		
25-34	49	*1198*	*980*	+0.03	-0.03	+0.10
35-44	46	*1274*	*1201*	+0.00	-0.07	+0.07
45-54	49	*1216*	*1108*	+0.03	-0.04	+0.10
55-64	53	*860*	*820*	+0.07	-0.00	+0.15
65+	54	*764*	*708*	+0.06	-0.03	+0.16
Sex**						
Male	46	*3419*	*2777*	**Ref. 0.46**		
Female	52	*2989*	*2859*	+0.06	+0.03	+0.09
Educational attainment*						
Degree or higher	46	*1750*	*1534*	**Ref. 0.48**		
A-levels or equivalent	46	*1316*	*1159*	-0.01	-0.05	+0.03
O-levels or equivalent	47	*1385*	*1140*	-0.00	-0.05	+0.04
Other/none	57	*1208*	*1079*	+0.06	+0.01	+0.11
Missing	N/A			+0.02	-0.03	+0.07
Employment						
Paid employment/self employed	47	*4054*	*3543*	**Ref. 0.48**		
Unemployed	54	*335*	*284*	+0.03	-0.04	+0.10
Retired	54	*941*	*891*	+0.00	-0.06	+0.07
Student	44	*621*	*492*	-0.00	-0.07	+0.07
Other	57	*456*	*426*	+0.04	-0.02	+0.10
Ethnic group						
White British	48	*5484*	*4582*	**Ref. 0.48**		
South Asian (Indian, Pakistani, Bangladeshi)	57	*195*	*323*	+0.09	+0.01	+0.16
Black African/Caribbean	54	*120*	*192*	+0.05	-0.04	+0.14
Other (includes mixed and White other)	51	*489*	*457*	+0.02	-0.03	+0.08
Marital and cohabitation status						
Married, civil partner	50	*3204*	*2950*	**Ref. 0.50**		
Single: never married	46	*1743*	*1360*	-0.02	-0.07	+0.03
Single: widowed, divorced, separated	52	*593*	*589*	-0.04	-0.09	+0.01
Cohabiting	47	*868*	*737*	-0.02	-0.06	+0.03
Area deprivation						
Lowest quintile	48	*1430*	*1287*	**Ref. 0.49**		

(least deprived)						
2nd	45	*1352*	*1192*	-0.03	-0.07	+0.02
3rd	49	*1305*	*1117*	+0.01	-0.04	+0.05
4th	48	*1202*	*1012*	-0.01	-0.05	+0.04
Highest quintile (most deprived)	55	*913*	*843*	+0.05	-0.01	+0.10
Missing	N/A			-0.03	-0.13	+0.06
General health**						
Excellent/very good/good	48	*5849*	*5139*	**Ref. 0.48**		
Fair	57	*463*	*410*	+0.06	+0.00	+0.12
Poor	67	*95*	*86*	+0.16	+0.05	+0.27
Equivalised household income quintile*						
Highest	44	*1821*	*1607*	**Ref. 0.46**		
2nd	46	*1502*	*1323*	+0.01	-0.04	+0.05
3rd	50	*1252*	*1094*	+0.04	-0.01	+0.08
4th	55	*997*	*868*	+0.08	+0.03	+0.13
Lowest	54	*835*	*744*	+0.05	-0.00	+0.11

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D13: Prevalence and average marginal effects of decreasing the number of cigarettes smoked among stable smokers						
	Unadjusted prevalence of decreasing number of cigarettes smoked	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI Higher**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Age						
16-24	16	*487*	*339*	**Ref. 0.16**		
25-34	19	*743*	*585*	+0.03	-0.03	+0.08
35-44	21	*831*	*738*	+0.05	-0.01	+0.11
45-54	25	*858*	*731*	+0.09	+0.02	+0.15
55-64	26	*632*	*555*	+0.09	+0.02	+0.17
65+	25	*370*	*308*	+0.09	-0.02	+0.19
Sex						
Male	24	*1905*	*1496*	**Ref. 0.23**		
Female	21	*2016*	*1760*	-0.03	-0.06	+0.01
Educational attainment						
Degree or higher	17	*337*	*295*	**Ref. 0.18**		
A-levels or equivalent	23	*537*	*467*	+0.06	-0.00	+0.13
O-levels or equivalent	20	*1040*	*827*	+0.03	-0.03	+0.09
Other/none	25	*1583*	*1269*	+0.04	-0.02	+0.10
Missing	N/A			+0.01	-0.05	+0.08
Employment						
Paid employment/self employed	21	*2037*	*1752*	**Ref. 0.23**		
Unemployed	24	*521*	*396*	+0.01	-0.05	+0.07
Retired	25	*495*	*421*	-0.02	-0.09	+0.06
Student	12	*128*	*105*	-0.05	-0.15	+0.05
Other	23	*739*	*582*	-0.02	-0.07	+0.03
Ethnic group*						
White British	23	*3493*	*2765*	**Ref. 0.23**		
South Asian (Indian, Pakistani, Bangladeshi)	15	*70*	*126*	-0.07	-0.15	+0.01
Black African/Caribbean	11	*56*	*103*	-0.11	-0.18	-0.04
Other (includes mixed and White other)	18	*272*	*242*	-0.04	-0.10	+0.02
Marital and cohabitation status						
Married, civil partner	22	*1393*	*1224*	**Ref. 0.21**		
Single: never married	19	*1094*	*817*	+0.01	-0.04	+0.06
Single: widowed, divorced, separated	24	*733*	*646*	-0.00	-0.05	+0.04
Cohabiting	23	*701*	*569*	+0.04	-0.01	+0.09
Area deprivation						
Lowest quintile	20	*437*	*374*	**Ref. 0.21**		

(least deprived)						
2nd	19	*541*	*465*	-0.01	-0.07	+0.05
3rd	25	*756*	*633*	+0.04	-0.02	+0.10
4th	22	*894*	*724*	+0.00	-0.05	+0.06
Highest quintile (most deprived)	22	*1167*	*945*	+0.01	-0.05	+0.06
Missing	N/A			+0.02	-0.08	+0.12
General health**						
Excellent/very good/good	19	*2711*	*2268*	**Ref. 0.20**		
Fair	27	*832*	*676*	+0.07	+0.03	+0.11
Poor	30	*378*	*312*	+0.08	+0.02	+0.15
Equivalised household income quintile						
Highest	19	*481*	*426*	**Ref. 0.20**		
2nd	20	*662*	*585*	+0.00	-0.05	+0.06
3rd	24	*852*	*694*	+0.04	-0.02	+0.09
4th	20	*964*	*774*	-0.00	-0.06	+0.06
Lowest	25	*961*	*777*	+0.05	-0.02	+0.11

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D14: Prevalence and average marginal effects of increasing number of cigarettes smoked among stable smokers						
	Unadjusted prevalence of increasing number of cigarettes smoked	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age**						
16-24	27	*487*	*339*	**Ref. 0.27**		
25-34	19	*743*	*585*	-0.08	-0.15	-0.01
35-44	17	*831*	*738*	-0.11	-0.18	-0.04
45-54	16	*858*	*731*	-0.12	-0.19	-0.05
55-64	14	*632*	*555*	-0.13	-0.21	-0.05
65+	15	*370*	*308*	-0.12	-0.23	-0.01
Sex*						
Male	19	*1905*	*1496*	**Ref. 0.19**		
Female	16	*2016*	*1760*	-0.03	-0.06	-0.00
Educational attainment						
Degree or higher	13	*337*	*295*	**Ref. 0.14**		
A-levels or equivalent	14	*537*	*467*	-0.00	-0.07	+0.06
O-levels or equivalent	21	*1040*	*827*	+0.05	-0.01	+0.11
Other/none	17	*1583*	*1269*	+0.03	-0.03	+0.09
Missing	N/A			+0.05	-0.02	+0.12
Employment						
Paid employment/self employed	15	*2037*	*1752*	**Ref. 0.16**		
Unemployed	25	*521*	*396*	+0.06	+0.00	+0.11
Retired	15	*495*	*421*	+0.00	-0.07	+0.08
Student	22	*128*	*105*	+0.00	-0.08	+0.08
Other	20	*739*	*582*	+0.03	-0.02	+0.08
Ethnic group						
White British	18	*3493*	*2765*	**Ref. 0.18**		
South Asian (Indian, Pakistani, Bangladeshi)	18	*70*	*126*	-0.02	-0.10	+0.06
Black African/Caribbean	11	*56*	*103*	-0.07	-0.14	-0.01
Other (includes mixed and White other)	15	*272*	*242*	-0.02	-0.08	+0.04
Marital and cohabitation status						
Married, civil partner	17	*1393*	*1224*	**Ref. 0.19**		
Single: never married	21	*1094*	*817*	-0.02	-0.06	+0.02
Single: widowed, divorced, separated	15	*733*	*646*	-0.01	-0.06	+0.03
Cohabiting	18	*701*	*569*	-0.02	-0.07	+0.02
Area deprivation						
Lowest quintile (least deprived)	14	*437*	*374*	**Ref. 0.15**		
2nd	17	*541*	*465*	+0.03	-0.03	+0.08

3rd	18	*756*	*633*	+0.03	-0.02	+0.09
4th	16	*894*	*724*	+0.00	-0.05	+0.05
Highest quintile (most deprived)	21	*1167*	*945*	+0.04	-0.01	+0.10
Missing				+0.02	-0.06	+0.10
General health						
Excellent/very good/good	17	*2711*	*2268*	**Ref. 0.17**		
Fair	20	*832*	*676*	+0.03	-0.01	+0.06
Poor	18	*378*	*312*	+0.01	-0.04	+0.07
Equivalised household income quintile						
Highest	*15*	*481*	*426*	**Ref. 0.17**		
2nd	*14*	*662*	*585*	-0.02	-0.08	+0.04
3rd	*19*	*852*	*694*	+0.02	-0.04	+0.07
4th	*19*	*964*	*774*	+0.01	-0.05	+0.07
Lowest	*20*	*961*	*777*	+0.01	-0.05	+0.07

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D15: Prevalence and average marginal effects of reducing units of alcohol consumed on heaviest drinking day among stable binge drinkers						
	Unadjusted prevalence of reducing units of alcohol consumed	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age**						
16-24	20	*359*	*267*	**Ref. 0.20**		
25-34	11	*572*	*484*	-0.08	-0.17	-0.00
35-44	7	*636*	*611*	-0.13	-0.21	-0.04
45-54	10	*606*	*551*	-0.10	-0.19	-0.01
55-64	8	*459*	*435*	-0.12	-0.21	-0.03
65+	5	*207*	*187*	-0.15	-0.24	-0.05
Sex**						
Male	12	*1689*	*1392*	**Ref. 0.12**		
Female	8	*1150*	*1143*	-0.04	-0.07	-0.02
Educational attainment*						
Degree or higher	9	*669*	*591*	**Ref. 0.10**		
A-levels or equivalent	8	*561*	*494*	-0.02	-0.05	+0.02
O-levels or equivalent	12	*683*	*588*	+0.03	-0.01	+0.07
Other/none	9	*546*	*471*	-0.01	-0.05	+0.03
Missing	N/A			+0.03	-0.01	+0.08
Employment						
Paid employment/self employed	9	*2053*	*1853*	**Ref. 0.09**		
Unemployed	23	*163*	*132*	+0.10	+0.02	+0.18
Retired	6	*298*	*281*	+0.01	-0.05	+0.08
Student	17	*158*	*125*	-0.01	-0.06	+0.04
Other	11	*165*	*144*	+0.03	-0.04	+0.10
Ethnic group*						
White British	10	*2657*	*2354*	**Ref. 0.10**		
South Asian (Indian, Pakistani, Bangladeshi)	26	*15*	*20*	+0.19	+0.01	+0.38
Black African/Caribbean	18	*9*	*21*	+0.10	-0.13	+0.32
Other (includes mixed and White other)	14	*140*	*129*	+0.05	-0.02	+0.13
Marital and cohabitation status						
Married, civil partner	8	*1444*	*1327*	**Ref. 0.10**		
Single: never married	17	*658*	*521*	+0.02	-0.03	+0.07
Single: widowed, divorced, separated	9	*256*	*252*	+0.01	-0.04	+0.06
Cohabiting	8	*480*	*435*	-0.02	-0.05	+0.02
Area deprivation						
Lowest quintile (least deprived)	6	*616*	*599*	**Ref. 0.07**		
2nd	11	*617*	*549*	+0.04	+0.00	+0.07

3rd	11	*615*	*555*	+0.04	+0.00	+0.08
4th	12	*531*	*448*	+0.04	+0.00	+0.08
Highest quintile (most deprived)	13	*369*	*298*	+0.04	-0.00	+0.09
Missing	N/A			+0.03	-0.04	+0.11
General health						
Excellent/very good/good	10	*2491*	*2235*	**Ref. 0.10**		
Fair	15	*284*	*245*	+0.05	-0.01	+0.10
Poor	15	*62*	*55*	+0.04	-0.06	+0.14
Equivalised household income quintile						
Highest	11	*861*	*816*	**Ref. 0.14**		
2nd	8	*735*	*663*	-0.05	-0.09	-0.01
3rd	9	*527*	*455*	-0.04	-0.09	-0.00
4th	10	*423*	*354*	-0.05	-0.10	-0.00
Lowest	14	*291*	*246*	-0.03	-0.08	+0.02

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Table D16: Prevalence and average marginal effects of increasing units of alcohol consumed on the heaviest drinking day among stable binge drinkers						
	Unadjusted prevalence of increasing units of alcohol consumed	Bases		Average Marginal Effect (percentage point change from reference group)	95% CI lower	95% CI Higher
		Weighted	Unweighted			
	%	*n*	*n*			
Age**						
16-24	18	*359*	*267*	**Ref. 0.14**		
25-34	16	*572*	*484*	+0.01	-0.06	+0.08
35-44	14	*636*	*611*	+0.00	-0.07	+0.07
45-54	11	*606*	*551*	-0.02	-0.09	+0.05
55-64	4	*459*	*435*	-0.10	-0.17	-0.03
65+	5	*207*	*187*	-0.10	-0.18	-0.02
Sex						
Male	12	*1689*	*1392*	**Ref. 0.13**		
Female	11	*1150*	*1143*	-0.02	-0.05	+0.01
Educational attainment						
Degree or higher	10	*669*	*591*	**Ref. 0.10**		
A-levels or equivalent	16	*561*	*494*	+0.05	+0.00	+0.09
O-levels or equivalent	11	*683*	*588*	+0.01	-0.03	+0.05
Other/none	12	*546*	*471*	+0.04	-0.01	+0.09
Missing	N/A			+0.00	-0.04	+0.05
Employment						
Paid employment/self employed	12	*2053*	*1853*	**Ref. 0.11**		
Unemployed	12	*163*	*132*	-0.01	-0.07	+0.05
Retired	5	*298*	*281*	+0.02	-0.08	+0.12
Student	22	*158*	*125*	+0.05	-0.04	+0.13
Other	15	*165*	*144*	+0.03	-0.04	+0.11
Ethnic group						
White British	12	*2657*	*2354*	**Ref. 0.12**		
South Asian (Indian, Pakistani, Bangladeshi)	15	*15*	*20*	+0.03	-0.19	+0.25
Black African/Caribbean	14	*9*	*21*	+0.03	-0.14	+0.19
Other (includes mixed and White other)	12	*140*	*129*	+0.01	-0.06	+0.08
Marital and cohabitation status						
Married, civil partner	9	*1444*	*1327*	**Ref. 0.11**		
Single: never married	17	*658*	*521*	+0.03	-0.02	+0.07
Single: widowed, divorced, separated	6	*256*	*252*	-0.02	-0.07	+0.02
Cohabiting	16	*480*	*435*	+0.04	+0.00	+0.08
Area deprivation						
Lowest quintile (least deprived)	13	*616*	*599*	**Ref. 0.14**		
2nd	11	*617*	*549*	-0.03	-0.07	+0.01
3rd	12	*615*	*555*	-0.01	-0.06	+0.03

4th	11	*531*	*448*	-0.03	-0.08	+0.02
Highest quintile (most deprived)	12	*369*	*298*	-0.03	-0.08	+0.02
Missing	N/A			-0.06	-0.13	+0.01
General health						
Excellent/very good/good	12	*2491*	*2235*	**Ref. 0.12**		
Fair	15	*284*	*245*	+0.04	-0.02	+0.09
Poor	6	*62*	*55*	-0.04	-0.13	+0.05
Equivalised household income quintile						
Highest	12	*861*	*816*	**Ref. 0.12**		
2nd	11	*735*	*663*	-0.01	-0.05	+0.02
3rd	13	*527*	*455*	+0.01	-0.04	+0.05
4th	11	*423*	*354*	-0.01	-0.06	+0.04
Lowest	13	*291*	*246*	0.01	-0.05	+0.07

*Denotes variable significant in regression model: p<0.05 ** Denotes variable significant in regression model: p<0.01

Tables for Chapter 5 – Odds of changing health behaviours between 2010/11 and 2013/4

Table D17: Odds of stopping smoking			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age*			
16-24	**1**		
25-34	0.97	0.69	1.36
35-44	0.74	0.53	1.05
45-54	0.61	0.42	0.88
55-64	0.75	0.50	1.10
65+	0.91	0.54	1.55
Sex			
Male	**1**		
Female	1.04	0.89	1.22
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	0.73	0.56	0.96
O-levels or equivalent	0.51	0.38	0.67
Other/none	0.42	0.32	0.55
Missing	0.54	0.39	0.74
Employment**			
Paid employment/self employed	**1**		
Unemployed	0.59	0.42	0.82
Retired	1.03	0.71	1.50
Student	1.29	0.81	2.07
Other	0.59	0.44	0.77
Ethnic group			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	1.32	0.86	2.03
Black African/Caribbean	1.21	0.72	2.06
Other (includes mixed and White other)	0.90	0.64	1.26
Marital status**			
Married, civil partner	**1**		
Single: never married	0.71	0.55	0.90
Single: widowed, divorced, separated	0.63	0.50	0.81
Cohabiting	0.78	0.60	1.00
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.95	0.71	1.29
3rd	0.84	0.64	1.10
4th	0.81	0.62	1.06
Highest quintile (most deprived)	0.77	0.57	1.02
Missing	0.88	0.53	1.45
General health			

Excellent/very good/good	**1**		
Fair	0.90	0.73	1.12
Poor	0.91	0.65	1.27
Equivalised household income quintile			
Highest	**1**		
2nd	1.00	0.76	1.31
3rd	0.91	0.69	1.20
4th	0.87	0.65	1.16
Lowest	0.82	0.59	1.14

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D18: Odds of starting smoking			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.93	0.63	1.37
35-44	0.63	0.41	0.97
45-54	0.37	0.23	0.59
55-64	0.27	0.16	0.45
65+	0.10	0.04	0.25
Sex			
Male	**1**		
Female	0.86	0.70	1.05
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	1.55	1.08	2.22
O-levels or equivalent	2.03	1.44	2.85
Other/none	2.70	1.89	3.87
Missing	1.65	1.11	2.46
Employment			
Paid employment/self employed	**1**		
Unemployed	1.35	0.91	2.00
Retired	0.87	0.44	1.71
Student	1.10	0.74	1.64
Other	0.83	0.58	1.19
Ethnic group			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	0.60	0.37	0.98
Black African/Caribbean	0.75	0.45	1.23
Other (includes mixed and White other)	1.01	0.70	1.46
Marital status**			
Married, civil partner	**1**		
Single: never married	1.59	1.14	2.21
Single: widowed, divorced, separated	1.67	1.15	2.43
Cohabiting	1.93	1.41	2.63
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	1.00	0.70	1.43
3rd	1.04	0.72	1.49
4th	1.16	0.81	1.66
Highest quintile (most deprived)	1.52	1.06	2.18
Missing	0.94	0.48	1.83
General health**			
Excellent/very good/good	**1**		
Fair	1.61	1.21	2.15
Poor	1.59	1.02	2.49
Equivalised household income quintile			

Highest	**1**		
2nd	1.00	0.72	1.40
3rd	1.23	0.88	1.73
4th	1.08	0.74	1.56
Lowest	1.49	1.01	2.21

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D19: Odds of stopping binge drinking			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.91	0.68	1.22
35-44	0.75	0.55	1.03
45-54	0.77	0.56	1.06
55-64	0.73	0.52	1.04
65+	1.35	0.87	2.07
Sex**			
Male	**1**		
Female	1.39	1.22	1.58
Educational attainment*			
Degree or higher	**1**		
A-levels or equivalent	1.17	0.95	1.44
O-levels or equivalent	1.22	0.99	1.50
Other/none	1.33	1.07	1.67
Missing	0.97	0.77	1.21
Employment			
Paid employment/self employed	**1**		
Unemployed	1.25	0.93	1.70
Retired	1.07	0.80	1.43
Student	0.97	0.67	1.42
Other	1.35	1.02	1.79
Ethnic group**			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	2.08	1.05	4.12
Black African/Caribbean	2.71	1.45	5.07
Other (includes mixed and White other)	1.51	1.10	2.08
Marital status			
Married, civil partner	**1**		
Single: never married	1.02	0.81	1.28
Single: widowed, divorced, separated	0.97	0.78	1.22
Cohabiting	0.97	0.79	1.19
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.99	0.81	1.21
3rd	0.98	0.80	1.20
4th	0.93	0.75	1.16
Highest quintile (most deprived)	1.21	0.95	1.55
Missing	1.24	0.86	1.78
General health*			
Excellent/very good/good	**1**		
Fair	1.26	1.02	1.56
Poor	1.46	0.97	2.19
Equivalised household income quintile			

Highest	**1**		
2nd	1.02	0.84	1.23
3rd	1.09	0.88	1.35
4th	1.14	0.90	1.44
Lowest	1.41	1.09	1.84

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D20: Odds of starting binge drinking			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.79	0.61	1.01
35-44	0.76	0.59	0.98
45-54	0.64	0.49	0.82
55-64	0.51	0.39	0.67
65+	0.27	0.19	0.38
Sex**			
Male	**1**		
Female	0.80	0.72	0.88
Educational attainment			
Degree or higher	**1**		
A-levels or equivalent	1.16	0.98	1.38
O-levels or equivalent	1.24	1.04	1.46
Other/none	1.05	0.88	1.24
Missing	1.08	0.90	1.31
Employment*			
Paid employment/self employed	**1**		
Unemployed	0.97	0.72	1.31
Retired	0.83	0.66	1.06
Student	1.37	1.03	1.82
Other	0.84	0.68	1.03
Ethnic group**			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	0.14	0.09	0.22
Black African/Caribbean	0.49	0.34	0.71
Other (includes mixed and White other)	0.56	0.44	0.73
Marital status			
Married, civil partner	**1**		
Single: never married	1.01	0.85	1.21
Single: widowed, divorced, separated	0.86	0.72	1.04
Cohabiting	1.01	0.84	1.21
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	1.06	0.90	1.24
3rd	0.92	0.78	1.09
4th	0.98	0.82	1.17
Highest quintile (most deprived)	0.81	0.66	1.00
Missing	0.85	0.61	1.17
General health**			
Excellent/very good/good	**1**		
Fair	0.78	0.66	0.93
Poor	0.67	0.50	0.91
Equivalised household income quintile**			

Highest	**1**		
2nd	0.92	0.78	1.07
3rd	0.74	0.62	0.89
4th	0.80	0.66	0.97
Lowest	0.67	0.54	0.84

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D21: Odds and average marginal effects of starting to eat 5 or more portions of fruit and vegetables			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	1.04	0.79	1.37
35-44	1.39	1.06	1.81
45-54	1.36	1.03	1.79
55-64	1.81	1.35	2.41
65+	1.68	1.21	2.33
Sex**			
Male	**1**		
Female	1.37	1.25	1.50
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	0.82	0.71	0.95
O-levels or equivalent	0.70	0.60	0.81
Other/none	0.59	0.51	0.69
Missing	0.65	0.54	0.77
Employment*			
Paid employment/self employed	**1**		
Unemployed	0.69	0.52	0.91
Retired	1.01	0.84	1.22
Student	1.22	0.90	1.65
Other	0.92	0.78	1.09
Ethnic group**			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	0.62	0.48	0.80
Black African/Caribbean	0.85	0.65	1.11
Other (includes mixed and White other)	1.14	0.94	1.38
Marital status**			
Married, civil partner	**1**		
Single: never married	0.77	0.65	0.91
Single: widowed, divorced, separated	0.87	0.75	1.00
Cohabiting	1.00	0.85	1.18
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.97	0.84	1.11
3rd	1.01	0.87	1.17
4th	1.06	0.90	1.24
Highest quintile (most deprived)	0.86	0.72	1.02
Missing	1.05	0.78	1.42
General health			
Excellent/very good/good	**1**		
Fair	0.93	0.81	1.06
Poor	0.84	0.68	1.04
Equivalised household income			

quintile			
Highest	1		
2nd	0.96	0.83	1.11
3rd	0.93	0.80	1.09
4th	0.79	0.67	0.94
Lowest	0.88	0.74	1.06

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D22: Odds of stopping eating five or more portions of fruit and vegetables per day			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.97	0.61	1.56
35-44	0.86	0.54	1.37
45-54	0.67	0.42	1.06
55-64	0.56	0.35	0.90
65+	0.57	0.35	0.95
Sex**			
Male	**1**		
Female	0.67	0.59	0.77
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	1.33	1.10	1.61
O-levels or equivalent	1.83	1.49	2.26
Other/none	2.39	1.96	2.91
Missing	1.74	1.40	2.17
Employment			
Paid employment/self employed	**1**		
Unemployed	1.17	0.77	1.76
Retired	0.98	0.79	1.22
Student	1.24	0.73	2.09
Other	1.23	0.97	1.57
Ethnic group**			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	2.40	1.51	3.81
Black African/Caribbean	2.63	1.50	4.63
Other (includes mixed and White other)	1.23	0.96	1.59
Marital status			
Married, civil partner	**1**		
Single: never married	1.16	0.90	1.48
Single: widowed, divorced, separated	1.17	0.97	1.40
Cohabiting	0.98	0.78	1.25
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.99	0.83	1.19
3rd	1.03	0.85	1.26
4th	0.99	0.79	1.23
Highest quintile (most deprived)	1.28	0.99	1.65
Missing	0.87	0.58	1.31
General health			
Excellent/very good/good	**1**		
Fair	1.14	0.93	1.38
Poor	0.89	0.66	1.22
Equivalised household income quintile			

Highest	**1**		
2nd	0.96	0.80	1.16
3rd	1.09	0.89	1.34
4th	1.00	0.81	1.25
Lowest	1.15	0.90	1.48

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D23: Odds of starting to meet physical activity recommendations			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age**			
16-24	**1**		
25-34	0.82	0.66	1.03
35-44	0.72	0.58	0.89
45-54	0.61	0.49	0.77
55-64	0.50	0.39	0.63
65+	0.29	0.21	0.40
Sex**			
Male	**1**		
Female	0.76	0.69	0.83
Educational attainment**			
Degree or higher	**1**		
A-levels or equivalent	0.99	0.87	1.14
O-levels or equivalent	0.86	0.74	1.00
Other/none	0.69	0.59	0.80
Missing	0.84	0.71	1.00
Employment			
Paid employment/self employed	**1**		
Unemployed	1.04	0.83	1.31
Retired	0.92	0.74	1.15
Student	1.03	0.80	1.33
Other	0.85	0.71	1.01
Ethnic group**			
White British	**1**		
South Asian (Indian, Pakistani, Bangladeshi)	0.76	0.61	0.95
Black African/Caribbean	0.85	0.65	1.12
Other (includes mixed and White other)	1.18	0.98	1.43
Marital status**			
Married, civil partner	**1**		
Single: never married	1.26	1.08	1.47
Single: widowed, divorced	0.93	0.80	1.09
Cohabiting	0.95	0.82	1.11
Area deprivation			
Lowest quintile (least deprived)	**1**		
2nd	0.87	0.76	1.00
3rd	0.83	0.72	0.96
4th	0.80	0.68	0.93
Highest quintile (most deprived)	0.87	0.74	1.03
Missing	0.93	0.69	1.25
General health**			
Excellent/very good/good	**1**		
Fair	0.67	0.58	0.78
Poor	0.32	0.23	0.43
Equivalised household income quintile			

Highest	**1**		
2nd	1.00	0.87	1.16
3rd	0.99	0.85	1.15
4th	0.87	0.74	1.03
Lowest	0.90	0.75	1.08

*Denotes variable significant in regression model: p<0.05

** p<0.01

Table D24: Odds of stopping meeting physical activity recommendations			
	Odds ratios	**95% CI lower**	**95% CI Higher**
Age			
16-24	**1**		
25-34	1.15	0.87	1.51
35-44	1.00	0.75	1.33
45-54	1.13	0.85	1.52
55-64	1.36	0.99	1.86
65+	1.28	0.87	1.89
Sex**			
Male	1		
Female	1.29	1.15	1.45
Educational attainment*			
Degree or higher	1		
A-levels or equivalent	0.95	0.80	1.14
O-levels or equivalent	0.99	0.82	1.19
Other/none	1.28	1.06	1.55
Missing	1.07	0.88	1.31
Employment			
Paid employment/self employed	1		
Unemployed	1.12	0.84	1.50
Retired	1.00	0.77	1.31
Student	0.99	0.74	1.32
Other	1.18	0.93	1.49
Ethnic group			
White British	1		
South Asian (Indian, Pakistani, Bangladeshi)	1.43	1.06	1.92
Black African/Caribbean	1.22	0.85	1.76
Other (includes mixed and White other)	1.10	0.88	1.36
Marital status			
Married, civil partner	1		
Single: never married	0.91	0.74	1.11
Single: widowed, divorced, separated	0.85	0.70	1.04
Cohabiting	0.93	0.77	1.13
Area deprivation			
Lowest quintile (least deprived)	1		
2nd	0.89	0.74	1.06
3rd	1.04	0.86	1.24
4th	0.97	0.80	1.17
Highest quintile (most deprived)	1.21	0.97	1.50
Missing	0.87	0.59	1.29
General health**			
Excellent/very good/good	1		
Fair	1.27	1.01	1.61
Poor	1.95	1.18	3.21
Equivalised household income quintile*			

Highest	1		
2nd	1.03	0.87	1.22
3rd	1.17	0.98	1.41
4th	1.37	1.12	1.69
Lowest	1.24	0.99	1.56

*Denotes variable significant in regression model: p<0.05

** p<0.01

Appendix E: Tables for Chapter 6 – relationship between health behaviour change and experience of life transitions between 2010/11 and 2013/4

Table E1: Prevalence of stopping smoking cigarettes by relationship transitions						
Relationship transitions	**Unadjusted prevalence of stopping cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into relationship						
Not in a relationship at both waves	20	*2083*	*1624*	**Ref. 0.20**		
Moved into a relationship	28	*221*	*244*	+0.06	-0.01	+0.12
Moved out of a relationship						
In a relationship at both waves	26	*2612*	*2272*	**Ref. 0.26**		
Moved out of a relationship	23	*226*	*180*	-0.03	-0.11	+0.04

Table E2: Prevalence of starting smoking cigarettes by relationship transitions						
Relationship transitions	**Unadjusted prevalence of starting cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into relationship						
Not in a relationship at both waves	4	*6678*	*5486*	**Ref. 0.04**		
Moved into a relationship	4	*442*	*594*	-0.01	-0.03	+0.00
Moved out of a relationship**						
In a relationship at both waves	2	*13882*	*13064*	**Ref. 0.02**		
Moved out of a relationship	7	*624*	*564*	+0.04	+0.02	+0.06

**Denotes variable significant in the regression model: P<0.01.

Table E3: Prevalence of stopping binging drinking by relationship transitions						
Relationship transitions	**Unadjusted prevalence of starting binge drinking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into relationship						
Not in a relationship at both waves	47	*1531*	*1198*	**Ref. 0.47**		
Moved into a relationship	53	*206*	*273*	+0.06	-0.01	+0.14
Moved out of a relationship						
In a relationship at both waves	42	*3168*	*2877*	**Ref. 0.43**		
Moved out of a relationship	40	*156*	*136*	-0.07	-0.15	+0.02

Table E4: Prevalence of starting binging drinking by relationship transitions						
Relationship transitions	**Unadjusted prevalence of starting binge drinking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into a relationship						
Not in a relationship at both waves	13	*5268*	*4300*	**Ref. 0.14**		
Moved into a relationship	17	*334*	*421*	-0.00	-0.04	+0.03
Moved out of a relationship**						
In a relationship at both waves	13	*10196*	*9533*	**Ref. 0.13**		
Moved out of a relationship	18	*473*	*422*	+0.06	+0.02	+0.10

**Denotes variable significant in the regression model: P<0.01.

Table E5: Prevalence of starting to meet F&V recommendations by relationship transitions						
Relationship transitions	**Unadjusted prevalence of starting to meet F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into relationship						
Not in a relationship at both waves	12	*7233*	*5809*	**Ref. 0.12**		
Moved into a relationship	12	*579*	*724*	+0.01	-0.02	+0.04
Moved out of a relationship						
In a relationship at both waves	16	*12647*	*11758*	**Ref. 0.16**		
Moved out of a relationship	14	*682*	*590*	-0.01	-0.04	+0.02

Table E6: Prevalence of stopping meeting F&V recommendations by relationship transitions						
Relationship transitions	**Unadjusted prevalence of stopping meeting F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into relationship						
Not in a relationship at both waves	48	*1497*	*1273*	**Ref. 0.48**		
Moved into a relationship	51	*83*	*112*	-0.00	-0.11	+0.10
Moved out of a relationship*						
In a relationship at both waves	41	*3800*	*3531*	**Ref. 0.41**		
Moved out of a relationship	51	*166*	*151*	+0.10	+0.00	+0.19

*Denotes variable significant in the regression model: P<0.05.

Table E7: Prevalence of starting to meet PA recommendations by relationship transitions						
Relationship transitions	**Unadjusted prevalence of starting to meet PA recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into relationship						
Not in a relationship at both waves	17	*6556*	*5361*	**Ref. 0.17**		
Moved into a relationship	21	*467*	*588*	-0.02	-0.06	+0.01
Moved out of a relationship**						
In a relationship at both waves	15	*12519*	*11723*	**Ref. 0.15**		
Moved out of a relationship	19	*676*	*595*	+0.05	+0.01	+0.08

**Denotes variable significant in the regression model: P<0.01.

Table E8: Prevalence of stopping meeting PA recommendations by relationship transitions						
Relationship transitions	**Unadjusted prevalence of stopping meeting PA recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*N*	*n*			
Moved into relationship**						
Not in a relationship at both waves	46	*2131*	*1694*	**Ref. 0.46**		
Moved into a relationship	61	*194*	*249*	+0.16	+0.09	+0.23
Moved out of a relationship						
Not in a relationship at both waves	49	*3896*	*3536*	**Ref. 0.49**		
Moved out of a relationship	47	*169*	*145*	-0.01	-0.10	+0.08

**Denotes variable significant in the regression model: P<0.01.

Table E9: Prevalence of stopping smoking by employment transitions						
Employment transition	**Unadjusted prevalence of stopping cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment						
Not in employed in 2010/11 and 2013/4	11	*208*	*163*	**Ref. 0.11**		
Moved into employment in 2013/4	13	*219*	*171*	+0.02	-0.05	+0.09
Moved out of employment						
Employed in 2010/11 & 2013/4	28	*2471*	*2122*	**Ref. 0.28**		
Moved into unemployment in 2013/4	20	*98*	*81*	-0.07	-0.17	+0.03
Students: moved into employment^**						
Full time student in 2010/11 & 2013/4	50	*37*	*30*	**Ref. 0.59**		
Moved into employment in 2013/4	28	*104*	*78*	-0.34	-0.54	-0.14
Students: moved into unemployment^						
Full time student in 2010/11 & 2013/4	50	*37*	*30*	**Ref. 0.57**		
Moved into unemployment in 2013/14	35	*38*	*31*	-0.26	-0.54	+0.02
Retired						
Employed in both 2010/11 & 2013/4	28	*2471*	*2122*	**Ref. 0.28**		
Retired in 2013/4	30	*110*	*104*	+0.08	-0.03	+0.19

** Denotes variable significant in regression model: P<0.01.

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly.

Table E10: Prevalence of starting smoking by employment transitions						
Employment transition	**Unadjusted prevalence of starting cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment^						
Not in employed in 2010/11 and 2013/4	14	*188*	*156*	**Ref. 0.14**		
Moved into employment in 2013/4	7	*378*	*331*	-0.07	-0.14	+0.01
Moved out of employment*						
Employed in 2010/11 & 2013/4	3	*10694*	*9664*	**+0.03**		
Moved into unemployment in 2013/4	7	*250*	*223*	+0.03	-0.00	+0.06
Students: moved into employment^**						
Full time student in 2010/11 & 2013/4	3	*498*	*432*	**+0.03**		
Moved into employment in 2013/4	8	*614*	*485*	+0.05	+0.02	+0.09
Students: moved into unemployment^**						
Full time student in 2010/11 & 2013/4	3	*498*	*432*	**+0.03**		
Moved into unemployment in 2013/14	13	*116*	*99*	+0.14	+0.04	+0.23
Retired						
Employed in both 2010/11 & 2013/4	3	*10694*	*9664*	**+0.03**		
Retired in 2013/4	1	*786*	*746*	-0.01	-0.03	+0.00

** Denotes variable significant in regression model: P<0.01. * Denotes variable significant in regression model: P<0.05.

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly.

Table E11: Prevalence of stopping binge drinking by employment transitions						
Employment transition	**Unadjusted prevalence of stopping binge drinking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment*^						
Not in employed in 2010/11 and 2013/4	61	*103*	*71*	**Ref. 0.63**		
Moved into employment in 2013/4	47	*151*	*120*	-0.17	-0.32	-0.01
Moved out of employment						
Employed in 2010/11 & 2013/4	39	*3075*	*2775*	**Ref. 0.39**		
Moved into unemployment in 2013/4	37	*83*	*72*	-0.04	-0.16	+0.08
Students: moved into employment^						
Full time student in 2010/11 & 2013/4	46	*76*	*62*	**Ref. 0.44**		
Moved into employment in 2013/4	43	*172*	*137*	+0.01	-0.14	+0.17
Students: moved into unemployment^$						
Full time student in 2010/11 & 2013/4	46	*76*	*62*	**Ref. 0.44**		
Moved into unemployment in 2013/14	59	*35*	*25*	+0.16	-0.09	+0.41
Retiring						
Employed in both 2010/11 & 2013/4	39	*3075*	*2775*	**Ref. 0.39**		
Retired in 2013/4	41	*139*	*131*	+0.02	-0.08	+0.12

$ = age not included in the regression model due to homogeneity of the population

** Denotes variable significant in regression model: P<0.01. * Denotes variable significant in regression model: P<0.05.

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly.

Table E12: Prevalence of starting binge drinking by employment transitions						
Employment transition	**Unadjusted prevalence of starting binge drinking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment^						
Not in employed in 2010/11 and 2013/4	14	*212*	*155*	**Ref. 0.17**		
Moved into employment in 2013/4	15	*302*	*257*	-0.03	-0.13	+0.07
Moved out of employment*						
Employed in 2010/11 & 2013/4	17	*7546*	*7040*	**Ref. 0.17**		
Moved into unemployment in 2013/4	9	*194*	*163*	-0.08	-0.12	-0.03
Students: moved into employment^						
Full time student in 2010/11 & 2013/4	30	*365*	*314*	**Ref. 0.30**		
Moved into employment in 2013/4	26	*354*	*297*	-0.02	-0.10	+0.07
Students: moved into unemployment*^						
Full time student in 2010/11 & 2013/4	30	*365*	*314*	**Ref. 0.31**		
Moved into unemployment in 2013/14	14	*78*	*67*	-0.19	-0.30	-0.08
Retiring						
Employed in both 2010/11 & 2013/4	17	*7546*	*7040*	**Ref. 0.17**		
Retired in 2013/4	13	*638*	*598*	+0.01	-0.03	+0.06

** Denotes variable significant in regression model: P<0.01. * Denotes variable significant in regression model: P<0.05.

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly.

Table E13: Prevalence of starting to meet F&V recommendations by employment transitions						
Employment transition	**Unadjusted prevalence of starting to meet F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment^						
Not in employed in 2010/11 and 2013/4	6	*381*	*304*	**Ref. 0.06**		
Moved into employment in 2013/4	8	*524*	*437*	+0.02	-0.03	+0.06
Moved out of employment*						
Employed in 2010/11 & 2013/4	15	*10515*	*9379*	**Ref. 0.15**		
Moved into unemployment in 2013/4	8	*300*	*261*	-0.06	-0.10	-0.02
Students: moved into employment^						
Full time student in 2010/11 & 2013/4	9	*475*	*415*	**Ref. 0.10**		
Moved into employment in 2013/4	14	*631*	*495*	+0.04	-0.01	+0.09
Students: moved into unemployment^						
Full time student in 2010/11 & 2013/4	9	*475*	*415*	**Ref. 0.09**		
Moved into unemployment in 2013/14	9	*137*	*117*	-0.02	-0.08	+0.05
Retiring						
Employed in both 2010/11 & 2013/4	15	*10515*	*9379*	**Ref. 0.15**		
Retired in 2013/4	19	*643*	*607*	+0.02	-0.02	+0.06

** Denotes variable significant in regression model: P<0.01. * Denotes variable significant in regression model: P<0.05.

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly.

Table E14: Prevalence of stopping meeting F&V recommendations by employment transitions						
Employment transition	**Unadjusted prevalence of stopping meeting F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment^						
Not in employed in 2010/11 and 2013/4	69	*16*	*14*	**Ref. 0.75**		
Moved into employment in 2013/4	65	*72*	*65*	-0.12	-0.47	+0.23
Moved out of employment						
Employed in 2010/11 & 2013/4	42	*2627*	*2382*	**Ref. 0.42**		
Moved into unemployment in 2013/4	42	*47*	*43*	-0.00	-0.16	+0.15
Students: moved into employment^$						
Full time student in 2010/11 & 2013/4	67	*59*	*47*	**Ref. 0.64**		
Moved into employment in 2013/4	55	*84*	*66*	-0.06	-0.26	+0.14
Students: moved into unemployment£						
Full time student in 2010/11 & 2013/4	67	*59*	*47*	**Ref. 0.67**		
Moved into unemployment in 2013/14	67	*13*	*10*	-0.01	-0.34	+0.32
Retired						
Employed in both 2010/11 & 2013/4	42	*2627*	*2382*	**Ref. 0.42**		
Retired in 2013/4	35	*247*	*239*	-0.04	-0.11	+0.04

$ = health status not included in the regression model due to homogeneity of the population
£ = age, education, and health status not included in the regression model due to homogeneity of the population
** Denotes variable significant in regression model: P<0.01. * Denotes variable significant in regression model: P<0.05.
^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly.

Table E15: Prevalence of starting to meet PA recommendations by employment transitions						
Employment transition	**Unadjusted prevalence of starting to meet PA recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment^						
Not in employed in 2010/11 and 2013/4	16	*315*	*254*	**Ref. 0.18**		
Moved into employment in 2013/4	25	*420*	*356*	0.06	-0.01	+0.14
Moved out of employment						
Employed in 2010/11 & 2013/4	20	*9495*	*8577*	**Ref. 0.20**		
Moved into unemployment in 2013/4	20	*266*	*239*	0.01	-0.05	+0.06
Students: moved into employment^						
Full time student in 2010/11 & 2013/4	37	*297*	*266*	**Ref. 0.37**		
Moved into employment in 2013/4	29	*415*	*330*	-0.08	-0.17	+0.01
Students: moved into unemployment**						
Full time student in 2010/11 & 2013/4	37	*297*	*266*	**Ref. 0.38**		
Moved into unemployment in 2013/14	15	*92*	*81*	-0.24	-0.35	-0.14
Retired						
Employed in both 2010/11 & 2013/4	20	*9495*	*8577*	**Ref. 0.19**		
Retired in 2013/4	14	*712*	*678*	+0.01	-0.03	+0.05

** Denotes variable significant in regression model: P<0.01.

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly

Table E16: Prevalence of stopping meeting PA recommendations by employment transitions						
Employment transition	**Unadjusted prevalence of stopping meeting PA recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Moved into employment						
Not in employment at both waves	52	*82*	*65*	**Ref. 0.51**		
Moved into employment at W5	46	*176*	*145*	-0.04	-0.20	+0.11
Moved out of employment						
Employment at both waves	46	*3644*	*3183*	**Ref. 0.46**		
Moved into unemployment at W5	55	*80*	*64*	+0.07	-0.07	+0.21
Students: moved into employment^						
Student at both waves	40	*234*	*194*	**Ref. 0.39**		
Moved into employment	44	*303*	*233*	+0.06	-0.05	+0.17
Students: moved into unemployment^						
Student at both waves	40	*234*	*194*	**Ref. 0.40**		
Moved into unemployment	48	*62*	*49*	+0.05	-0.14	+0.23
Retired						
Employed at both waves	46	*3644*	*3183*	**Ref. 0.47**		
Retired at wave 5	49	*179*	*168*	-0.05	-0.14	+0.04

^ The base size for regression models are slightly lower than the unadjusted prevalence rates. This is because some cases were dropped in the regression model where category membership in some of the control variables predicted failure perfectly

Table E17: Prevalence of stopping smoking cigarettes by changes in equivalised household income						
Household income change	**Unadjusted prevalence of stopping cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	23	*2194*	*1840*	**Ref. 0.23**		
Income increased	22	*1899*	*1579*	-0.01	-0.04	+0.02
Income decreased						
Income stable	23	*2194*	*1840*	**Ref. 0.23**		
Income decreased	26	*1027*	*880*	+0.03	-0.01	+0.07

Table E18: Prevalence of starting smoking cigarettes by changes in equivalised household income						
Household income change	**Unadjusted prevalence of starting cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	***n***	***n***			
Income increased						
Income stable	3	*9984*	*9000*	**Ref. 0.03**		
Income increased	3	*7684*	*7014*	+0.00	-0.00	+0.01
Income decreased						
Income stable	3	*9984*	*9000*	**Ref. 0.03**		
Income decreased	3	*3904*	*3644*	+0.01	-0.00	+0.01

Table E19: Prevalence of stopping binged drinking by changes in equivalised household income						
Household income change	**Unadjusted prevalence of stopping binging**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	44	*2294*	*2032*	**Ref. 0.44**		
Income increased	45	*1835*	*1601*	+0.01	-0.03	+0.04
Income decreased						
Income stable	44	*2294*	*2032*	**Ref. 0.44**		
Income decreased	41	*903*	*823*	-0.02	-0.07	+0.02

Table E20: Prevalence of starting binge drinking by changes in equivalised household income						
Household income change	**Unadjusted prevalence of starting binging**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	14	*7576*	*6797*	**0.14**		
Income increased	14	*5657*	*5073*	0.00	-0.01	0.01
Income decreased*						
Income stable	14	*7576*	*6797*	**0.14**		
Income decreased	12	*3014*	*2780*	-0.02	-0.03	-0.00

* Denotes variable significant in regression model: P<0.05.

Table E21: Prevalence of starting to meet F&V recommendations by changes in equivalised household income						
Household income change	**Unadjusted prevalence of starting to meet F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	15	*9599*	*8493*	**0.15**		
Income increased	13	*7659*	*6845*	-0.01	-0.02	0.00
Income decreased						
Income stable	15	*9599*	*8493*	**0.15**		
Income decreased	15	*3828*	*3493*	-0.00	-0.02	0.01

Table E22: Prevalence of stopping meeting F&V recommendations by changes in equivalised household income.						
Household income change	**Unadjusted prevalence of starting to meet F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	42	*2549*	*2319*	**Ref. 0.42**		
Income increased	44	*1895*	*1719*	+0.01	-0.02	+0.05
Income decreased						
Income stable	42	*2549*	*2319*	**Ref. 0.42**		
Income decreased	45	*1082*	*1009*	+0.03	-0.01	+0.08

Table E23: Prevalence of starting to meet PA recommendations by changes in household income						
Household income change	**Unadjusted prevalence of starting to meet PA recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	16	*9247*	*8268*	**Ref. 0.16**		
Income increased	16	*7231*	*6533*	+0.00	-0.01	+0.01
Income decreased						
Income stable	16	*9247*	*8268*	**Ref. 0.16**		
Income decreased	16	*3671*	*3409*	+0.00	-0.01	+0.02

Table E24: Prevalence of stopping meeting PA recommendations by changes in household income						
Household income change	**Unadjusted prevalence of stopping meeting recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
Income increased						
Income stable	48	*2880*	*2529*	**Ref. 0.47**		
Income increased	49	*2292*	*2008*	+0.01	-0.02	+0.05
Income decreased						
Income stable	48	*2880*	*2529*	**Ref. 0.47**		
Income decreased	51	*1213*	*1074*	+0.04	-0.00	+0.08

Table E25: Prevalence of stopping smoking by addition of child to previously child-free household						
Addition of child to household	**Unadjusted prevalence of stopping cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	23	*3077*	*2548*	**Ref. 0.23**		
Yes	34	*189*	*179*	+0.05	-0.03	+0.13

Table E26: Prevalence of starting smoking by addition of child to previously child-free household						
Addition of child to household	**Unadjusted prevalence of starting cigarette smoking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	2	*14218*	*12538*	**Ref. 0.02**		
Yes	3	*744*	*712*	-0.00	-0.01	+0.01

Table E27: Prevalence of stopping binge drinking by addition of child to previously child-free household						
Addition of child to household	**Unadjusted prevalence of stopping binge drinking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	45	*3127*	*2764*	**Ref. 0.45**		
Yes	50	*203*	*198*	+0.07	-0.02	+0.15

Table E28: Prevalence of starting binge drinking by addition of child to previously child-free household						
Addition of child to household*	**Unadjusted prevalence of starting binge drinking**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	12	*10622*	*9348*	**Ref. 0.13**		
Yes	13	*584*	*537*	-0.04	-0.07	-0.01

*Denotes variable significant in regression model: p< 0.05.

Table E29: Prevalence of starting to meet F&V recommendations by addition of child to previously child-free household						
Addition of child to household	**Unadjusted prevalence of starting to meet F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	15	*13250*	*11434*	**Ref. 0.15**		
Yes	13	*780*	*741*	-0.01	-0.04	+0.03

Table E30: Prevalence of stopping meeting F&V recommendations by addition of child to previously child-free household						
Addition of child to household	**Unadjusted prevalence of stopping meeting F&V recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	41	*3980*	*3595*	**Ref. 0.41**		
Yes	49	*149*	*147*	+0.05	-0.06	+0.17

Table E31: Prevalence of starting meeting PA recommendations by addition of child to previously child-free household						
Addition of child to household**	**Unadjusted prevalence of starting to meet PA recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	14	*13254*	*11596*	**Ref. 0.15**		
Yes	17	*626*	*622*	-0.05	-0.07	-0.03

**Denotes variable significant in regression model: p<0.01.

Table E32: Prevalence of stopping meeting PA recommendations by addition of child to previously child-free household						
Addition of child to household	**Unadjusted prevalence of stopping meeting recommendations**	**Bases**		**Average Marginal Effect (percentage point change from reference group)**	**95% CI lower**	**95% CI upper**
		Weighted	**Unweighted**			
	%	*n*	*n*			
No	48	*3899*	*3373*	**Ref. 0.48**		
Yes	51	*304*	*266*	+0.08	+0.01	+0.16

*Denotes variable significant in regression model: p< 0.05.

Appendix F: Rapid Evidence Assessment: Search protocols

Background

Objective 3 aims to explore whether certain life transitions are related to changes in health behaviours, and if so, in what way. The following four life transitions were considered:

- Changes in relationship status – moving from being in a relationship to not being in a relationship, and vice versa
- Changes in employment – focusing on key transitions, such as moving from employment to unemployment and vice versa, moving from full time education to paid employment etc.
- Changes in income – defined as changes in income of +/- 20% between 2010/11 and 2013/4
- Adding a child to a household.

For each of the four health behaviours (smoking, drinking, F&V consumption, PA), we conducted a Rapid Evidence Assessment (REA) to identify pertinent literature and evidence relating to the relationship between each life transition and changes in each health behaviour. This meant sixteen different REAs were conducted in total. A REA is a technique recommended by the Government Social Research Unit[25] and is a delineated form of evidence review undertaken to establish the scope and strength of the evidence in areas where existing review evidence is limited. It uses the same principles as a broader evidence assessment in that it is conducted with clear research questions and predefined inclusion and exclusion criteria (see Table F1) but, as a rapid review, is conducted within a short time frame and thus considers fewer outputs in lesser detail.

Although sixteen different REAs were conducted in total, the search protocol was the same for each and is shown below. Searches were conducted using PubMed and University of Glasgow Advance Serial Solution, which is the University's main searching and citation database, searching print and online records held by the University and beyond. Both primary studies and systematic/critical reviews were identified and are included in our review.

Table F1: Search protocol for the REAs

Research question	What evidence is there about the relationship between a) changes in relationship status, b) changes in employment status, c) changes in income and d) having/adding a child to a household and changes in smoking behaviour/drinking behaviour/F&V consumption/PA levels?
Methods	
Search databases:	
Academic	PubMed, University of Glasgow Advance Serial Solution.
Grey literature	None
Search terms (in title/abstract)	Change(s) + smoking + (relationship status/marital status) OR change(s) + (binge drinking/alcohol consumption) + (relationship status/marital status) OR change(s) + (binge fruit and vegetable/dietary change) + (relationship status/marital status) OR change(s) + (exercise/physical activity) + (relationship status/marital status) OR Change(s) + smoking + (employment/jobs/unemployment)OR change(s) + (binge drinking/alcohol consumption) + (employment/unemployment)OR change(s) + (binge fruit and vegetable/dietary change) + (employment/unemployment)OR change(s) + (exercise/physical activity) + (employment/unemployment) OR Change(s) + smoking + household income OR change(s) + (binge drinking/alcohol consumption) + household income OR change(s) + (binge fruit and vegetable/dietary change) + household income OR change(s) + (exercise/physical activity) + household income OR Change(s) + smoking + (childbirth/having child(ren)/parenthood) OR change(s) + (binge drinking/alcohol consumption) + (childbirth/having child(ren)/parenthood) OR change(s)

	+ (binge fruit and vegetable/dietary change) + (childbirth/having child(ren)/parenthood) OR change(s) +(exercise/physical activity) + (childbirth/having child(ren)/parenthood).
Inclusion criteria:	
Types of studies	Systematic reviews and primary studies included. Types of primary studies included: longitudinal studies; cohort studies; cross-sectional follow-up studies. Types of primary studies excluded: cross-sectional; RCTs; pilot, localised or regional intervention studies.
Types of participant	Adults aged 16 and over living in the general population (not institutions or special population groups).
Types of articles	Studies that present empirical data about changing health behaviours over time and their relationship to one of the four life transitions. Comment/discussion articles excluded.
Types of comparisons	Changing behaviour over time.
Types of outcome measure	Rates of changing health behaviours over time; variance in rates among those experiencing different life events.
Other	English only; online access online; focus on OECD countries
Data collection and analysis:	
Selection of studies	Searches will be conducted and screened according to the selection criteria by the review authors (HW & DP). The full text of any potentially relevant papers will be retrieved for closer examination. All studies which initially appear to meet the inclusion criteria but on inspection of the full text paper do not meet the inclusion criteria will be documented. Overall figures for all sixteen reviews combined are shown in below; individual results for each REA are available from the authors.
Data extraction	Data extracted for each article will include: • Author • Year of publication • Year of study • Country or region of study • Study type • Population/sample size • Results • Quality assessment* *see below
Assessment of methodological quality	Studies will be assessed using the Government Social Research Unit's Framework for Assessing Quality. This considers the following domains: **Conceptual framing**: Does the study acknowledge existing research? Does the study pose a research question or outline a hypothesis? **Transparency**: Is it clear what is the geography/context in which the study was conducted? Does the study present or link to the raw data it analyses? Does the study declare sources of support/funding? **Appropriateness of method:** Does the study identify a research design and data collection and analysis methods? Does the study demonstrate why the chosen design and method are well suited to the research question? **Internal validity**: To what extent is the study internally valid? **Cultural/context sensitivity**: Does the study explicitly consider any context-specific cultural factors that may bias the analysis/findings? **Cogency**: To what extent does the author consider the study's limitations and/or alternative interpretations of the analysis? Are the conclusions clearly based on the study's results (rather than on theory, assumptions or policy priorities)? **Systematic reviews:** Does the study describe where and how studies were selected for inclusion? Does the study assess the quality of the studies included? Does the study draw conclusions based on the reviews conducted?

Data synthesis	Summary of findings and strength of evidence tables will be produced (these are available on request from the authors). Descriptive summaries about the relationship between health behaviour change and life transitions will be generated, see below.

Search results:

Overall, 4962 papers were identified across the 16 searches. 4673 were excluded on initial screening and 220 shortlisted for further review. Of these, 87 were duplicates between the two databases and 60 were excluded based on fuller examination of the paper (see Table F2 for details for each individual search and reasons for exclusion). In total, 73 papers were retrieved and fully reviewed.[25] Table F2 summarises the search results for each individual REA.

Table F2: REA search results

Search	Total identified	Total excluded	Shortlist	Duplicates removed from shortlist	Excluded after shortlist (including reasons)	Additional studies identified in other searches	Number of studies for full review
Smoking and marital/relationship behaviour change	255	234	9	2	4 (2 analysed marital status, not change in status; 1 not OECD country; 1 only focused on 18-20 year-olds);	1	4
Smoking and employment change	499	476	24	10	7 (3 used macro data on unemployment change, not change for individuals; 1 analysed data cross-sectionally; 1 was intervention study; 1 looked at the impact of stopping smoking on employment change; 1 focused on special population group)	0	7
Smoking and income change	609	593	16	5	8 (3 looked at impact of specific US tax credit; 3 looking at macro level changes in either health behaviours or income; 1 is a review; 1 based on cross-sectional data	1	4
Smoking and adding a child	143	124	19	5	9 (5 small base sizes <200; 1 intervention study; 2 looking at cross-sectional data; 1 about smoking during pregnancy)	0	5
Drinking and marital/relationship behaviour change	276	253	23	9	8 (7 did not look at change in marital status; 1 small base sizes (<200);	1	7
Drinking and employment change	513	417	38	25	3 (1 small base sizes (<200); 1 uses data cross-sectionally; 1 focused on specific sub group)	0	10
Drinking and income change	591	577	14	6	6 (2 focused on macro trends; 2 did not look at household income change; 1 review; 1 focused on comparisons between	1	3

[25] Because of the number of studies included, we have not presented a summary of each study in this report. This information is available on request from the authors.

					special population groups)		
Drinking and adding a child	115	105	10	3	0	0	7
F&V and marital/relationship behaviour change	47	43	4	1	0	0	3
F&V and employment change	135	130	5	2	3 (2 did not look at employment change; 1 focus group of US women)	0	0
F&V and income change	506	500	6	0	5 (3 looked at macro changes in income; 1 review of interventions; 1 focused on special population group)	0	1
F&V and adding a child	158	152	6	2	2 (2 did not look at diet changes)	0	2
PA and marital/relationship behaviour change	255	248	7	2	1 (did not look at PA change over time)	1	5
PA and employment change	371	352	19	10	2 (did not look at either PA change or employment change)	1	8
PA and income change	334	327	7	1	5 (3 did not look at changes in income; 1 used macro data only; 1 was comment article)	0	1
PA and adding a child	155	142	13	4	4 (3 did not include PA change/did not present results; 1 did not look at change in number of children)	1	6

Descriptive summary of findings from the REA

A) Marital/Relationship transitions

Smoking

There was mixed evidence about the relationship between marital/relationship transitions and changes in smoking behaviour. One UK-based study found no relationship between stopping or starting smoking, once other confounders were taken into account (Giordano & Lindstrom, 2010). A further study from the USA found no relationship between getting married and starting or stopping smoking though they did find that getting divorced increased the odds of smoking (Kutob et al, 2017). Two further studies, one French and one from the USA, highlighted a significant relationship between marriage and smoking, with the odds of smoking being lower among those who got married (Tamers et al, 2015; Merline & Schlenberg, 2008). Tamers et al (2015) also demonstrated a relationship between divorce and smoking, with the odds of smoking being lower among those who got divorced (the converse pattern to that reported by Kutob et al, 2017).

Overall, there is some evidence that marital or relationship transitions are associated with changing smoking behaviour, but the evidence is mixed and the patterns are not consistent between studies. Some studies found no relationship with marriage, others found a decrease in smoking among those who got married. The only UK-based study located through our review showed no relationship between any marital/relationship transition and smoking behaviour once changes in other factors, like income and education change, were taken into account.

Drinking

Eight studies were included in the review, including five from the USA. Four of the eight studies found that getting married or entering a new relationship was associated with reduced alcohol consumption, including one study from the UK (Merline et al, 2008; Kretsch & Paige, 2014; Vladimirov et al, 2016; Staff et al, 2014). One other study found no relationship between marriage and alcohol consumption (Molander et al, 2010); and two studies found that among older people marriage and remarriage increased alcohol consumption (Reczek et al, 2016; Kutob et al, 2017).

The relationship with divorce or leaving a relationship was mixed. Of the studies that looked at this (5 out of the 8), two found no relationship between becoming divorced and changing alcohol consumption (Molander et al, 2010; Kutob et al, 2017), two found that alcohol consumption increased among those who became divorced or left a relationship (Reczek et al, 2016; Kretsch & Paige, 2014) and one study of older people in Finland found that leaving a relationship was a predictor of increased consumption among men but of decreased consumption among women (Vladimirov et al, 2016).

There appears to be a relationship between marital/relationship transitions and changes in alcohol consumption, though the findings are by no means consistent across studies. Half of the studies reviewed found that marriage reduced alcohol consumption and half of the studies which considered divorce/separation found that this increased alcohol consumption. The studies reviewed looked at patterns for different genders and age cohorts and potentially highlight that patterns may differ particularly for older women.

F&V

Only three studies meeting the inclusion criteria for our review looked at marital/relationship transitions and changing fruit and vegetable consumption. The evidence was mixed. One Australian study found no relationship between marital transitions and changing dietary quality (Smith et al, 2017). One study of mid-age/older adults in Norfolk, UK, found a relationship for men but not women, with men who became separated, divorced or widowed reducing their fruit and vegetable consumption (Vinther et al, 2016). A final study from Switzerland found that vegetable intake reduced for those who became partnered (Hartmann et al, 2014).

There seems to be a paucity of evidence about the impact of marital/relationship transitions on fruit and vegetable consumption and what evidence exists is mixed. The single UK-based study of older people showed different impacts for men and women.

PA

Two systematic reviews were identified examining the relationship between physical activity changes and marital/relationship transitions (Enberg et al, 2012; Allender et al, 2008). Both reviews had similar results, with the evidence being mixed. Enberg et al (2012) included 12 studies, which showed mixed results. Three studies showed no relationship between marital/relationship transitions and physical activity whereas three further studies, focusing on younger women, showed a decline in physical activity among those who became married. Other studies, however, showed that starting a relationship or getting remarried (among older women) was associated with an increase in physical activity.

Looking at the impact of separation or divorce, studies included in the review by Enberg et al (2012) tended to show that physical activity increased after divorce among men but that results for women were mixed. Two further studies, not included in Enberg et al's (2012) review, were considered. One showed that among young women, odds of decreasing levels of physical activity were higher among those who became married. Among middle aged women, widowhood was associated with an

increase in physical activity though this was not observed among older women (Brown et al, 2011). The final study showed no relationship between marital/relationship transitions and physical activity, though the study may have been underpowered to detect such changes (Hull et al, 2010).

Overall, there appears to be some emerging evidence that, among young women, marriage is associated with lower levels of physical activity and that, among men, divorce is associated with an increase in physical activity. However, these patterns were not universal across all studies considered and there were no recent studies identified focusing on patterns of change in the UK.

B) Employment transitions

Smoking

Seven studies examined the relationship between employment transitions and changing smoking behaviour, two of which looked at the impact of retirement and found that retiring was associated with stopping smoking (Lang et al, 2007; Tamers et al, 2015). Lang et al (2007) used the English Longitudinal Study of Aging to explore this. The other five studies (including one using UK data; Giordano & Lindstrom, 2011) looked at the relationship between other employment transitions and smoking behaviour. Four studies considered the relationship between becoming unemployed or involuntary job loss and smoking behaviour, and three of these found this to be associated with an increase in smoking (Golden & Perreira, 2015; Arcaya et al, 2015; Giordano & Lindstrom, 2011). However, Arcaya et al (2015) found this association for men and not women. The fourth study found no association between employment transitions and changing smoking status, though the authors did note that smoking rates increased most among chronically unemployed women (those who were unemployed across a number of years) (Virtanen et al, 2008). A final study found that moving into employment increased the odds of smoking, which the authors interpreted as people having more money with which to purchase cigarettes (Blakely et al, 2014).

Overall, there is some broadly consistent evidence that becoming unemployed or remaining unemployed is associated with an increase in smoking.

Drinking

Eleven studies were reviewed which explored the relationship between employment transitions and alcohol consumption, two of which found no relationship between any employment transition once other cofounders had been taken into account (Vladimirov et al, 2016; van der Deen et al, 2014). Five studies looked at becoming unemployed, three of which found a relationship between becoming unemployed and increased levels of alcohol consumption (Popovici & French, 2013; Bosque-Prous et al, 2015; Molander & Yorke, 2010; Virtanen et al, 2008), though Virtanen et al (2008) only observed this for men and not women. The fifth study found that becoming unemployed lead to a one-unit reduction in alcohol consumption (Arcaya et al, 2014).

Three studies examined entering employment and found mixed results. Virtanen et al (2008) found, among men, that an upward employment trajectory (i.e. moving from unemployment to employment or ad hoc employment to more permanent employment) was associated with a decrease in alcohol consumption – but no such pattern for women. Colell et al (2014) found that women who became employed after being 'home makers' increased their alcohol consumption. Staff et al (2013) also found that employment was associated with increased alcohol intake.
Zins et al (2011) looked at the transition from employment to retirement (among employees of Electricité de France-Gaz de France) and found an increase in the proportion of heavy drinkers around the period of retirement among both men and women, followed by a decrease post retirement - with some variation by socioeconomic category.

There is evidence that changing employment status is related to changing alcohol consumption. Broadly speaking, it appears that becoming unemployed is associated with an increase in consumption whereas the pattern for becoming employed is more mixed. As previously, there is some evidence that patterns differ for men and women and that these associations may be related to life stage and prior economic activity.

F&V

No studies were identified that looked at the relationship between employment transitions and fruit and vegetable consumption.

PA

Evidence from a systematic review (Engberg et al, 2012) reported that starting paid employment was associated with decreasing levels of physical activity among younger men and women, that retirement was associated with increased levels of physical activity and that becoming a student was associated with reduced levels of physical activity. A further five studies and one additional review were located through the REA and broadly confirmed these findings (Koeneman et al, 2012; Feng et al, 2016; Virtanen et al 2008; Hivensalo et al, 2011; Barnett et al 2013; Brown et al, 2011), although Barnett et al (2013) pointed out that changes in PA among those retiring very much depended on the type of job people were retiring from. Barnett et al (2013) found that retirement was associated with a reduction in occupational and travel activity and an increase in recreational and household activity. The net pattern was actually a decrease in PA overall. This was the sole study reviewed based on UK data.

Across all studies, there was very little insight into the impact of unemployment upon PA. One study among older adults saw light levels of PA increase among older adults who became unemployed (Hivensalo et al, 2011) whereas another study (Virtanen et al, 2008) saw a reduction in PA among women who became unemployed, though this pattern was not evident for men.

Broadly speaking, moving into paid employment seems to be associated with a reduction in PA whereas becoming retired is associated with an increase in leisure time PA. The net impact on overall levels of PA among those retiring is contingent on what their occupation was prior to this. There is little evidence about the impact of unemployment on PA.

C) Income transitions

Smoking

Very few studies were identified that looked at the impact on individual changes in personal or household income and smoking behaviour. Of the four studies reviewed, three found no association between changing income and changing smoking status (Giordano & Lindstrom, 2011; Golden & Perreira, 2015; Young-Hoon, 2012). Blakely et al (2014) found that the odds of smoking increased as income increased and, correspondingly, that the odds of smoking decreased as income decreased. This was broadly supported by Young-Hoon (2012) who overall found no association between income change and smoking behaviour unless the income change moved someone out of poverty. Those whose increase in income moved them out of poverty were less likely to stop smoking than those whose income stayed the same.

Drinking

As with smoking, there were few studies that looked at the relationship between income change and alcohol consumption change. Those that did showed mixed results. One study found no relationship between changing income and alcohol consumption (van der Deen et al, 2014) though noted an

increase in subjective individual deprivation was associated with slight increase in average alcohol consumption. Similarly, Kalousova & Burgard (2014) found that a perceived reduction in economic resources was associated with an increase in harmful and hazardous levels of drinking whereas Olafsdottir and Asgeirsdottir (2015) found that reduced incomes were associated with reductions in alcohol consumption among men but not women.

F&V

Only one study examined the relationship between changing income and diet. This study looked at the impact of changing household income on children's diet and so is only indirectly relevant for this project. The authors found no relationship and concluded that changes in income do not predict changes in diet very well (Skafida & Treanor, 2014).

PA

Engberg et al's (2012) systematic review of factors associated with changing PA included just one study which looked at the relationship with changing income. This focused on women and found that a decrease in income was associated with a decrease in PA among younger women, whereas among older women, a decrease in income was associated with an increase in PA (this may be related to changing employment status, moving from employment to retirement). No further studies were identified.

D) Adding children/having children

Smoking

There is a well-established body of literature examining changes in smoking behaviour during pregnancy. The REA focused on longitudinal evidence for continued behaviour change post-partum, as this best reflects our analysis for objective 3, whereby we are looking at behaviour change over a three year period.

The REA identified five studies, including one critical review. All studies noted that having a child/pregnancy was associated with changes in smoking behaviour but that often this did not lead to sustained behaviour change. Among smokers who quit during pregnancy, resumption of smoking post-partum was common. Martin et al (2008) estimated that 60% of smokers who quit during pregnancy started smoking again post-partum. Similar patterns were found by Gilbert et al (2015) in their study of Canadian first-time mothers. Interestingly, Martin et al (2008) also found that 3% of those who were non-smokers pre- and during pregnancy started smoking post-pregnancy. Mumford and Lie (2016) categorised mothers into five different groups based on their smoking status over a five year period. 70% of mothers were persistent non-smokers but 12% were persistent smokers. The rest had variable smoking behaviour, smoking prior to pregnancy, stopping during pregnancy and then seeing a smoking relapse at some point in the next five years.

Common correlates of smoking resumption were: living with other smokers, whether the mother continued to breastfeed (or had ever breastfed) and alcohol consumption (Meernik et al, 2015; Martin et al, 2015; Mumford & Liu, 2016). Only one study was identified that looked at the impact of having a child upon the smoking behaviour of partners. This study saw a slight reduction in smoking among partners during pregnancy but that quit rates were very low compared to women and, as with women, a high degree of resumption of smoking post-partum (Kaneko et al, 2008).

Having a child is clearly associated with changes in smoking behaviour, but there are a range of trajectories evident and positive behaviour change tends not to be sustained for the majority. There appears to be little evidence on the impact of having a child on the smoking status of partners.

Drinking

There was a fairly consistent pattern among the articles reviewed that alcohol consumption reduced among those who became parents. However, one study of alcohol consumption among mothers in Norway found that their alcohol consumption increased post-partum compared with the three months prior to pregnancy (Mellingen et al, 2015). It is unclear whether the women reduced their alcohol consumption whilst trying to conceive and thus whether this influenced results.

The association between parenthood and reduced alcohol consumption was subject to some mediating factors. For example, Staff et al (2014), using UK data, noted that changes in alcohol consumption depended on the age of the child, with alcohol use being lower when the parent resides with a child under the age of 5 compared with those who do not. They also noted that changes in number of units of alcohol consumed were related to the age of the child. The authors stated that:

> "Heavy-daily drinking was less likely when respondents resided with young children. Women, but not men, were also less likely to drink heavily when they resided with school-aged children (i.e. ages 5–16). Residing with older children was not related to changes in heavy-daily drinking….men in particular showed a slight increase in alcohol consumption when they resided with older children (i.e. ages 17–21)".

Mellingen et al (2015) in a study of Norwegian mothers noted that those who were married increased their frequency of consumption the most whilst those who were single increased their frequency the least. Single mothers, however, had a greater increase in number of units consumed than other mothers, suggesting that they consumed more alcohol on the days they drank. For one study in the USA, results varied based on the age at which people became parents. For those becoming parents in their early twenties, alcohol consumption reduced. Those who became parents as adolescents saw their alcohol consumption increase (though it is not clear whether this is associated with the legal age of consumption) (Little et al, 2009).

F&V

Only two studies were identified which examined the relationship between becoming parents and changes in F&V consumption. These showed mixed results. One study from the USA found no relationship between becoming a parent and changes in F&V intake. However, this study looked at changes over a seven year period which may have been too long to detect any shorter terms changes (Laroche et al, 2012). Hartmann et al (2014) found different relationships for men and women. Among women, becoming a parent was associated with an increase in vegetable (but not fruit) consumption whereas among men, it was associated with a decrease in vegetable (but not fruit) consumption.

PA

Engberg et al's (2012) systematic review of evidence relating to changes in PA included focus on pregnancy and having children. Of the eight studies included in Engberg et al's review, four found that PA levels decreased post pregnancy compared with pre-pregnancy levels for mothers. Two studies found no significant differences and the two other studies looked at pre-pregnancy to pregnancy changes. Engberg et al (2012) also noted how the type of activity that mothers take part in may change, with some studies reporting that new mothers had lower levels of occupational activity and participation in formal sports and exercise but increased participation in activities like walking and household activity.

Two further studies, not included in Engberg's review, were included in the REA. These broadly confirmed the association between adding a child to the household and a reduction in PA (Brown et al, 2011; Hull et al, 2010). Hull et al (2010) noted a different pattern for men and women. Among

men, the addition of the first child to a household was associated with a decrease in PA but there were no changes for women. However, among women, adding a subsequent child to the household was associated with a decrease in PA. The equivalent pattern was not observed for men. In this study, the major change for men seems to be adding the first child whereas for women it is adding a subsequent child.

Finally, two qualitative studies explored reasons and motivations for PA change after having children. Garfield et al (2010) explored attitudes to PA among American fathers, who stated that having children motivated them to stay fit and that fitness improved because they 'ran around' more after their kids. Hamilton and White's (2010) exploration of PA change with parents displayed different views, with parents reporting general declines in activity for a variety of reasons, though also noting the switch from formal to informal forms of activity.