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Introduction to this issue

John Bynner
Executive Editor

This issue of the journal coincides with a key stage of the journal's history. It marks the end of the Nuffield Foundation development grant, for which our heartfelt thanks, and transition from publication by *Longview* to the *Society for Longitudinal and Life Course Studies*, who now become financially responsible for the journal. As the Society builds membership and fee income to support its work, we are being helped in the task of assuring the journal's future by co-sponsorship over the next three years from the Department of Psychiatric Methodology, VU University Medical Center, Amsterdam, and the Institute for Social and Economic Research, University of Essex, shortly to be joined we hope by others. Welcome aboard!

This month's Issue has a number of special features. It starts with a Special Section comprising 8 papers related to the launch of the worlds' biggest household panel survey - the newly launched 40,000 household-based *Understanding Society* at the University of Essex - describing the survey's special design features and presenting a set of papers reporting findings from a range of authors. These studies mainly draw on the predecessor British Household Panel Survey to demonstrate the value of household panel data in its own right and to introduce the research potential offered by the new survey. This is followed by a three-author individual paper on the short and long-term social and family outcomes of 'Single-sex and co-educational secondary schooling', a methodological debate about a previously published paper on 'Social class returns to higher education' and the response to a book review symposium published in the last issue on 'A companion to cohort studies. A rich feast that we hope you enjoy!

European Child Cohort Network and Society for Longitudinal and Life Course Studies: International Conference

"Childhood and Beyond: tracing cohorts across the lifecourse"
PARIS, France, 29-31 October 2012

CALL FOR CONTRIBUTIONS

Closing date for submissions – 15th March 2012.

This is the final conference of the ESF-funded *European Child Cohort Network* (EUCCONET), joint with the third conference of the *Society for Longitudinal and Life Course Studies* (SLLS).

It will feature reports and research from the teams following the multi-purpose child cohort studies in EUCCONET, as well as wider in research on the whole life course and longitudinal methodology from an international and interdisciplinary perspective.

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GUEST EDITORIAL
The Origins of Understanding Society

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(Received May 2011 Revised December 2011)

Keywords *Understanding Society,* history, household panel study

Understanding Society, the UK Household Longitudinal Study, is a new household panel survey motivated by the success of longitudinal studies in the UK, and funded by the UK Economic and Social Research Council (ESRC) with co-funding from UK government departments. The UK has a diverse and rich portfolio of longitudinal studies including the British Household Panel Survey (BHPS), based on 5,500 households, which ran for eighteen years from 1991 and is the predecessor of *Understanding Society*. The BHPS continues to be a widely used dataset in the UK and internationally, but as the panel matured it was recognised there was a need to look to the future of longitudinal data resources for the coming decades in the UK. The ESRC and the wider academic community saw this as a strategic priority to meet the emerging data needs of the social science and policy-making communities. The ESRC were successful in establishing funding for a new study which would incorporate the existing BHPS sample but with an expanded and ambitious scientific research agenda. What follows is a short description of the study's development to date to provide the background for the papers included in this special section.

In July 2005, the ESRC submitted a pivotal bid to the UK Government's Large Facilities Capital Fund, which typically funds key infrastructural investments across the natural sciences. The success of this bid represented a sea change in funding mechanisms for the social sciences, with the growing recognition that large data sets are the key infrastructural investments for the social sciences, equivalent to laboratories for the natural sciences such as the Large Hadron Collider facility in Geneva. The bid sought funding for a new and much larger household panel study, following a consultation report carried out by *Longview,* which recommended renewal and major expansion of the BHPS (Martin et al 2004). In May 2006, the then Office for Science and Information agreed funding for the new household panel study.

The new UK household longitudinal study (UKHLS), which became known as *Understanding Society,* was to have the following features:

- A longitudinal survey, with at least a 20 year life, of a cross-section of UK households
- A sample size of 40,000 households
- Innovative methods and types of data collection
- A resource facilitating research on a wide variety of issues, involving not just traditional social science but linking to medical and environmental sciences
- Data collection starting in 2008

Four 'expert studies' were commissioned to address distinctive aspects of the study design:

- The transition from BHPS into the UKHLS
- Integrating ethnic minority research within the design of the UKHLS
- Sample design, innovation and new methods of data collection
- Collection of biomarkers in the UKHLS

These features make possible the expanded and ambitious scientific research agenda mentioned above. This includes research possibilities enabled by the main survey design including its large sample size, longitudinal nature, household structure and high frequency interviewing schedule; research facilitated by the collection of biomarkers, enabling

links between biological and social research; the inclusion of the BHPS sample with 18 previous waves, especially for health research (the BHPS respondents are part of the biomarkers survey sample and will be linked to hospital records and health registers); new ethnicity research based on the ethnic minority boost and the extra interview time for questions relevant for such research; methodological research in areas such as response and measurement in mixed mode surveys; and the possibilities for cross-national comparative research. The *Understanding Society* team are committed to contributing the data to international data harmonisation efforts, especially for the Cross-National Equivalence File (http://www.human.cornell.edu/pam/research/centers-programs/german-panel/cnef.cfm) and supporting cross-national comparability between *Understanding Society*, the U.S. Panel Study of Income Dynamics and the German Socio-Economic Panel. A capacity for policy analysis will also be developed by incorporating *Understanding Society* data into the EUROMOD (www.iser.essex.ac.uk/euromod) cross-national tax and benefit simulation model – this will provide researchers with the ability to estimate policy impacts under different scenarios.

The paper in this issue on '*Understanding Society*: Design Overview' by Buck and McFall sets out in detail the main features of the design of *Understanding Society* that reflect its scientific rationale and how it can be exploited to generate major innovations in scientific research. From its inception, *Understanding Society* was conceived as a multi-topic, bio-social survey suitable for analysis across a range of disciplines, and designed to facilitate inter-disciplinary research within and beyond the social sciences. The aim was to provide breadth of content and high quality longitudinal data to meet research and policy needs over the coming decades.

One of the key elements for the new study is its sample size, as it was recognised that a larger sample size than was available in the BHPS would enable a broader range of analysis and finer-grained analysis of sub-groups within the population. The BHPS initially sampled some 5,500 households containing over 10,000 members. These households were augmented by Scotland and Wales booster samples in 1999 and a Northern Ireland booster sample in 2001, so that in 2009, almost 14,500 adults and 1,222 youth aged 11-16 years were interviewed. The total achieved sample for *Understanding Society* was set at 40,000 households, with an estimated 100,000 household members, and includes the existing sample of BHPS households to enable this long-running sample to continue as part of the new study. Some examples of the size of sub-groups of the general population sample (see Buck and McFall, this issue) are over 6,600 adults aged 70 years and older; almost 6,600 unmarried cohabiting partners; 3,700 self-employed individuals; and 4,650 adults with asthma.

The papers in this special section were written before the release of the *Understanding Society* Mainstage Wave 1 data, and several are based on the first year's data for the general population sample. Jenkins and Taylor's paper combines data from the BHPS (before it became incorporated into *Understanding Society*) with the first year's data, to examine non-employment rates by age over the economic cycle. They show that from 1991-2009, non-employment rates have changed most for the youngest and oldest age groups. Their paper exemplifies how data from the two surveys may be combined – in future, researchers will be able to document trends over more than 20 years in outcomes such as labour market behaviour. The large sample size of *Understanding Society* enables an examination of recent trends for subgroups of the population in greater detail than was possible hitherto. As the sample covers the full age range, the study complements age-focused cohort studies in the UK and provides a unique look at behaviours and transitions in mid-life. The study also adds to the cohort studies by sampling adults currently over 65 years, (65 being the present age of the cohort in the Medical Research Council's National Survey of Health and Development), and complements the English Longitudinal Study of Ageing. Moreover the large sample size means that cohorts within *Understanding Society* can be analysed at a common point in time.

The household focus of the design allows analysis of all members of the household and their interactions. Two papers in this special section provide examples of such analyses. The first, by Booker and Sacker, examines well-being within families when other family members have a limiting long-term illness. They find that the effect of limiting illness of one family member on the well-being of other family members depends on their

age and relationship to the sick individual. For example, well-being was maintained by adult children of an older parent with limiting illness and by older parents of an adult child with limiting illness, but not by partners or younger children of a sick parent.

The second paper, by Meadows and Arber, examines sleep maintenance among older and younger partners and also finds differences by age. *Understanding Society* includes several questions on sleep quality and quantity from which the authors focus on self-reported nocturnal awakenings. Using multi-level models, Meadows and Arber illustrate how both younger and older women had more difficulties with sleep maintenance than their male partners. For both men and women, poor sleep maintenance was associated with poor health, own unemployment, dissatisfaction with income, having had a previous cohabiting relationship and having younger children. Further understanding of the dynamic relationships of health, behaviour and affect between family members, suggested by the analyses in these two papers, will be revealed through longitudinal analysis as *Understanding Society* matures.

A further focus is on ethnic minority research and the study includes an over-sample of ethnic minority groups to facilitate the analysis of within-group and between-group differences as well as comparisons with the general population in the UK. This provides the first longitudinal panel data for ethnic minority research in the UK. The paper by Nandi and Platt describes the process of development of a series of new ethnic identity questions, designed specifically for inclusion in *Understanding Society*. They explain the rationale for the development of the ethnic identity questions and the process by which the final set of questions was arrived at. In due course, this careful generation of effective and appropriate measures of ethnic identity will allow researchers to investigate mechanisms underlying changes in identity and its development across the lifecourse.

Children in *Understanding Society* households are interviewed as part of the main survey once they reach the age of 16, but there is also a special survey of household members aged 10-15 included in *Understanding Society.* The Youth Panel receive a self-completion questionnaire which is designed to measure key features of young people's behaviour, interests and attitudes in a format likely to appeal to this age group. One of these features is the use of emoticons (figures such as smiley, neutral and sad faces to represent emotions) to capture feelings of happiness about different aspects of their life. Wolke and Skew use these data in their analysis of bullying victimisation and well-being during adolescence. Sibling bullying was widespread, with half of youth with siblings involved in bullying each other. Reports of bullying at school were much lower, with around 12 percent being victims of bullying. Both bullies and victims at home and those victimized at school were at increased risk for behaviour problems and were significantly less happy. Sibling bullying was related to having brothers and a greater number of siblings, and to less or negative parental involvement. School bullying was more likely among those growing up in materially deprived homes and among those who were bullied by their siblings. A research question awaiting further waves of *Understanding Society* is whether a legacy of bullying experiences is detrimental for adult well-being, independent of the material disadvantage which also tends to track into adulthood.

Finally, ensuring the study is supported by a programme of methodological research, to inform the survey development and to contribute to longitudinal survey methodology in general, is a key feature of the scientific research programme. The study includes an Innovation Panel of 1500 households for methodological research and testing which is a resource for survey practitioners and methodologists. In his paper, Uhrig presents results on an investigation of bias in self-reported height and bodyweight using the first two waves of the Innovation Panel. A major strength of this paper is that it used an experimental design to test ideas on panel conditioning. He examined whether the sensitivity of survey questions affected the tendency to give socially desirable responses over time. Uhrig found that because height and weight questions may cause embarrassment when posed, respondents are motivated to misreport their body size in cross-sectional studies, but this motivation dissipates when they are asked again in a longitudinal study. Although the effects of obesity on employment should be affected by biases in self-reported height and bodyweight, the results did not support this hypothesis. Although one cannot extrapolate from a single finding, this null finding

adds to the body of knowledge for researchers who have reservations about the collection of self-reported anthropometrics in surveys.

The Innovation Panel is a resource not only for its scientific team but also for the wider academic community to carry out methodological research. Calls for proposals for methodological studies are issued each year, with the next one on wave 6 due to be published in spring 2012. Interested readers should consult http://www.understandingsociety.org.uk/design/innovation/content.aspx.

Perhaps most innovatively for a household panel survey of its kind, is the inclusion of a wide range of bio-markers and health indicators to ensure the study meets its inter-disciplinary objectives. This opens up exciting prospects for advances at the interface between social science and biomedical research, providing an opportunity to assess exposure and antecedent factors of health status in the context of household and socio-economic effects. In addition to the survey data collection, *Understanding Society* is undertaking an extensive programme of data linkage to administrative sources including geo-coded data, health, education, and pension and state benefit records. These data will provide significant new areas for analysis where the rich, contextual social survey data can be used in combination with administrative data.

The pace of development has been rapid. Wave 1 of the Innovation Panel was fielded in January 2008 and four waves of annual data collection have been carried out. Wave 1 of the main study began in January 2009 and was completed at the end of 2010. Data from the first half of Wave 1, covering interviews during 2009 are now available from the UK Data Archive. Waves 2 and 3 are currently in the field and Wave 4 goes into the field in January 2012. Supplementary funding from the Large Facilities Capital Fund has enabled the planned extension to a truly biosocial survey through the collection of biomarkers and cognitive measures, initially by nurse interviewers and to be supplemented by survey interviewers for more limited content. An innovative approach to increasing the depth of information covered has involved careful planning of the 'cycling' of some questions at intervals of two to four years. The pace of development continues and innovation remains a key priority.

The papers in this special section inevitably contribute more to study of the life course than to longitudinal analysis, since data are currently only available from half of the first wave. As the waves of data collected increase, *Understanding Society* will prove to be a major and important study both nationally and internationally. Its size, scope and interdisciplinary nature make it an invaluable resource and its value will increase over the years to come. It is truly a capital investment for the social and biomedical sciences that will appreciate in value. Its success so far, and continued promise, is attributable to the commitment of the scientific community to maintain the critical longitudinal data resources needed to further deepen our understanding of social change.

For further information about the design and content of *Understanding Society* see: www.understandingsociety.org.uk

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Understanding Society: design overview

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Abstract

'Understanding Society', the UK Household Longitudinal Study, builds on the success of the British Household Panel Survey (BHPS). This paper describes some of the key elements of the design and conduct of the study and suggests how Understanding Society is distinctive as a longitudinal survey. Its large sample size offers new opportunities to study sub-groups that may be too small for separate analysis using other studies. The new content included in Understanding Society, not least the bio-measures, provides exciting prospects for inter-disciplinary research across the social and medical sciences. The Innovation Panel is already proving to be an invaluable resource for research in longitudinal survey methodology. Finally, the inclusion of the BHPS sample within Understanding Society enables that long-running panel to continue into the future, opening up inter-generational research and the opportunity to look at very long-term trajectories of change. This paper also describes the four sample components: the general population sample, ethnic minority boost sample, the Innovation Panel, and participants from the BHPS. Each component has a multi-stage sample design, mostly with stratification and clustering. A complex weighting strategy is being developed to support varied analyses. This overview also describes the instruments, methods of data collection, and the timetable for data collection. A summary of the survey content is provided. With the data becoming available, the user community is beginning to benefit from this investment in longitudinal studies

Keywords *Understanding Society*; household panel study; design

Introduction

Understanding Society, the UK Household Longitudinal Study, is a major investment in longitudinal studies, the sort of large scale investment in science which has up to now has been more characteristic of the physical and biological sciences. It substantially expands the research resources available to social scientists and researchers in other disciplines, including biomedical and environmental scientists. The study brings potentially huge long-term contributions for the understanding of the UK in the early twenty-first century.

Understanding Society builds on the success of the British Household Panel Survey (BHPS). The BHPS has been heavily used by government departments and by researchers within and outside the UK. It has been accessed by more than 2000 users and generates more than 150 publications per year. However the ambitions of *Understanding Society* support a much wider range of research than the BHPS. It is an important addition to the UK's rich portfolio of longitudinal studies.

Understanding Society forms part of an international network of studies including the Panel Study of Income Dynamics (Hill 2001), the German Socio-Economic Panel Study (Wagner et al 1993), the Household, Income, and Labour Dynamics in Australia Survey (Wooden et al 2002), the Swiss Household Panel (Budowski et al 2001), the Survey of Labour and Income Dynamics in Canada (Webber 1994) and other active household panels in South Africa, Israel, Korea, China. The household panel design was established in the Panel Study of Income

Dynamics (PSID) in the USA in the late 1960s. This design has proved extremely powerful in understanding the dynamics of populations and the determinants of behaviour and outcomes at household and individual level.

This paper provides an overview of *Understanding Society*, focusing firstly on its design as a household panel study which makes it distinct from other longitudinal studies. This will include description of design features which will contribute to the scope of research questions that can be examined with the study. Secondly, it describes the sample design and thirdly, the plan for data collection. Finally it provides some overview of the data collected, via the survey questionnaire and by other means.

Understanding Society as a household panel study

Longitudinal studies have advanced social science methods, enhanced the understanding of major social changes, and supported better assessment of policy interventions. The UK has taken a prominent role in the development of longitudinal studies, especially with its unique portfolio of birth cohort studies, the Office for National Statistics Longitudinal Study linking census and vital records for England and the comparable Scottish Longitudinal Study and Northern Ireland Longitudinal Study, the English Longitudinal Study of Ageing, the Longitudinal Study of Young People in England, the British Household Panel Survey, and many others. These studies provide an understanding of social change, the trajectories of individual life histories and particularly the processes of individual development across the life course, and the dynamic processes which underlie social and economic life.

Understanding Society is a major addition to this portfolio. As a longitudinal study it follows individuals over time, regularly collecting data about each participant, together with similar data about all other members of his or her household. The design allows it to provide information on the persistence of such states as unemployment, child poverty or disability; on factors which influence key life transitions, such as marriage and divorce, labour force entries and exits and retirement; and, as the study matures, information on the effects of earlier life circumstances on later outcomes. It will support research relevant to the formation and evaluation of policy and will also foster the development of improved and more reliable analytical techniques. Cross-sectional data, based on only a single observation of each individual, cannot achieve these aims.

Longitudinal studies have a major role in understanding the social and economic changes facing all types of society, as the range of studies cited above suggests, since they collect data about different time points within an individual's life, or indeed look across generations, by collecting and linking data from different points in the lives of parents and children. Longitudinal analysis can provide very different understandings than cross-sectional ones. Specific examples of anticipated uses for the longitudinal data are included in the other papers in this Special Section. Some important issues for which we anticipate contributions from the longitudinal data of *Understanding Society* include:

- The analysis of the incidence of states such as poverty or unemployment over time. The distribution of such states has important temporal dimensions (Hill and Jenkins 2006; Jenkins and Micklewright 2007). The experience of long term unemployment or persistent poverty has different implications for other outcomes such as health, than short term or transitory occurrences (McLeod and Shanahan 1996). Longitudinal studies are uniquely placed to collect the information necessary to analyse these effects.

- The measurement of the rates of transition between states, and the factors associated with them. These might include spells of illness or transitions in partnerships (Aassve, Burgess, Propper and Dickson 2006; Ermisch and Francesconi 2000). The analysis of associations between the life courses of different household members, and of their mutual interactions, is enabled by *Understanding Society* interviews with all household members from age 10. The combined data can be used to examine the dynamics of household formation and dissolution and associated outcomes.

- The analysis of the association between change in the different domains (e.g. health and the labour market), to understand causal ordering.

- The use of repeated survey measures from the same individual allows researchers to separate out person-specific time invariant effects, including those which may be unmeasured, and hence reduce biases caused by associations between these person-specific factors and the change in the phenomenon of interest (e.g. see Hedeker and Gibbons 2006).

- The accumulation of life history data over the waves of the panel, which can be used to analyse the long-term accumulation of personal and financial resources and their implications for other behaviours and outcomes.

The household panel design of *Understanding Society* contrasts with that of the cohort design of many other longitudinal studies. In these cohort studies, a sample of individuals from a particular age group is selected and followed. There are birth cohorts, where the sample is selected around birth and followed thereafter, cohorts of young people, often selected from a particular school year, or ageing cohorts, where people over a threshold age are followed. In the household panel design, a sample of the whole population is selected in their household context. It is important to stress here that the longitudinal elements, just as in the cohort studies, are the individual people. It is not a longitudinal study of households, since arguably households have no coherent existence over time, and focusing analysis only on households whose composition does not change between waves leads to severe biases (see Duncan and Hill 1985). Rather, it is a study of individuals in their changing household contexts and this context is very important for analysis of many life domains (Giles 2001).

There are three key distinctive features of the household panel design compared with the cohort design. Firstly, while a birth cohort study is representative of the population in that particular cohort, the household panel is a representative survey of the whole population of all ages. Research from studies with a household panel design supports direct inferences about the whole population. Since the study has a full range of age cohorts, and because births to sample members join the sample, there is a representative sequence of new cohorts constantly replenishing the study. Consequently, studies with a household panel design are an important complement to cohort studies by supporting generalisations beyond specific cohorts.

Secondly, it is a survey based on households. Multiple social environments shape behaviours and life circumstances. For example Skew and Wolke, in this Special Section, examine bullying in relation to school and home. However, households can be closely observed in *Understanding Society*. Economic welfare, income and material conditions are normally assessed at the household level, because of the degree of sharing of resources. Households also provide a context for understanding the social and cultural resources available to individuals, both children and adults. The collection of comparable data from each individual in the household at each wave provides a natural way of collecting rich household level data. It also provides a very important resource for the study of how households are changing and the demographic processes which lead to household composition change.

Thirdly and related, the household focus also provides a way of understanding the inter-relationships between individuals within households and families. Many of the key decisions which individuals make are influenced by other household members. A focus on households also provides an opportunity to investigate the inter-relationship with families. Families clearly extend beyond household boundaries and not all household members will consider themselves family members. The study supports research on the interactions over time with family members outside the household, and the evolution of relationships within the household. For example, household panel surveys have contributed to the study of resident and non-resident parents and their contributions to the developmental outcomes for children (Ermisch 2008). They also permit examination of changing patterns in partnerships, such as dissolution and cohabitation, timings of marriages and births, and re-partnering in relation to childbearing and employment outcomes.

Observing multiple generations and all siblings allows examination of long-term transmission processes and isolates the effects of commonly shared family background characteristics. Articles in this issue make use of household relationships in their analyses. Meadows and Arber find a shift with age in the couple level influences on sleep maintenance. Booker and Sacker report that the well-being of younger children is more strongly influenced by a parent with chronic illness, than are older children.

The sustained collection of short-term data makes it possible to accumulate long-term sequences of high quality biographical information across multiple domains. The central purpose of *Understanding Society* is to understand the individual dynamics of change experienced by the population of the UK. With a national sample covering the whole population, *Understanding Society* will also provide representative cross-sectional population estimates for each wave. This Special Section focuses on data from Wave 1 collected in 2009. Nevertheless, its real strength will be the provision of nationally representative longitudinal data at the individual and household level across a range of substantive domains.

Design features which broaden research questions

Five key areas extend the research potential of the household panel design beyond that of the BHPS. The five extensions are:

Size of the survey

The survey's large sample size is a key attribute. The target of 40,000 households across the study's samples will permit exploration of questions for which other longitudinal surveys are too small to support effective research. Many relatively rare events or sub-populations can be studied with the survey. It permits analysis of small sub-groups, people who moved to the UK as children or disabled people, or regional and sub-regional levels. It allows examination of the effects of geographical variation in policy, for example differences between the countries of the UK. The large sample size also allows high-resolution analysis of events in time, for example focussing on single-year age cohorts. As an example, with a total of approximately 1,000 births to sampled women per year, it will be possible to study births to teenage mothers.

An emphasis on ethnicity research

Understanding Society is also noteworthy for its ability to contribute to the understanding of ethnic minorities, which are relatively poorly covered by other longitudinal studies. The UK population can be characterized as having a relatively large number of minority groups, each with small population shares. Study of ethnic variation in general population surveys requires over-representation, using boost samples of minorities in order to achieve sufficient sample size. An ethnic minority boost was also incorporated in the Millennium Cohort Study (Dex and Joshi 2005).

Understanding Society will provide important new information about ethnic minorities through over-sampling of ethnic minorities and the collection of additional measurements relevant to their life experiences. These additional measures are asked of members of the boost sample (over-sample), of members of ethnic minority groups not sampled as part of the boost sample, and by a comparison group of around 1,000 adults from the general population sample (Berthoud et al 2009). Examples of the additional ethnicity relevant measures include ethnic identity, discrimination and harassment, questions about ethnicity and social networks, and questions about remittances or financial payments to families in the country of origin. The ethnicity strand of Understanding Society also informs questions for the whole sample. The objective is that the whole study should contribute to the understanding of the UK as a multi-ethnic society. In this Special Section, Nandi and Platt describe the development of ethnic identity measures. It will be interesting to see how the relative importance of identity dimensions change over time. More frequent assessment of ethnic identity in young adults highlights the potential for the shifting importance of its dimensions.

A multi-topic survey

The goal of *Understanding Society* is to support research across the range of social sciences as well as biomedical sciences and other physical sciences, such as environmental sciences. While the research agenda of household panel studies has in the past focused particularly on issues of family dynamics and household organisation, household income and welfare, and labour market participation, *Understanding Society* will also support inter-

disciplinary research on such issues as health and well-being, social participation and a range of other behaviours. *Understanding Society* is extending this agenda with questions tapping psychological attributes and attitudes related to environmental behaviours. Consequently, a long-term content plan has been developed to prioritize measures within the questionnaires and to provide breadth and balance of coverage in topic.

Collection of biomeasures

The fourth feature is a special but extremely important case of expansion in content. It involves the collection of a relatively wide range of biomeasures and other health indicators (Weinstein, Vaupel and Wachter 2008). We use biomarker or biological sample to refer to an assay generated from a biological specimen. We use the broader term, biomeasure, to refer to a range of biological, anthropometric, functional, and sensory measures (Jaszczak, Lundeen and Smith 2009).

The study has been designed to become a biosocial survey, to support biomedical and social science research. Health scientists will find the study a rich source of information about social and economic factors that may influence health status at a single time point, or the trajectory of health outcomes. The particular markers included are relevant to major health outcomes of cardiovascular and metabolic conditions and have been related to social and economic resources and attainments. For example, there is utility to having health measures based on direct physical measurements and samples, in contrast to self-reported health measures, where the reporting may be influenced by the individual's life circumstances. There is also substantial interest in gene-environment linkages as potential explanations of behaviour and disease etiology.

Innovation in measures and methods of data collection

The study involves innovation in both data collection methods and in the type of data collected. The plans include the augmentation of conventional interview data with novel data collection methods and measures, including linkage to spatial and administrative data and the collection of qualitative, visual and audio data. The study also aims to advance methods of survey data collection. Key to this is an Innovation Panel of approximately 1,500 households, which is a testbed for research related to longitudinal survey methods. It is intended both to guide decisions about the study and contribute to the development of longitudinal survey research methods more generally. Methodological questions are addressed in a realistic survey context similar to the general *Understanding Society* design. That is, the same methods of data collection are used in conjunction with a similar set of questionnaires. Uhrig (2011) summarises the experiments included in the first two waves of the Innovation Panel, for example, methodological experiments on incentives, alternative question wording and the use of dependent interviewing on measures of change (Bottazzi, Crossley and O'Dea 2008; Pudney 2010).

Sample design

Understanding Society has four sample components: a) the general population sample, b) the ethnic minority boost sample, c) the Innovation Panel, and d) the sample of participants from the BHPS. The sample designs are similar in having multi-stage sample designs mostly with stratification and clustering. However, the sample design of each sample component has some unique features, (Lynn 2009) which are discussed below.

General population sample component

The general population sample is a stratified, clustered, equal probability sample of residential addresses drawn to a uniform design throughout the whole of the UK (including north of the Caledonian Canal). The Northern Ireland sample is not clustered. Within Great Britain, the Primary Sampling Units (PSUs) are postal sectors stratified by nine regions of England plus Scotland and Wales), population density and minority ethnic density. 2,640 postal sectors were selected systematically, with probability proportional to size (number of addresses). Within each sampled sector, 18 addresses were selected systematically, resulting in an equal-probability sample of a total of 47,520 addresses in Great Britain. In Northern Ireland, 2,400 addresses were selected systematically from the Land and Property Services Agency list of domestic properties, thus making a total of 49,920 selected addresses in the UK. Since constraints of survey capacity meant that fieldwork needed to be spread over a two year period, the overall sample was divided into 24 monthly sub-samples, each independently representative of the UK population.

This means that differences over time within a wave can be compared using nationally representative samples, and annual or quarterly subsets can be independently analysed.

Ethnic minority boost sample component.

The goal for the ethnic minority boost sample was to provide samples of at least 1,000 adults in each of the five largest ethnic minority groups: Indian, Pakistani, Bangladeshi, Caribbean and African. Such a sample would support group-specific analyses of these ethnic groups (Berthoud et al 2009). While the sampling targets are defined in terms of numbers of adults, the sample is of households.

The sampling approach first identifies geographic areas with at least 5% density of ethnic minority groups. Because the 2001 Census was becoming outdated, the density estimates were adjusted using more recent survey estimates. These high density sectors were 36 per cent of the total sectors and accounted for 85% of all members of minorities. Further sub-sampling of the high density areas was done to increase the efficiency of the yield. Thus, a higher sampling fraction was used for areas anticipated to yield three or more households while successively smaller fractions were used for areas expected to yield two, one or zero ethnic minority households.

At selected addresses, households were screened for the presence of a member of a minority ethnic group. The screening question was, "Do you come from or have parents or grandparents who come from any of the following ethnic groups?" The response categories are Indian, mixed Indian, Pakistan, Bangladeshi, Sri Lankan, Caribbean/West Indian, mixed Caribbean/West Indian, North African, Black African, African Asian, Chinese, Far Eastern, Turkish, or Middle Eastern/Iranian, or other. At the screening stage, all households with the smaller ethnic groups were selected and there is some de-selection of larger ethnic minority groups, e.g. Indians.

Following the first six months of data collection the procedures were reviewed and modified. One change was to increase the number of addresses issued in areas estimated to be high in Bangladeshi, the smallest of the five main ethnic groups.

The screening question also identified persons in the following categories in addition to the five target groups: Chinese, other Far Eastern, Sri Lankan, and Middle Eastern. While it is useful to be able to identify members of these ethnic groups, the number of cases is well below 1,000. White minorities were not selected in the screening but can be identified by survey questions in the general sample.

BHPS sample component.

Understanding Society incorporates the BHPS sample members into the overall sample design beginning in Wave 2. The extensive longitudinal data of the BHPS has great scientific value, including the opportunity for early longitudinal analyses of *Understanding Society*. The BHPS was a random sample of Great Britain, excluding the Scottish Highlands and Islands. In its first wave in 1991, it achieved a sample of 5,500 households. Boost samples of Scotland and Wales were added in 1999 and of Northern Ireland in 2001. These modifications were motivated by interest in analyses in these countries, related to political changes associated with devolution in the UK.

In planning the timing of fieldwork for the BHPS sample, it was necessary to balance fully integrating the sample into Understanding Society as against creating a discontinuity in the BHPS series. After consultation, it was decided that it was most important to ensure the integration of BHPS into the new study (Laurie 2010). So instead of having its fieldwork concentrated between September and December, as was the practice up to 2008, fieldwork is distributed evenly over the 12 months of the first year of data collection beginning in January 2010, as part of wave 2 of *Understanding Society*. This does introduce a one-off longer gap between interviews for the BHPS sample. From wave 2 onwards the BHPS sample has the same questionnaire as the *Understanding Society* general population sample. Jenkins and Taylor in this issue present rates of employment from 1991 to 2009 from BHPS and Understanding Society data. This allowed examination of the effects of two major recessions on employment patterns of young and older persons. Their discussion of how to maximise the comparability of questions, response categories, and sample composition illustrate important decisions for analyses integrating the two surveys.

The Innovation Panel.

The final sample component is the Innovation Panel (IP). As noted, the purpose of the IP is to test methods of data collection and data collection instruments relevant to the conduct of the main survey. As far as practical, it has design and procedures identical to the other samples. Its sample design began with 2,760 households drawn from 120 areas of Britain. Northern Ireland, and Scotland north of the Caledonian Canal are not included.

Use of the whole sample

The overall achieved initial sample was targeted at 40,000 households: approximately 26,000 from the general population sample, 4,000 from the ethnic minority boost, 1,500 from the Innovation Panel, and 8,400 from the BHPS participants at wave 18 of that study. The total achieved numbers across these four components were 39,802 households containing 101,086 individuals, including children.

Understanding Society has a complex sample design and will be used in various ways by data analysts. Consequently the weighting strategy is also complex. *Understanding Society* must provide weights for the household and individual levels, for units that respond or do not respond to different instruments, e.g. the self-completion instrument, for responding to different combinations of study waves, and for the diverse sample components. Sampling information, including primary sampling unit and strata identifiers, will be available on the data set.

In general, weights are the product of a design weight to convey the probability of selection, adjustment for non-response, and sometimes post-stratification, to make the distribution a closer match to the population distribution.

Units in the major sample components have different probabilities of selection. For example, the members of different ethnic minority groups in the boost sample have different probabilities of selection. In addition, the countries in the former BHPS sample have different sampling fractions, including boost samples for Scotland, Wales and Northern Ireland. Different weights may also be used for analyses which combine the sampling components. For example, when combining the general population component with the former BHPS, the weights adjust for the fact that the BHPS sample does not contain immigrants since its initial period of recruitment.

The development of weights also takes the time pattern of response into consideration. For example, weights for complete longitudinal responses will be produced. These would take into account differential probabilities of attrition after wave 1. They would include those for Waves 1 and 2 or Waves 1, 2, and 3. Weights for other combinations of waves will be developed to support important analyses based on data from those waves. Cross-sectional weights and weights for single year samples waves will also be produced. This brief summary of the weighting strategy can be supplemented by Lynn and Kaminska (2010).

Following respondents over time and eligibility for interview

The composition of the household, the first stage of sampling, determines the rules for following individual respondents over time. The individuals found at selected households in the first wave are designated as Original Sample Members (OSM). We attempt to retain OSM respondents as part of the sample as long as they live in the UK. Individuals joining the household of an OSM after the sample selection/first interview are temporary sample members (TSM). However, births to an OSM are also classified as OSMs. We attempt to interview TSM participants in successive waves as long as they live in the household of an OSM. In sum, TSMs are not followed for interviews when they leave the household, but OSMs are.

The following rules mimic the demographic processes by which the population is reproduced, including births and deaths, partnership formations and dissolutions, and emigration. They provide a natural sampling method over time, which represents the evolving pattern of households and families in the UK. The one exception is that there is no direct way in which the following rules capture immigrants into the UK. Apart from immigration, the sample remains representative of the UK population as it changes over time, subject to weighting for attrition. Whether and how to sample new immigrants remains an issue to be decided in the future development of the study.

Data Collection

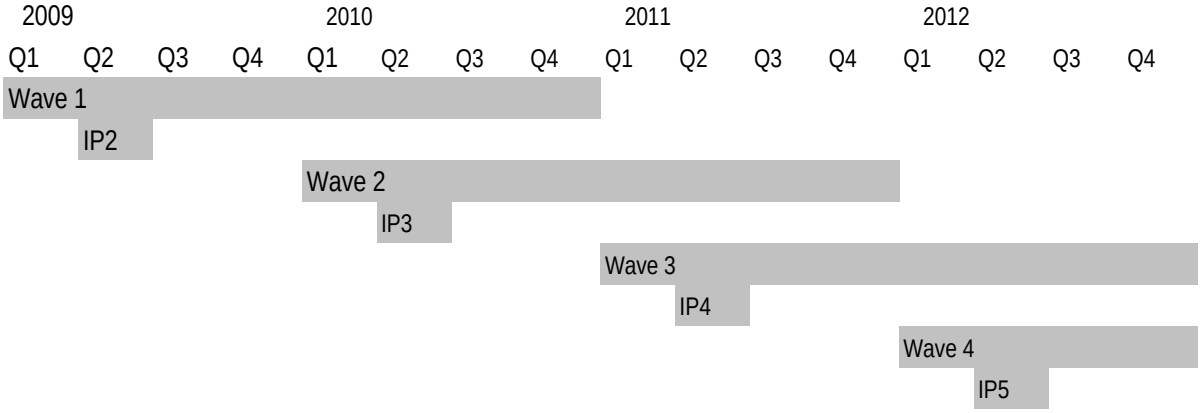
This section describes some important features of the study in relation to data collection, including

the timing of data collection, modes of data collection, and description of the survey instruments and topics.

Understanding Society is a household panel survey with annual measurements. A sample of households is selected, data are collected from all adult household members, and sample members are followed in subsequent years. Each wave is collected over two years or 24 months, because of the large sample size. Thus, the first wave of data was collected between January 2009 and December 2011. The second wave of data collection began in January 2010 with those interviewed in the first month of the first wave and concluded in December 2012 with those interviewed in the last month of the first wave. The Innovation Panel is collected in the spring of the year before the main survey wave.

The 12 month interval between interviews with participants, as with the BHPS, is important from an analysis perspective. It captures information about life changes over relatively short periods, before events are forgotten, and provides a high frequency of repeated measures of states that cannot reliably be reported retrospectively (e.g. health and well-being). The timetable for data collection of the first four waves over the period 2009 to 2012, including the innovation panels within this period, is shown in Figure 1. It illustrates the pattern of overlapping waves which is part of the design.

Figure 1: Timetable for data collection waves 1 to 4 by quarter (Q) 2009-2012



Note. IP2, IP3 etc: Innovation panel wave 2, 3 etc.

Most of the data collection uses computer assisted personal interviewing (CAPI). There are several instruments for members in selected households. The structure is similar to the BHPS. One household member completes the household enumeration grid and the household interview, which takes about 15 minutes. Each person aged 16 or older has the individual adult interview (32 minutes) and self-completed questionnaire (8 minutes). Youth aged 10 to 15 are asked to respond to a self-completion questionnaire, which is a paper and pencil instrument. Information about younger children is provided by the responsible parent in the household and adult interviews. There is a brief proxy interview about adults unable to be interviewed.

The initial four waves of data collection are face to face, a mode of administration that is typically more costly but more likely to reduce attrition when we are establishing the study. An experiment in the second wave of the Innovation Panel compared groups issued to face-to-face interviewing, vs those initially issued to telephone administration with varied procedures for interviewing outstanding household members face-to-face (Lynn, Uhrig and Burton 2010). This experiment has provided information about the reduction in response rates and costs of different

interviewing options. Implementation of multi-mode data collection is planned for Wave 5.

The questionnaire instruments and survey materials have been translated into nine languages: Bengali, Punjabi in Urdu and Gurmukhi scripts, Welsh, Arabic, Somali, Cantonese, Urdu, and Gujarati. Software development of the Language Management Utility (LMU) (Harkness 2003) supports the work of multiple translators and is important for the CAPI scripting of non-Roman scripts and languages not read left to right. In the translated interviews, interviewers can toggle between English and the alternative questionnaire.

Response Rates

The overall response rate at wave 1 for the general population sample at the household level response rate was 57.2%, which is somewhat below the target rate of 60%. The response rate for the ethnic minority boost sample after screening for eligibility was 56.9%, somewhat above the 55% target rate. These rates are typical for multi-purpose surveys of this sort in the UK. Surveys with a more specific focus of particular relevance for the sampled individuals, e.g. interviewing mothers about their children, tend to get rather higher response rates. The target for household response rate in Wave 2 is greater than 80% and for Wave 3 is greater than 90%. Burton, Laurie and Lynn (2011) provide more information about wave 1 response rates. They also present some results from a comparison of the characteristics of the *Understanding Society* wave 1 year 1 sample with the 2009 Labour Force Survey. They find that the two surveys have very similar sample distributions on the characteristics compared. There is no difference between the surveys on housing tenure status but the *Understanding Society* sample appears to have a higher proportion of female participants than the LFS, a higher proportion of children younger than 16 years and a lower proportion of those aged 65 or older. The *Understanding Society* sample has a higher proportion of divorced individuals and a lower proportion of those who are widowed. The *Understanding Society* sample contains a lower proportion of participants who are in paid employment and higher proportion of those who are not in paid employment or looking for work. Although these differences are statistically significant, the sample sizes are large and so the actual percentage differences between the two samples on these key characteristics are quite small.

Data collected

Questionnaire data

Following extensive consultation with users it was clear there was demand for a wide range of content to be included in the study. To meet this demand within the available questionnaire time, *Understanding Society* has adopted a model in which questions are organized in topical modules which appear annually or are rotated less frequently. Rotating modules vary in frequency, depending on the subject matter and expected rates of change. The annual core is approximately 50% of the interview length and includes, after wave 1, an annual event module concerning key events over the previous year.

Because some of the annual measures are BHPS questions, analysts can examine a longer time series for that sample component. Incorporation of many measures from the BHPS will allow longitudinal analysis in key areas to continue for the BHPS sample. In addition, the inclusion of some BHPS measures provides continuity with the new *Understanding Society* sample.

A key design task in the initial stages was to agree which measures were critical for the annual panel design, and which questions should be carried annually. Table 1 sets out the content of the annual repeated measures and the rotating modules being carried over the first four waves. The table also includes information about modules which are included as part of the additional coverage for the ethnic minority boost sample.

Table 1. Outline of questionnaire content

Annual repeated measures	**Rotating modules (general population sample)**	**Ethnic minority boost: additional rotating modules**
Basic demographic characteristics for all household members	Family background, place of birth, education, relationship and fertility information (at first interview only)	Language and functional English literacy
Housing characteristics	Leisure and cultural participation	Migration history
Housing expenditure	Transport and communication access, travel behaviour	Remittances
Household facilities, car ownership	Well-being, sleep quality	Employment discrimination
Consumption expenditure	Psychological/personality traits (e.g. "Big 5", trust, risk perceptions)	Harassment
Health status (e.g. SF12), disability	Health-related behaviour, diet, exercise	Dimensions of identity
Mental health (GHQ12)	Family and social networks	Additional items on political engagement
Education qualifications, aspirations and expectations	Family relationships	Additional items on family and social networks
Labour market activity and employment status, job search	Local neighbourhood	Financial literacy and financial inclusion
Current job characteristics, basic employment conditions, hours of paid work, second jobs	Social support	Religious practice
Childcare, other caring within and outside household	Environmental attitudes and behaviour	Civic capital/use of services
Income and earnings	Political engagement	
Life satisfaction	Employment conditions and job quality	
Political affiliation	Uses of time (e.g. domestic work, volunteering)	
Changes between waves - employment, fertility, partnering, geographic mobility, education and training, diagnosis of health conditions	Wealth, assets and debts	

The broad outline of content in the self-completion questionnaire asked of 10-15 year olds is set out in table 2. Once again some of this content is repeated each wave and some is repeated at intervals, usually of two years. Some of this content is also carried forward to young adults aged 16-19 who answer the main individual questionnaire.

Table 2: Outline of content of youth self-completion

Relationships with family and friends
Social networks
Illicit/risky behaviour
Experience of education and aspirations
Bullying at school and between siblings
Use of leisure time
Health, diet and obesity, exercise
Self-esteem and satisfaction with life
Strength and Difficulties Questionnaire (SDQ)
Future aspirations for job, family, independence
Social and political attitudes and values
Financial behaviour and paid work
Caring responsibilities
Ethnic and religious identity

Links to Other Types of Data

The ability to link *Understanding Society* survey data with other data sources is a central goal for the study. The added data will greatly enhance its scientific research capacity.

Administrative data.

Administrative data can be used to supplement the interview data and reduce respondent burden, by adding data that would otherwise be collected in the interview and be a potential source of validation for the survey data (Lane 2010). Respondents were asked in Wave 1 for consents to link health and educational administrative records for themselves and for their children. The health records are held by the National Health Service (NHS), the NHS Central Registers, the health departments for England, Wales, Scotland and Northern Ireland, the General Registration Office and the Office for National Statistics. Consent to link to education records was requested of parents of children aged 4-15 and by young adults aged 16-24 who were currently attending school or had attended school in the UK in the past. At wave 1 approximately 70% of respondents gave consent to linkage. The majority of linked data will be accessed by researchers in a secure environment since it does increase disclosure risk.

We will illustrate the linkage process in terms of health data linkages in England. For those who consented, personal information from their survey data will be sent to the NHS to establish a flag in the Central Register. The Central Register records the registration of the individual with a general practitioner and is updated following births, moves, name changes, and major events like marriages and deaths. With the flag established, the study will be notified when the Central Register is updated for a study participant. In addition, we will link to medical records like the Hospital Episode Statistics (HES). The type of data in HES includes dates of the episode, information about the facility, procedures and treatments, diagnoses, and waiting times. The data systems in Scotland, Wales and Northern Ireland vary somewhat but similar procedures will be followed for the linkages to the extent possible.

Spatial data.

This study will have the ability to link survey data to geographic designations of relevance for a variety of research interests, including parliamentary constituencies, local educational authorities, travel to work areas for local labour market analysis, local authority districts, and primary care trusts. The rural-urban classification categorizes localities by population size and the population density of surrounding areas. Spatial data will be released with additional safeguards to protect participants from disclosure of their identities. For a useful description of these geographical classifications see: *A Beginners' Guide to UK Geographies* (Office for National Statistics 2010).

Biomeasures.

Biomeasures have been included in several major longitudinal surveys including the 1946 and 1958 British Cohort studies (Ferri, Bynner and Wadsworth 2003), and the English Longitudinal Study of Ageing (ELSA) (Marmot et al 2003). The addition of biomeasures to *Understanding Society* is useful for the examination of objective biological, anthropometric and functional measures within a large sample that spans many ages, and which can be studied within a household context. The measurement of biomarkers in BHPS participants will permit researchers to immediately examine questions which rely on longitudinal psycho-social data.

Collection of the biomeasures began with a sample of adults from the general population sample of Wave 2. Data collection was conducted in a separate visit by trained nurses. The measures include anthropometric information (height, weight, waist circumference and body fat from bioelectrical impedance), blood pressure, lung function (spirometry), grip strength, and the collection of whole blood through venipuncture. The blood can be used for a range of analytes including total cholesterol, high density lipids, c-reactive protein, cystatin-c, and glycated haemoglobin (HbA1C). Respondents have been asked to provide written consent to store blood for future research and for genetic studies. Access to these samples will be regulated by a Data Access Committee established by the Economic and Social Research Council (ESRC).

Qualitative studies.

In the longer term, *Understanding Society* will be significantly enriched by the collection of a wider range of data, which will help to address research issues that questionnaire data alone cannot address. Examples include using the survey data as a sampling frame for longitudinal qualitative research, the use of diaries to collect more accurate measurements such as time use information or specific health behaviours, and experiments to test specific hypotheses. An example of such a structured experiment is an experiment on trust (Ermisch et al 2009).

Conclusion

Understanding Society is designed to provide high quality longitudinal data to answer research and policy needs over the coming decades. Every effort is being made to conduct the study to the highest standards of best practice in the methodology of conducting longitudinal surveys. This paper has described some of the key elements of the design and conduct of the study and suggested how *Understanding Society* is distinctive as a longitudinal survey. With the data becoming available, the user community is beginning to benefit from this investment. The large sample size offers new opportunities to study sub-groups that may be too small for separate analysis in other studies. The new content included in *Understanding Society*, not least the biomeasures, provides exciting prospects for inter-disciplinary research across the social and medical sciences. The Innovation Panel is already proving to be an invaluable resource for research in longitudinal survey methodology. Finally, the inclusion of the BHPS sample within *Understanding Society* enables this long running panel to continue into the future, opening up inter-generational research and the opportunity to look at very long-term trajectories of change.

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Non-employment, age, and the economic cycle

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Abstract

We describe the relationship between non-employment rates and age in Britain and consider how this relationship has been changing with the economic cycle. Using data from the British Household Panel Survey for survey years 1991–2008 and Understanding Society for 2009, we show that non-employment rates have changed most for people in the youngest and oldest age groups. Young people have been hit particularly hard by the current recession and non-employment rates are higher now than during the early-1990s recession, especially for those without educational qualifications. Among older men and women, non-employment rates have been in longer-term decline and the current recession has had a less marked effect.

Keywords

BHPS, Understanding Society, non-employment, recession

Introduction

One of the most important determinants of the evolution of individuals' life chances is how their participation in paid work varies over the life course, and it is well known that there is a broadly U-shaped relationship between the probability of non-employment and age on average (see e.g. ONS 2009, Anyadike-Danes 2007). At the start of the life course, young people enter work at different ages depending on educational choices and preferences and their ability to find suitable employment. Non-employment rates then decline with age until individuals' late thirties or early forties. Thereafter, rates of non-employment begin to increase with age, reflecting exits from work due to family care, sickness, disability, and retirement. Labour market withdrawal increases as people approach and pass the state pension age and, after age 70, very few people work. Although there has been a increase in the proportion of young people remaining in full-time education and in the labour market participation rates of women of middle and older ages (National Equality Panel 2010; ONS 2009), there remains a U-shaped relationship between non-employment rates and age on average. But how does this relationship change as the economy goes from bust to boom and back? In particular, how do the effects of the current Great Recession on non-employment differ from those of the recession of the early 1990s?

A recession is commonly defined as a decline in Gross Domestic Product (GDP) in two or more consecutive quarters. From the beginning of 2008, GDP in the UK fell for six consecutive quarters, the first such recessionary period since the early 1990s. In 2009, UK GDP contracted by 4.8%, which represents its steepest fall since 1921 (Crafts and Fearon 2010). Furthermore, the preceding financial crisis triggered the first contraction in the global economy since the Second World War (Keeley and Love 2010), and the subsequent recession was, in

most OECD countries, the worst economic downturn since the Great Depression (Jenkins et al 2011). We compare the impact of the Great Recession on non-employment with that of the early 1990s recession in particular, using data covering 1991 to 2009, and looking at all age groups.

We differentiate between generic changes in the level of non-employment rates (shifts up or down in the U-shape) and age-specific changes in slope (changes in the nature of the U-shape itself). Other things being equal, we expect non-employment rates for people of all ages to increase with a recession; with a boom, we expect rates to decline. But other things are not equal: there are systematic differences by age group in labour market advantage and disadvantage that translate into differences in the sensitivity of employment rates to the economic cycle. Young people are vulnerable because, by definition, they have not accumulated labour market experience or skills learned on the job. The youngest groups also have the option of remaining in full-time education (which counts as non-employment). Older workers are also expected to be vulnerable to job loss or less likely to be hired relative to middle-aged groups because employers may view their skills and experience as outdated and there is less time to recoup investments in training before retirement. (Greater eligibility for redundancy payments in the former group relative to the latter may moderate the job loss differential.) Among semi- or fully-retired individuals, non-employment rates may fall with recession: there is an incentive to return to employment to replace income lost from recession-related decreases in income from private pensions and other financial assets, and older people may be more willing to take on part-time rather than full-time jobs. In sum, we expect the impact of the economic cycle on the slope of the non-employment/age relationship to be greatest at the youngest and the oldest ages.

In this paper, we describe the relationship between non-employment rates and age in Britain and show how this relationship has been changing with the economic cycle over the last two decades, with a specific comparison of the current Great Recession with the recession of the early 1990s. We look at not only the raw association between non-employment rates and age, but also the association that remains after controlling for factors such as educational qualifications, region, marital status, and so on. Our research complements previous work about the impact of recessions on the British labour market by, inter alia, Bell and Blanchflower (2010), Government Equalities Office (2010), Gregg and Wadsworth (2010*a*, *b*), and Office for National Statistics (2009). There are several distinctive features to our work.

First, we focus on non-employment rates rather than unemployment rates and describe the variation of rates with age and sex in greater detail. Looking at non-employment rates means that the population at risk is all adults, whereas the population at risk of unemployment is a subset of all adults who are economically active. We study all adults aged 15–69 years and therefore include discouraged workers of pre-retirement age, individuals who are beyond the state retirement pension age, and young people regardless of whether they are in full-time education. As explained earlier, changes in rates of economic activity are likely to be important features of labour market changes for these age groups in macroeconomic booms and busts. On changes in economic activity rates, see Gregg and Wadsworth (2010*a*, *b*).

A second feature of our research is that we showcase newly-released data from the UK's new household panel survey, Understanding Society. These data refer to calendar year 2009, and are used along with data from each year between 1991 and 2008 from the British Household Panel Survey (BHPS). We therefore cover a full turn of the British economic cycle including coverage of the recession of the early 1990s, the recovery and boom thereafter through to the mid-2000s, and a period including the Great Recession that began at the end of 2007. Most previous work for Britain on the labour market and the economic cycle has been based on annual cross-sectional data from the Labour Force Survey (LFS) (e.g. Bell and Blanchflower 2010; Government Equalities Office 2010; Gregg and Wadsworth 2010*a*, 2010*b*; Office for National Statistics 2009). Analysis based on cross-sectional data from household panels remains valuable nonetheless. It is important to benchmark the results from different types of data source against each other. Our work reported below illustrates that trends in non-employment rates derived from our data sets are consistent with those derived from the larger LFS, and that

Understanding Society data are comparable with BHPS data. Of course, the particular strength of household panel surveys is their capacity to describe labour market transitions and histories in greater detail than is possible with the LFS. Analysis of labour market dynamics is a task for the future, when data from more than one wave of Understanding Society are available.

The BHPS and Understanding Society data that we use are described in more detail in the second section. In the third section, we describe trends in non-employment rates by age for men and women, highlighting the differences between recession and boom years. In the next two sections, we consider the extent to which the picture changes if one controls for a range of other characteristics besides age. We report results derived from estimates of probit regression models for the probability of non-employment, fitted separately to data for each year and sex. In addition, probabilities predicted from the fitted models are used to illustrate how changes with the economic cycle in the non-employment and age relationship differ by education level. The final section contains a summary and conclusions.

Data from Understanding Society and the British Household Panel Survey

Our research draws on data for 2009 from Understanding Society and for 1991 to 2008 from the BHPS. Understanding Society is the UK's new household panel study and replaces the BHPS which ended in its current form in 2008. (The surveys are documented online at http://www.iser.essex.ac.uk/survey/bhps/documentation and http://www.understandingsociety.org.uk/design/content/default.aspx.) Understanding Society aims to interview annually 100,000 individuals across 40,000 households in the UK. Our analysis uses a subset of data from the new General Population Sample, that relating to 'wave 1-year 1' which was collected in 2009. This is approximately one half of the initial target sample (each wave of data is collected over a two year period). Former BHPS sample members are also tracked and interviewed as part of the Understanding Society design, but data from this component are not yet available (nor are data from the Understanding Society ethnic minority boost sample).

Understanding Society and the BHPS have similar household panel designs, aiming to be nationally representative samples of the private household population of the initial year, with sample members tracked over time and (re-)interviewed at approximately annual interviews. Both Understanding Society and the BHPS collect information about incomes, labour market status, housing tenure and conditions, household composition, education, health, and many other aspects of people's lives. There are, however, a number of important differences between the two surveys that need to be taken into account when combining data in analysis.

First, there are differences in the samples. Understanding Society wave 1 aims to be representative of the UK private household population in 2009/2010, whereas BHPS wave 1 was designed to represent the British private household population in 1991. Subsequent BHPS waves have become less representative of the contemporary population because the sample design does not take account of post-1991 immigration to the UK, and there has been sample attrition over time. The BHPS sample weights account for the latter aspect but not the former, and so a fundamental difference in composition between the two samples inevitably remains. In addition, Understanding Society samples individuals and households from England, Wales, Scotland, and Northern Ireland, whereas the original BHPS sample did not cover Northern Ireland. (We do not use data from the BHPS extension samples for Wales, Scotland and Northern Ireland that were introduced in the late 1990s. The samples' substantially different sampling probabilities make sample combination unduly reliant on the general survey weights provided.) Throughout our analysis, we use the relevant BHPS and Understanding Society cross-sectional weights for each survey year.

A second difference between the surveys concerns when interviews for each wave are undertaken during the calendar year. The great majority of BHPS interviews were held in the autumn of each calendar year, between September and December. In contrast, Understanding Society interviews are held in every month of the calendar year.

To maximise comparability between the Understanding Society and BHPS data used in the analysis for this paper, and also to abstract from potential issues related to seasonal employment, most of the results that we report are based on the Understanding Society sub-sample, with interviews

from September through December. We also exclude respondents in Northern Ireland from these samples. After these selections, we have between approximately 6,000–8,000 men and women aged between 15 and 69 for each year between 1991 through 2009. (More details on sample numbers appear in the Appendix tables.)

Third, there are some differences between the surveys in questions about similar topics – though there are also many similarities. For example, many of the same questions are used to elicit information about labour market status: we define non-employment in exactly the same way in the two surveys. If the respondent is undertaking paid employment or self-employment at the date of the interview (whether on a part-time or full-time basis), or is temporarily absent from such work because of e.g. holiday or sickness, he or she is counted as 'employed'. Non-employed individuals are those who are not employed and include persons who are unemployed, involved in family care, retired, long-term sick or disabled, or in full-time education.

Other examples of fully comparable variables include the respondent's age at interview (in years), sex, marital (civil) status, and household composition (number, age, and sex of each household member), and the government region in which the household is located. These regions refer to London, the rest of the South East, the South West, East Anglia, East Midlands, West Midlands, Yorkshire and Humberside, the North West, the North East, Wales and Scotland.

Highest educational level, housing tenure, health status, and ethnic minority membership are examples of variables that were asked about in different ways between the surveys. (The BHPS core questionnaire remained largely fixed throughout the 18 waves in order to maintain cross-wave comparability. Understanding Society modified questions to reflect changes in socio-economic institutions since 1991.)

To maximise comparability between the two data sources used in our analysis, we differentiate only three educational qualification levels: no qualifications, qualifications to GCSE or equivalent level, and qualifications higher than GCSE or equivalent. (GCSE refers to the General Certificate of Secondary Education, a qualification awarded at the end of compulsory schooling at age 16. Subsequent opportunities in further or other higher post-compulsory schooling are largely determined by GCSE passes.) There are four categories of housing tenure of the dwelling in which the respondent lives: owned-outright, owned with a mortgage, local authority or housing association tenancy, or other (all remaining tenures). The principal question about health status in Understanding Society asks a respondent whether his or her health is excellent, very good, good, fair, or poor (this is Question 1 from the Short Form 12 questionnaire – SF-12; see Ware et al 1996). This question was also used in BHPS waves 9 or 14 but, in all other waves, the self-rated health question allowed responses of excellent, good, fair, poor, or very poor. The derived binary variable we use in our analysis is 'poor health' which for Understanding Society and BHPS waves 9 and 14 refers to those reporting fair or poor health, and for respondents answering the other question, poor health refers to those reporting fair, poor, or very poor health. The variable is not entirely comparable, as evidenced by small but noticeable differences in distributions of poor health in BHPS years around waves 9 and 14, and between BHPS wave 18 and Understanding Society.

Regarding ethnic minority group membership, Understanding Society asks more detailed questions than the BHPS. But a more substantial issue for analysis of the current kind is that the number of respondents within different groups is very small. (This was one of the reasons for the Understanding Society boost sample of ethnic minority groups.) One cannot simply differentiate between 'white British' respondents and the remainder because the residual category hides large and genuine diversity in labour market behaviour between ethnic minority groups (National Equality Panel 2010). For the current paper, we have instead classified respondents in both surveys according to whether they arrived in the UK after age 15, on the grounds that this was a more reasonable way of classifying a common feature of ethnic minority group disadvantage. (About 3% of the BHPS sample arrived in the UK after the age of 15, compared with almost 9% of the Understanding Society sample. This difference is due to post-1991 immigration to the UK.) Arrivals after 15 had their compulsory schooling outside the UK and, for most, English was not learnt during childhood. We anticipate that this implies lasting disadvantage in the labour market as evidenced, for example, by differences in the

probability of job search success between natives and immigrants (e.g. Frijters et al 2005).

Non-employment rates, age, and the economic cycle

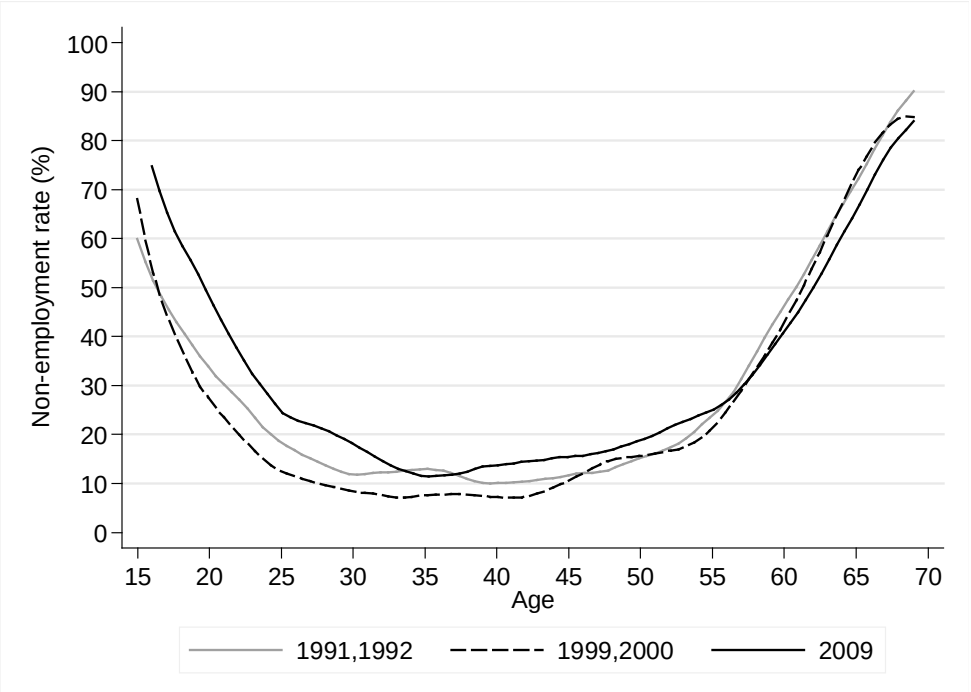
In this section, we describe the non-employment/age relationship and how it varies with the economic cycle. It is not feasible to summarise non-employment rates in detail simultaneously across the dimensions of age (ranging between 15 and 69 years) and calendar time (1991 to 2009). Hence, first, we show the details of variation by age for selected years (representing two economic cycle troughs and one peak) and then, second, we show the details of variation by calendar year for six age groups. In both cases, men and women are analysed separately.

The U-shaped relationship between non-employment rates and age is shown in Figure 1 (for men) and Figure 2 (for women). Each figure summarises rates by age at three dates: '1991,1992' and '1999,2000' (two years of data pooled from the BHPS analysis sample in each case) and '2009' (data from all twelve months of Understanding Society data collection). The dates correspond to a trough, a peak, and a further trough in the economic cycle. A local polynomial smoother has been used in order to smooth out random variability in rates from one age to another, and thereby reveal the key features of the non-employment/age relationship more clearly.

How does the U-shaped relationship change with the economic cycle? Observe that the U-shaped curves do not simply shift up vertically between the early 1990s recession and subsequent peak or shift down vertically between the peak and Great Recession. And there are clear differences between the pictures for men and women in any given year.

Put differently, what stands out most is the substantial increase in non-employment rates among young people in the two recession periods compared to the peak period, and especially in the current recession. For the average 20 year old man or woman, the non-employment rate at the start of the 1990s was around 35%, fell to around 30% at the turn of the century, but then increased substantially, to around 50%, by 2009. Some of this is due to increases in participation in post-compulsory education, which itself tends to increase during economic downturns (Clark 2011).

Figure 1. Non-employment rates by age among men: BHPS 1991–2008; Understanding Society 2009

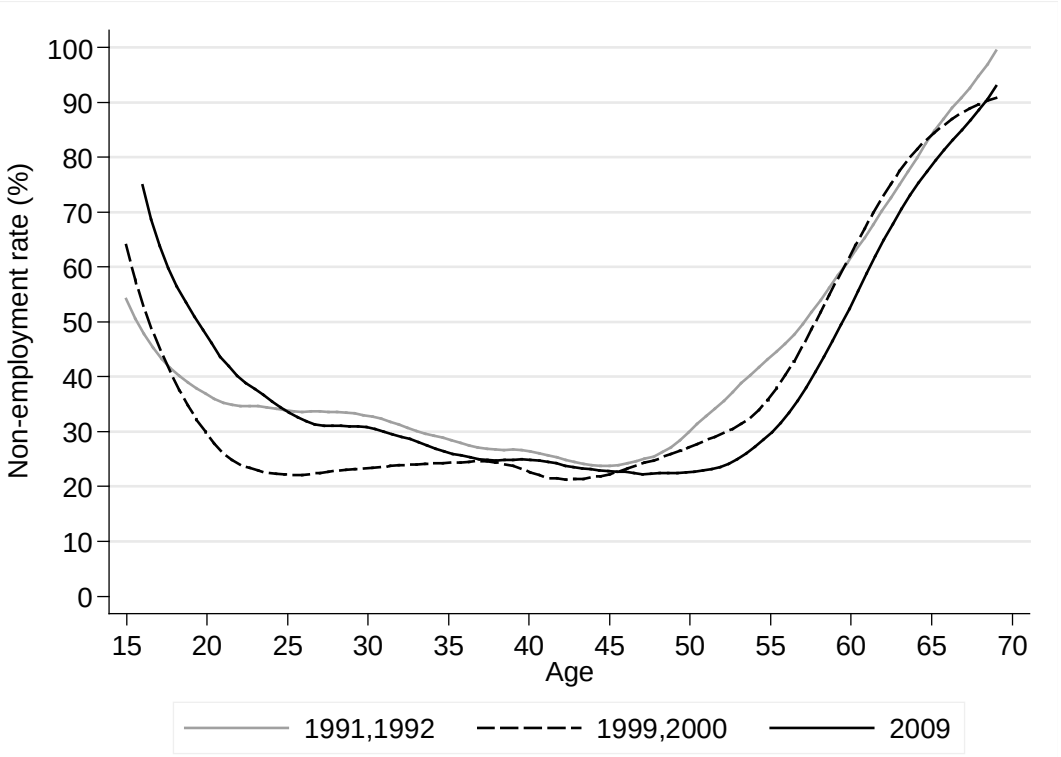


Note. Estimates derived using local polynomial smooth of degree one.

At the other end of the age range, the changes associated with the economic cycle are quite different. For the average man or woman aged over 60, the current recession is associated with a decrease of around 5 percentage points in non-employment rates compared to rates in the boom years a decade before. The early-1990s recession is, however, not associated with lower non-employment rates than in the boom years for men or women.

For the in-between age range, from 25–60 years, differences between men and women are more apparent. Women have non-employment rates that are about 10 percentage points higher than men's (around 30% compared to 20%) and there is less variation with age. As a result, the U-shape curve describing women's non-employment rates has a flatter bottom than does that for men. In addition, the economic cycle has different impacts for men and women in this middle age group. For men, both recessions raised non-employment rates – there is a vertical shift upwards in the line over this age range, broadly speaking. But the increase is markedly greater for the current recession than the early 1990s one, particularly towards the younger end of the age range. For women, both recessions increased non-employment rates relative to the peak years for those in the 25–45 age range but, for women aged 45–60, the recessions had quite different effects: non-employment rates increased in the early-1990s recession, but decreased in the current recession.

Figure 2. Non-employment rates by age among women: BHPS 1991–2008; Understanding Society 2009

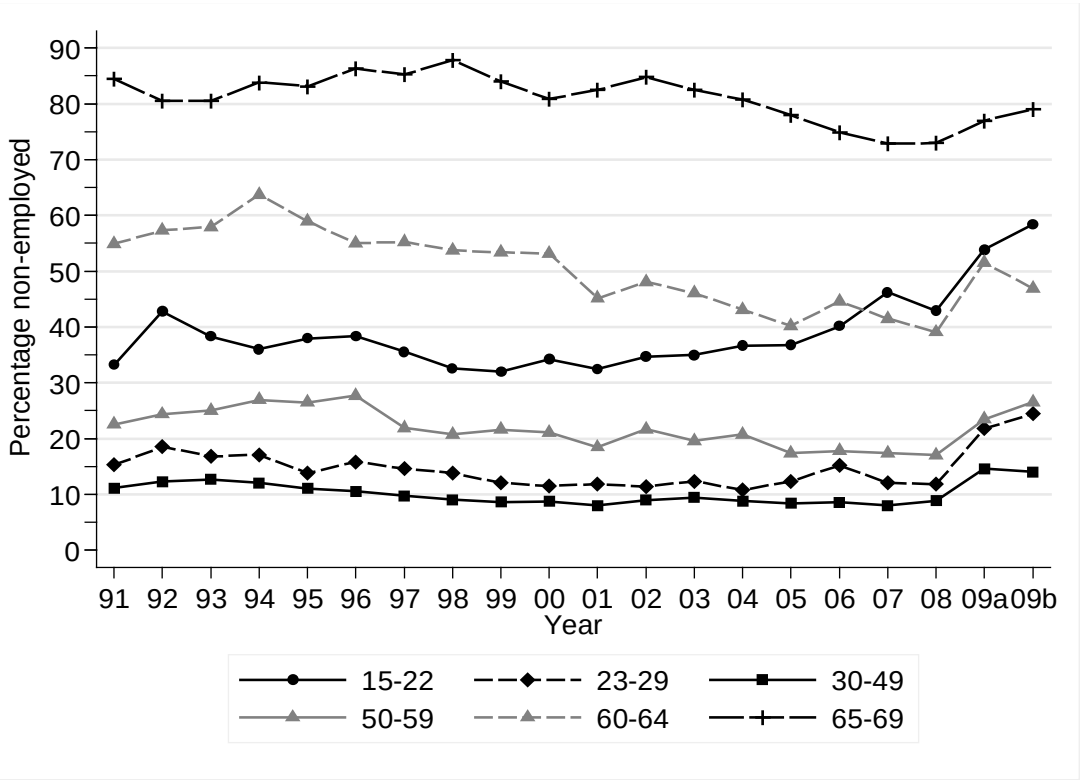


Note. Estimates derived using local polynomial smooth of degree one.

In sum, there is ample evidence that the current recession has changed the relationship between non-employment and age, and in particular at the extremes of the age distribution. This finding has also been reported in analyses based on Labour Force Survey data (GEO 2010; ONS 2009; Bell and Blanchflower 2010).

We now look in greater detail at year-on-year trends in non-employment rates over the full 19 year period in order to show changes over the full turn of the economic cycle rather than concentrating on only selected bust and boom years. See Figure 3 (for men, whom we discuss first) and Figure 4 (for women).

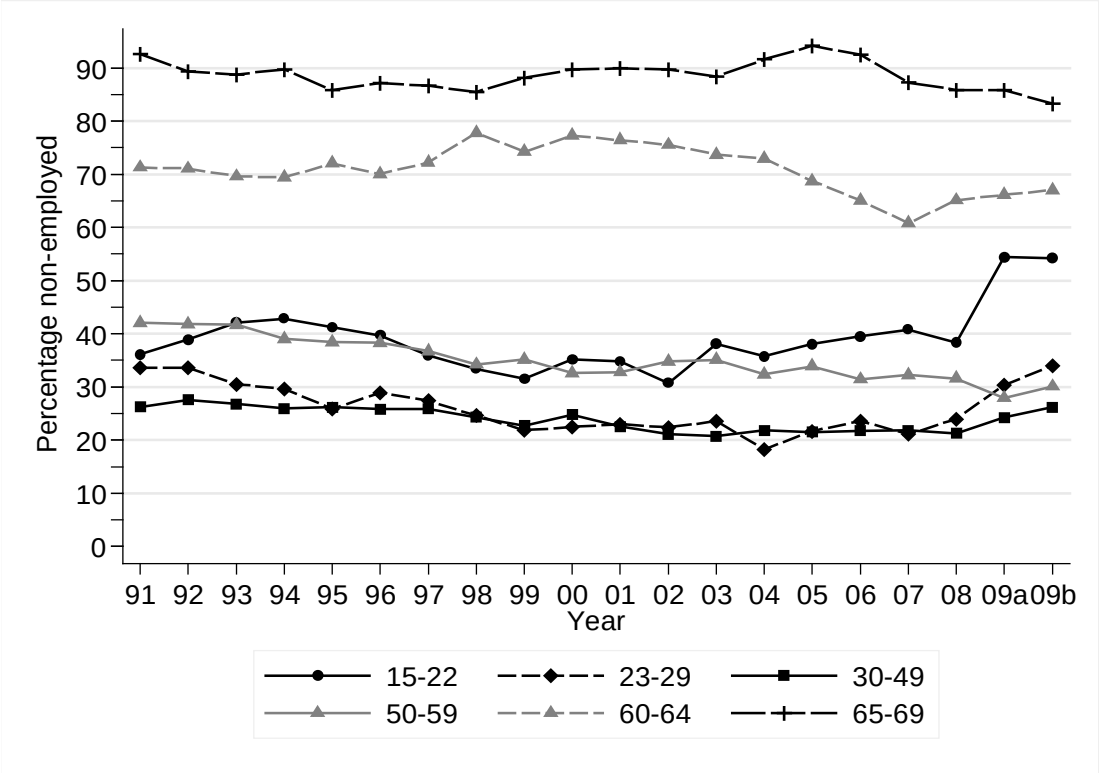
Figure 3. Percentage of men non-employed, by age and survey year: BHPS 1991–2008, Understanding Society 2009



Notes. For Understanding Society, year 09a refers to interviews between January and August 2009, and year 09b refers to interviews from September 2009 onwards

Between the early- to mid-1990s and 2008, non-employment rates generally fell among older men, from around 85% to around 75% for men aged 65–69, and from around 60% to 40% for men aged 60–64. However, non-employment rates then increased markedly in 2009 for both groups, to nearly 80% and 50% respectively. Non-employment rates also fell over the period since the early-mid 1990s for men aged 23–59, although from much lower starting points. The increase in non-employment rates in the current recession is also apparent for this age group, especially for men aged 23–29 years for whom non-employment rates increased by more than 10 percentage points between Autumn 2008 and Autumn 2009. (Observe also that the 1990s recessionary peak in non-employment rates occurs around 1992 for younger men, but several years later for older age groups.) The trend in non-employment rates for men aged 15–22 is distinctive, however, with rates starting to rise much earlier than for other groups, in around 2000. For this group of men, the non-employment rate was about as high, 45%, in the mid-2000s (when the British economy was doing well) as in 1992 (when there was a recession). The rate continued to increase, reaching almost 60% by the end of 2009. The increase between 2000 and 2007 mostly reflects increasing participation in post-compulsory education, while the large jump between 2008 and 2009 also reflects the increase in unemployment associated with the recession.

Figure 4. Percentage of women non-employed, by age and survey year: BHPS 1991–2008, Understanding Society 2009



Notes. For Understanding Society, year 09a refers to interviews between January and August 2009, and year 09b refers to interviews from September 2009 onwards.

For women, the trends in non-employment rates are broadly similar to those for men. (What differs more between the sexes is non-employment rate levels, which are generally higher for women than men.) Non-employment rates among women aged 65–69 fluctuated around 85% until the early-2000s. They fell thereafter until they increased again between 2008 and 2009 but not to their earlier level. Thus a larger proportion of older women were in work during the current recession than in the early-1990s recession. For women of other ages, and as for men, non-employment rates have tended to decline since the early- to mid-1990s, and then increase sharply after 2007. As for men, the exceptional group is women aged 15–22, for whom the increase in the non-employment rate also began around 2000 and, again, part of this rise can be attributed to an increased participation in post-compulsory education.

In sum, looking at the detailed year-on-year trends reveals that turning points in time series of non-employment rates do not coincide exactly with peak and trough years of the economic cycle. For example, non-employment rates for older men and women took several years to fall after the early-1990s recession, and rates for the youngest group began to rise from around 2000 while rates for other age groups continued to fall until the late-2000s. But Figures 3 and 4 also confirm that the Great Recession is associated with higher non-employment rates than the early-1990s recession, particularly for young people.

Non-employment and age, controlling for other characteristics

Figures 1–4 describe the non-employment/age relationship on average. What is not revealed is the nature of the relationship if one controls for differences in characteristics other than age and sex. To what extent does the relationship remain U-shaped if one takes account of differences in, say, educational qualifications, region of residence, or marital status? And has this relationship changed over time as well?

To examine the non-employment/age relationship adjusted for differences in characteristics, we fit probit regression models of the probability of being non-employed, separately

for each survey year and sex, for individuals aged 15–69. The explanatory variables besides age are: highest educational qualification, whether arrived in the UK after age 15, housing tenure, government region, whether the respondent's household has access to a car, self-reported health status, marital status, household type and presence of children in particular. This list of variables is similar to that used in regression modelling of the probability of unemployment (cf. Bell and Blanchflower 2010), except that we estimate separate rather than pooled models for men and women.

There is an issue of how to specify 'age' in these regression models. A very flexible specification would be ideal in order to capture all aspects of the U-shape revealed by Figures 1 and 2. However, this is not feasible: with few respondents of any given age, one has to either use some parametric form or some grouping along the age range. We experimented with a range of specifications: quadratic and higher order polynomials, linear and cubic splines, and several categorical definitions of age group. The polynomials tended to over-smooth. Categorical variables appeared to summarise the data as well as spline specifications and they are easier to interpret. We therefore report results for the case in which adjusted differences in non-employment rates are summarised using the same six age groups as employed in Figures 3 and 4. In preliminary analysis, we also experimented with a number of interaction effects between age and other explanatory variables, but these were never statistically significant – which is probably a reflection of small cell size – and so no specifications with interactions are reported in the paper.

When fitting the probit regression models, we use the relevant cross-sectional weight for each year. Standard errors are calculated using the commonly-used estimator that adjusts for clustering of individuals within households (White 1980). The details of our regression estimates are presented in the Appendix to the paper. We report average marginal effects (AMEs) rather than probit coefficients, because AMEs are more easily interpreted – they are in the probability metric. For a given explanatory variable, the AME is derived by first calculating, for each respondent, the change in the probability of non-employment associated with a unit change in that explanatory variable, holding all other explanatory variables at their observed values. Second, these probability changes are averaged across the estimation sample. Since 30–49 is the reference age category used in the regressions, we are particularly interested in the AMEs for each of the binary variables that indicate membership of the other age groups: these tell us how much higher (or lower) the non-employment probability is for those other groups relative to persons aged 30–49.

In the rest of this section, we first summarise the estimates concerning the non-employment/age relationship adjusted for differences in other characteristics (drawing on the AME estimates in the Appendix), and then illustrate the estimates in greater detail by comparing the experience of individuals with different levels of educational qualification. For brevity, discussion of the associations between non-employment rates and other explanatory variables is omitted.

Non-employment, age and the economic cycle

The estimates for men indicate that the U-shaped non-employment age relationship remains when other characteristics are adjusted for. Compared with 20–49 year olds, younger and older men have more positive AMEs. However, there are some important changes across calendar years.

For example, men aged 15–22 were significantly more likely than men aged 30–49 to be non-employed in all years, but the magnitude of the differential varies with the economic cycle. In 2009, young men were 32 percentage points more likely than otherwise similar men aged 30–49 to be non-employed. This is considerably higher than in any other year, and compares to a differential of between 17 and 20 percentage points for years in the early 1990s. Therefore the current recession has had a more harmful impact on the relative employment prospects of young people than the previous recession did. (A similar but smaller effect emerges for men aged 23–29.) The relatively large increase in unemployment among young people during the Great Recession has been noted in research based on the Labour Force Survey (ONS 2009; Bell and Blanchflower 2010; Gregg and Wadsworth 2010*c*). Here we are looking at non-employment rather than unemployment, and trends in non-employment are partly driven by higher rates of participation in education during the recession (Clark 2011).

In contrast, non-employment probabilities for age groups 60–64 and 65–69 were lower in 2009 than during the previous two decades. For example, in 2009, men aged 60–64 were about 30 percentage points more likely to be out of work than men aged 30–49, other things being equal. For most of the 1990s, this differential was greater than 36 percentage points, and around 30% throughout the 2000s. Men aged 65–69 were 58 percentage points more likely to be out of work than similar men aged 30–49 in 2009, which is the lowest the differential has been since the early 1990s.

Similar patterns arise for women. Between 1991 and 2008, women aged 15–22 were between 10 percentage points and 17 percentage points more likely to be non-employed than similar women aged 30–49. However in 2009 this differential increased substantially, to 22 percentage points. Women aged 23–29 had similar probabilities of non-employment to women aged 30–49 in most years, except that in 2009 they were 5 percentage points more likely to be without employment. Therefore, as for young men, the current recession is associated with substantially lower employment rates for young women – rates that are lower than during the previous recession.

Women aged 50–59 were 20 percentage points more likely to be non-employed in the early-1990s than their 30–49 peers, and this differential fell to around 12 percentage points during the upswing of the economic cycle. However, in 2009, the adjusted non-employment probability differential halved to 7 percentage points. A similarly large effect arises for women aged over 60, particularly those aged 65–69, for whom the probability of non-employment fell from being 60 percentage points greater than the probability for women aged 30–49 in 2007 and 2008 (and in the recession of the early-1990s) to 50 percentage points in 2009.

In sum, the adjusted estimates provide additional evidence that the current recession has changed the relationship between age and non-employment for both men and women – significantly raising the probability of non-employment among the young, while reducing it among older people relative to the recession of the early 1990s. These findings for non-employment rates are consistent with Bell and Blanchflower (2010) who document that increases in unemployment rates associated with the current recession are particularly concentrated among young workers, and more so than in previous recessions, while the impact on workers aged between 40 and the state retirement pension age has been small.

Non-employment, age, and the economic cycle: differences by education level

We now illustrate how changes with the economic cycle in the non-employment/age relationship vary by education level. We use the probit regression estimates to predict non-employment probabilities by age and education level, with separate calculations for men and women, and year. (To control for differences in other characteristics, we take a UK-born person who lives in the South-East outside London, has access to a car, is not in poor health, lives with a partner but no children, and is a house-owner with a mortgage.) We focus on 1992 (relating to the recession of the early-1990s), 2000 (a boom year), and 2009 (the current recession).

The results for men are displayed in Figure 5, with the situation for those without educational qualifications shown in panel (a). Panel (b) shows the situation for men with GCSE or equivalent qualifications and panel (c) is for men with higher qualifications. A comparison of predicted non-employment probabilities across education levels, illustrates that having more educational qualifications is protective against non-employment, regardless of the business cycle. For each year, men with no qualifications are predicted to have higher non-employment rates than men with some qualifications at all ages. From ages 23 to 50, non-employment probabilities vary little with the economic cycle – the profiles in each panel are very close together over this age range – but there are differences in non-employment probabilities by education level. For instance, the average middle-aged man with no educational qualifications has a non-employment rate of around 5%, but the rate is approximately half that for men with qualifications.

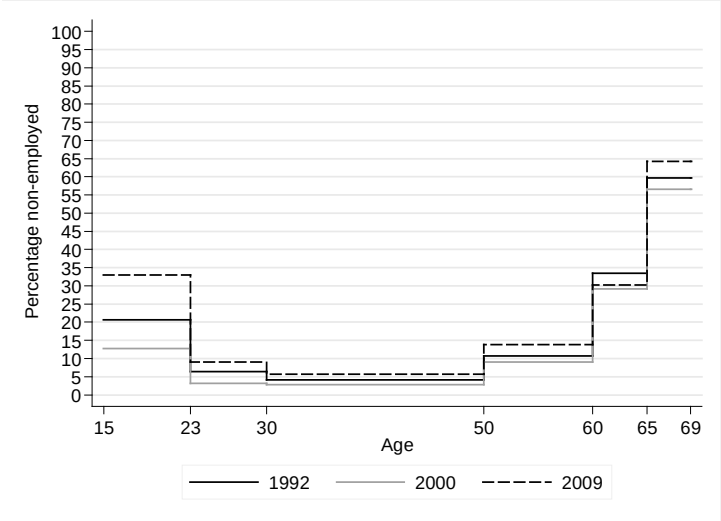
The gradients in non-employment rates by educational level are even more striking at the two extremes of the age range and, again, the main difference is between those with no educational qualifications and those with some qualifications. There is also greater sensitivity of non-employment rates to the economic cycle for the youngest age group.

For example, men under the age of 23 with no qualifications are predicted to have a 34% probability of non-employment in 2009, other things being equal, compared with a rate of 20% in 1992 and 14% in 2000. If they have GCSE or equivalent qualifications, the corresponding non-employment probabilities are 25%, 15%, and 7%; for those with higher qualifications, the probabilities are around 20%, 16%, and 8%.

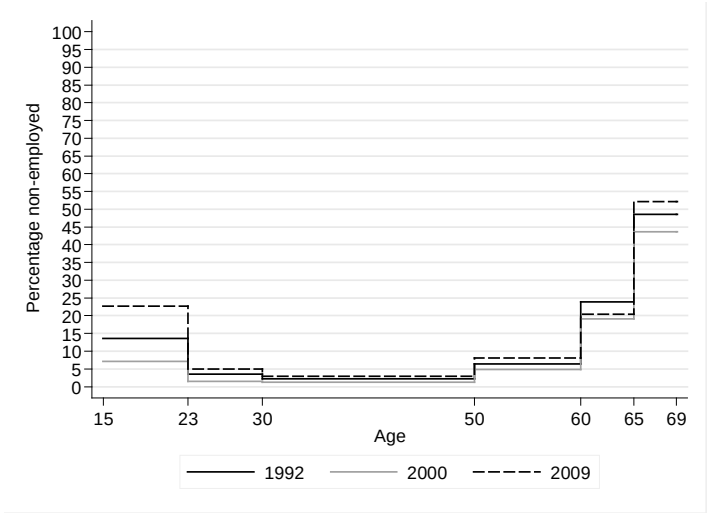
Among men aged 65 or more, predicted non-employment rates are between 55% and 65% for those with no educational qualifications, but between about 45% and 55% for those with some qualifications. For this group, and also men aged 50–64, and by contrast with the youngest group, it is not so clear that non-employment rates are higher in the current recession than the early-1990s one.

Figure 5. Men's predicted probabilities of non-employment by age, by education level and year

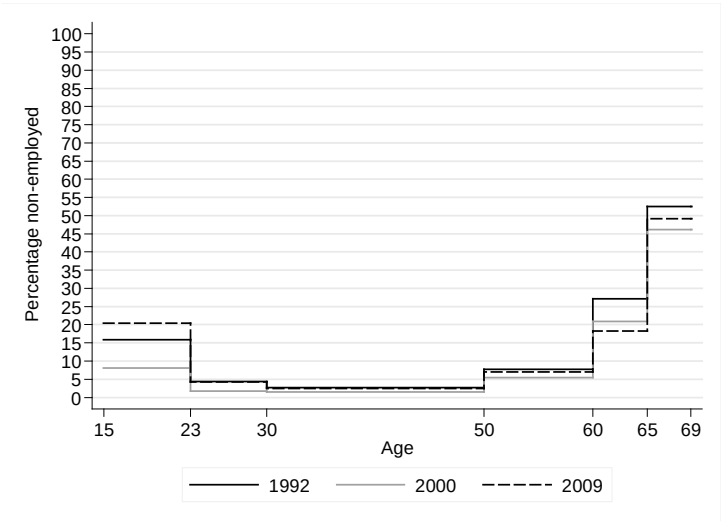
(a) No educational qualifications



(b) GCSEs or equivalent



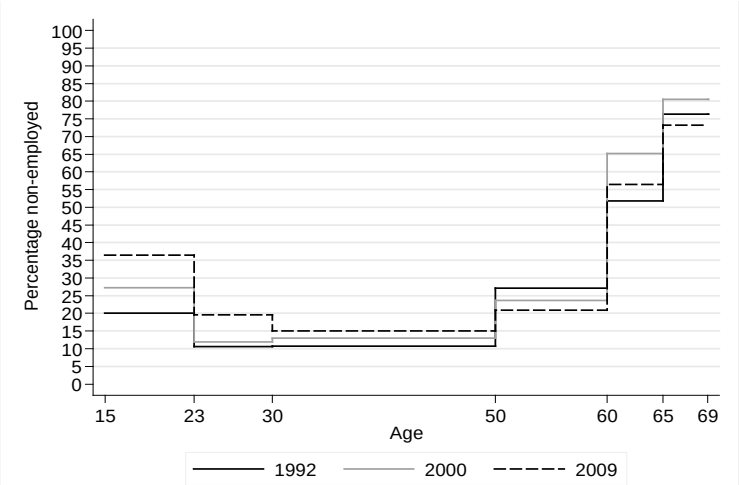
(c) Qualifications above GCSEs



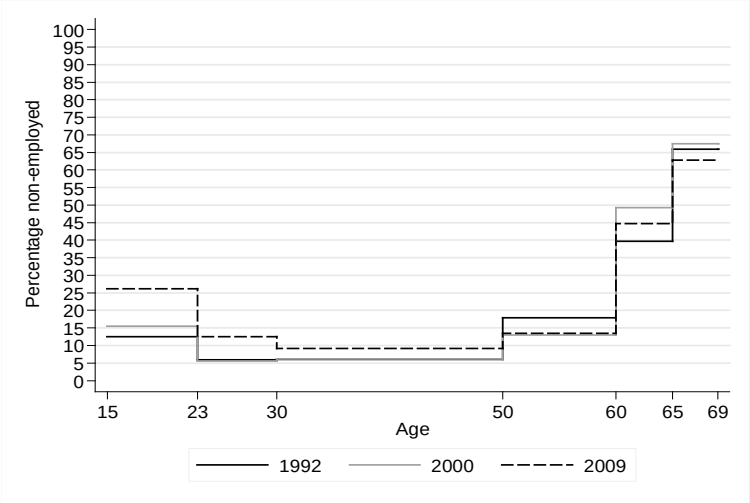
Notes. Predicted probabilities derived using the probit regression estimates summarised in the Appendix tables: see text for details.

Figure 6. Women's predicted probabilities of non-employment by age, by education level and year

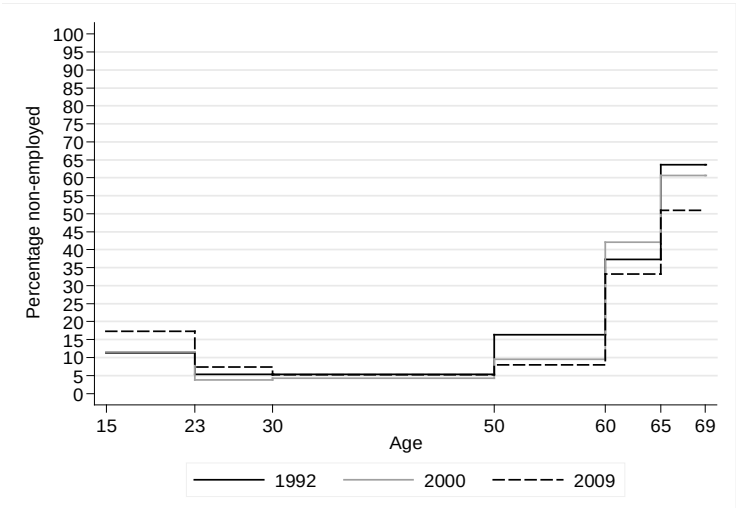
(a) No educational qualifications



(b) GCSEs or equivalent



(c) Qualifications above GCSEs



Notes. Predicted probabilities derived using the probit regression estimates summarised in the Appendix tables: see text for details.

For women, it is also the case that educational qualifications are protective against non-employment with gradients being most striking at the two extremes of the age range, and the main difference is between those with no educational qualifications and those with some qualifications. See Figure 6, panels a–c. Among women aged 15–22 with no qualifications, the predicted non-employment rate is around 36% in 2009, compared with rates of 26% in 1992 and 17% in 2000. For those with GCSE or equivalent qualifications, the corresponding probabilities are much lower (26%, 12%, and 15%), and lower still for those with higher qualifications (17%, 12%, and 12%).

We remarked earlier on the decline in the average non-employment rate among older women between the previous economic cycle peak and 2009 (Figures 2 and 4). Figure 6 shows that this decrease occurred for all three education groups. (In analysis not reported, we find that the decline began in the mid-2000s for all three groups.) Among women over 50, it is also clear that non-employment rates in the current recession are lower than in 1992 for those with qualifications to a level greater than GCSE or equivalent. For those with lower or no educational qualifications, the picture is less clear.

Summary and conclusions

Using data from the first wave of Understanding Society relating to 2009 and from 18 waves of BHPS data covering 1991–2008, we have described the U-shaped relationship between non-employment rates and age, and considered how the details of this relationship have changed with the economic cycle. Unlike much previous work which has analysed unemployment rates among people of 'working age' (conventionally defined as 16 to 59 for women and 16 to 64 for men), we consider all adults aged between 15 and 69. Hence the at-risk population for our analysis includes young people (who may be more likely to stay in post-compulsory education in recessionary periods) and discouraged workers (whose status is likely to be sensitive to macro-economic conditions), and individuals older than the state retirement pension age (who may re-enter work in a recession in order to maintain incomes).

Our results suggest that changes for individuals towards the youngest and oldest ends of the age range account for the largest changes over time in non-employment rate levels and in their U-shaped relationship with age. We show that employment rates of young people, especially young people with no qualifications, have been hit particularly hard by the current recession and by more so than in the recession of the early-1990s. While this is partly due to higher rates of participation in post-compulsory education, our evidence is consistent with other research documenting large increases in unemployment among young people. The rates of middle-aged men and women were affected considerably less. We also find that non-employment rates among older men and women declined from the mid-2000s and the current recession has not fully offset this trend.

In addition to providing substantive analysis of non-employment rates, our paper has had the role of showcasing newly-released data from Understanding Society. We have shown that the data may be combined with data from the BHPS to look at longer-term trends in labour market behaviour (though we have also drawn attention to some inevitable non-comparabilities that researchers should be aware of), and the combined data sets yield estimates of trends that are consistent with those derived from the Labour Force Survey. In the future, there will be panel data from Understanding Society, so analysts can consider labour market transitions and histories, and for much larger samples than we have used in this paper, thereby enabling better analysis of small-sized groups including, for examples, differences by ethnic minority group. The full potential of Understanding Society data for labour market analysis has yet to be realised.

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Appendix. Average marginal effects on the probability of non-employment, by sex and year (probit regression estimates)

MEN	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Age: 15–22	0.169***	0.242***	0.178***	0.211***	0.196***	0.185***	0.165***	0.140***	0.190***	0.171***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 23–29	0.025	0.044**	0.036*	0.047**	0.009	0.023	0.016	0.030	0.032	0.009
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Age 50–59	0.098***	0.114***	0.113***	0.126***	0.145***	0.172***	0.134***	0.118***	0.117***	0.117***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Age 60–64	0.368***	0.376***	0.393***	0.415***	0.425***	0.408***	0.424***	0.370***	0.376***	0.362***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age 65–69	0.641***	0.596***	0.601***	0.620***	0.675***	0.705***	0.681***	0.694***	0.625***	0.602***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)
GCSE or equivalent	–0.054***	–0.067***	–0.065***	–0.083***	–0.036*	–0.061***	–0.069***	–0.054**	–0.065***	–0.070***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Above GCSE or equivalent	–0.059***	–0.044**	–0.056***	–0.048**	–0.049***	–0.042**	–0.054***	–0.068***	–0.053***	–0.057***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
UK arrival aged 15+	0.093***	0.031	0.081*	0.030	0.001	0.038	–0.027	0.004	0.028	–0.039
	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.04)
Own house – mortgage	–0.061***	–0.086***	–0.072***	–0.070***	–0.053***	–0.051***	–0.058***	–0.090***	–0.105***	–0.121***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Local authority tenant	0.076***	0.081***	0.071**	0.089***	0.100***	0.109***	0.060**	0.032	0.032	0.038
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Other tenancy	0.036	0.034	–0.030	0.008	0.052	0.061**	0.040	–0.001	–0.072**	–0.077**
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
North East	0.058*	0.060*	0.076**	0.019	–0.002	0.058	0.060	0.080**	0.080**	0.039
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
North West	0.040	0.022	0.050*	0.023	0.003	0.008	0.026	0.007	0.020	0.017
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Yorkshire/Humberside	–0.013	–0.028	0.016	–0.025	–0.002	–0.006	0.038	0.018	0.026	–0.026
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
East Midlands	0.006	–0.02	0.040	0.013	0.018	0.033	0.052*	0.041	0.058*	0.005
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
West Midlands	0.013	–0.016	0.033	0.008	–0.006	0.015	0.034	0.042	0.022	0.019
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
East Anglia	–0.015	–0.035	0.053*	–0.035	–0.041	–0.023	–0.015	0.003	–0.009	–0.046
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

Rest of South East	–0.021	–0.013	0.007	–0.047*	–0.058**	–0.019	–0.009	–0.001	0.018	–0.016
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
South West	–0.009	–0.025	–0.014	–0.050*	–0.028	–0.012	0.008	0.017	0.025	0.012
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Wales	0.033	0.028	0.057	0.054	0.084**	0.052	0.060*	0.079**	0.073**	0.024
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Scotland	–0.009	–0.004	0.026	0.030	0.019	0.005	0.055*	0.045	0.059*	0.010
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
1+ cars in household	–0.128***	–0.139***	–0.150***	–0.115***	–0.120***	–0.149***	–0.135***	–0.103***	–0.077***	–0.087***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Poor health	0.117***	0.151***	0.146***	0.161***	0.148***	0.131***	0.156***	0.148***	0.188***	0.143***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Separated/divorced/widowed	0.067**	0.081**	0.154***	0.103***	0.046	0.079**	0.038	0.052*	0.061*	0.049
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Single never married	0.060***	0.070***	0.088***	0.033	0.054**	0.075***	0.088***	0.080***	0.068***	0.075***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Responsible for child < 16	0.097	0.323***	0.236***	0.190**	0.122	0.170**	0.298***	0.199**	0.110	0.211**
	(0.06)	(0.10)	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)	(0.10)	(0.10)	(0.11)
Household size	0.008	0.013**	0.014**	0.005	0.013**	0.014**	0.011**	0.013**	0.008	0.012**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Child < 5 in household	0.033	0.048**	0.034	0.018	0.018	0.020	0.019	–0.003	0.010	0.0145
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
F	28.719	28.040	26.957	29.246	26.407	24.375	24.983	25.727	23.401	23.587
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. persons	4043	3774	3621	3642	3533	3692	3682	3544	3467	3431
No. HH	3447	3212	3083	3084	3007	3112	3111	3053	3013	2992

MEN	2001	2002	2003	2004	2005	2006	2007	2008	2009
Age: 15–22	0.122***	0.158***	0.178***	0.201***	0.146***	0.172***	0.245***	0.200***	0.322***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Age 23–29	0.002	–0.006	0.005	–0.011	–0.005	0.018	0.015	–0.008	0.053**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Age 50–59	0.115***	0.125***	0.061***	0.097***	0.094***	0.083***	0.089***	0.079***	0.119***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Age 60–64	0.323***	0.334***	0.272***	0.301***	0.295***	0.331***	0.322***	0.284***	0.296***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age 65–69	0.653***	0.673***	0.597***	0.622***	0.626***	0.579***	0.586***	0.608***	0.580***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
GCSE or equivalent	–0.057**	–0.062**	–0.076***	–0.045*	–0.056**	–0.083***	–0.041	–0.029	–0.083**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Above GCSE or equivalent	–0.075***	–0.084***	–0.085***	–0.056***	–0.066***	–0.116***	–0.073***	–0.053**	–0.101***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
UK arrival aged 15+	–0.041	0.006	–0.006	–0.068*	0.034	0.005	–0.010	0.058	0.117***
	(0.05)	(0.06)	(0.04)	(0.04)	(0.06)	(0.06)	(0.05)	(0.05)	(0.04)
Own house – mortgage	–0.102***	–0.102***	–0.133***	–0.105***	–0.087***	–0.112***	–0.090***	–0.111***	–0.126***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Local authority tenant	0.047*	0.113***	0.069**	0.087***	0.112***	0.093***	0.147***	0.129***	0.088**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Other tenancy	–0.005	–0.051	–0.085**	–0.092***	–0.039	–0.036	0.025	0.013	–0.040
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
North East	0.057*	0.091**	0.073*	0.064	0.049	0.139***	0.074**	0.100**	0.144***
	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
North West	0.076***	0.049	0.094***	0.035	0.004	0.097***	0.121***	0.101***	0.083**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Yorkshire/Humberside	0.049*	0.011	0.025	–0.048	0.018	0.046	0.066**	0.071**	0.190***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
East Midlands	0.069**	0.028	0.032	–0.022	–0.006	0.056*	0.035	0.083**	0.075*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
West Midlands	0.072**	0.026	0.003	–0.029	–0.031	0.063**	0.042	0.018	0.075**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
East Anglia	0.024	0.012	0.030	–0.020	0.025	0.088***	0.103***	0.072**	0.067*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)

Rest of South East	0.004	–0.021	0.009	–0.007	0.018	0.052*	0.038	–0.001	0.061*
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
South West	0.035	0.015	0.015	–0.058*	–0.011	0.040	0.039	0.028	0.059
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Wales	0.097***	0.059	0.077**	0.017	0.006	0.073**	0.085**	0.060	0.057
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Scotland	0.054*	0.039	0.060	0.002	–0.021	0.083**	0.093***	0.082**	0.062*
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)
1+ cars in household	–0.090***	–0.038	–0.082***	–0.095***	–0.095***	–0.106***	–0.105***	–0.110***	–0.171***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Poor health	0.125***	0.102***	0.114***	0.172***	0.118***	0.158***	0.130***	0.119***	0.166***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Separated/divorced/widowed	0.029	0.029	0.032	0.039	0.014	0.078**	0.033	0.008	0.016
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Single never married	0.114***	0.095***	0.070***	0.065***	0.103***	0.117***	0.089***	0.108***	0.078***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
Responsible for child < 16	0.031	0.126	0.007	0.090	0.126	0.082	0.093	0.027	0.062
	(0.08)	(0.08)	(0.07)	(0.08)	(0.10)	(0.07)	(0.08)	(0.10)	(0.07)
Household size	0.014**	0.010*	0.002	0.008	0.015**	0.017***	0.013**	0.013**	0.013
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Child < 5 in household	–0.021	–0.002	–0.028	0.016	–0.021	0.003	–0.015	0.003	–0.034
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
F	24.740	21.977	23.626	22.867	21.599	25.446	24.224	22.413	21.847
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. persons	3364	3260	3178	3106	3060	3079	2964	2842	2819
No. HH	2923	2850	2782	2724	2668	2662	2569	2461	2499

*Notes. * p<.10, ** p<.05, *** p<.01.*

The reference categories in the probit regressions are: aged 30–49, no educational qualifications, arrived (or born) in the UK before age 15, house is owned outright, government region is London, no cars available to household, not in poor health, living with partner (legally married or cohabiting), no responsible for a child aged under 16 years, youngest child in household aged over 5 years (if children present).

WOMEN	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Age: 15–22	0.134***	0.124***	0.167***	0.128***	0.101***	0.151***	0.108***	0.110***	0.112***	0.161***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 23–29	0.012	–0.001	–0.009	–0.011	–0.023	0.001	0.013	–0.009	–0.014	–0.014
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Age 50–59	0.213***	0.200***	0.236***	0.194***	0.193***	0.169***	0.151***	0.144***	0.176***	0.123***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 60–64	0.440***	0.416***	0.441***	0.439***	0.454***	0.412***	0.443***	0.524***	0.486***	0.496***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
Age 65–69	0.645***	0.586***	0.604***	0.602***	0.566***	0.573***	0.561***	0.574***	0.614***	0.616***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
GCSE or equivalent	–0.069***	–0.092***	–0.086***	–0.062***	–0.063***	–0.085***	–0.073***	–0.089***	–0.077***	–0.127***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Above GCSE or equivalent	–0.106***	–0.110***	–0.114***	–0.092***	–0.102***	–0.123***	–0.125***	–0.157***	–0.150***	–0.179***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
UK arrival aged 15+	0.069**	0.007	0.053	–0.004	0.061	0.069*	0.078*	0.070	0.007	0.033
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)
Own house mortgage	–0.127***	–0.135***	–0.119***	–0.138***	–0.164***	–0.148***	–0.144***	–0.139***	–0.138***	–0.145***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Local authority tenant	0.000	–0.011	0.015	0.045	–0.038	–0.022	–0.009	–0.044	–0.013	–0.011
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Other tenant	–0.033	0.010	0.022	0.059*	–0.024	0.054	–0.062*	–0.037	–0.026	–0.074*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
North East	0.036	0.009	–0.008	–0.013	0.008	–0.010	0.017	0.037	0.049	0.042
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
North West	–0.044*	–0.011	–0.030	–0.036	0.019	0.042	0.035	0.042	0.067**	0.034
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Yorkshire/Humberside	–0.022	0.000	–0.002	–0.007	0.035	0.054*	0.088***	0.092***	0.085***	0.078**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
East Midlands	–0.000	0.011	–0.003	–0.006	0.054	0.019	0.035	0.053	0.056*	0.037
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
West Midlands	–0.038	–0.000	0.005	0.006	0.030	0.019	0.022	0.031	0.036	0.059*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
East Anglia	–0.006	0.014	–0.026	–0.017	0.001	0.048	0.052	0.011	0.019	–0.004
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

Rest of South East	–0.046*	0.003	–0.029	–0.036	–0.000	0.007	0.018	0.016	0.026	0.007
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
South West	–0.004	0.028	0.027	0.023	0.027	0.064*	0.046	0.049	0.043	0.059*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Wales	0.025	0.046	0.022	0.028	0.071*	0.090**	0.075**	0.112***	0.099***	0.065*
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Scotland	–0.032	–0.005	0.009	–0.013	0.021	–0.010	0.028	0.070**	0.060*	0.022
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
1+ cars in household	–0.085***	–0.102***	–0.085***	–0.079***	–0.100***	–0.115***	–0.135***	–0.105***	–0.075***	–0.092***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Poor health	0.108***	0.151***	0.117***	0.134***	0.143***	0.126***	0.127***	0.126***	0.171***	0.113***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Separated/divorced/widowed	0.024	0.030	0.046*	0.060***	0.047*	0.012	0.046*	0.009	–0.003	0.007
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Single never married	0.016	0.060**	0.070***	0.060**	0.079***	0.036	0.035	0.051**	0.040*	0.021
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)	(0.025)	(0.02)	(0.025)
Responsible for child < 16	0.092***	0.117***	0.130***	0.0960***	0.111***	0.093***	0.058**	0.080***	0.111***	0.118***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Household size	0.020***	0.015**	0.023***	0.032***	0.034***	0.027***	0.038***	0.023***	0.014**	0.017**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Child < 5 in household	0.240***	0.249***	0.197***	0.165***	0.161***	0.135***	0.173***	0.189***	0.136***	0.123***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)
F	37.514	32.941	31.473	32.044	28.546	26.958	26.633	26.762	26.453	25.985
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. persons	4510	4292	4136	4121	4008	4153	4144	4041	3966	3941
No. HH	4007	3742	3609	3606	3510	3602	3606	3566	3497	3463

WOMEN	2001	2002	2003	2004	2005	2006	2007	2008	2009
Age: 15–22	0.132***	0.101***	0.166***	0.126***	0.123***	0.163***	0.139***	0.133***	0.216***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)
Age 23–29	0.004	0.032	0.036	–0.037*	–0.032	0.000	–0.053**	–0.031	0.052*
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Age 50–59	0.150***	0.185***	0.172***	0.148***	0.166***	0.128***	0.146***	0.139***	0.065**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 60–64	0.504***	0.523***	0.503***	0.487***	0.451***	0.411***	0.389***	0.433***	0.385***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age 65–69	0.632***	0.654***	0.645***	0.666***	0.698***	0.662***	0.614***	0.589***	0.516***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
GCSE or equivalent	–0.100***	–0.140***	–0.106***	–0.092***	–0.078***	–0.100***	–0.126***	–0.115***	–0.093***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Above GCSE or equivalent	–0.165***	–0.191***	–0.172***	–0.162***	–0.182***	–0.189***	–0.201***	–0.207***	–0.183***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
UK arrival aged 15+	–0.009	0.036	–0.001	0.014	–0.012	–0.011	–0.010	0.022	0.105***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.03)
Own house mortgage	–0.160***	–0.161***	–0.137***	–0.150***	–0.124***	–0.116***	–0.119***	–0.150***	–0.172***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Local authority tenant	–0.001	–0.018	0.036	0.006	0.058*	0.074**	0.048	0.052	0.018
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Other tenant	–0.048	–0.085**	–0.056	–0.077**	–0.007	–0.055	–0.040	–0.016	–0.089***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
North East	0.097**	0.047	–0.000	0.008	–0.016	0.050	0.034	0.081*	0.007
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
North West	0.075**	0.017	–0.015	–0.002	–0.014	0.030	–0.004	0.037	0.008
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Yorkshire/Humberside	0.092***	0.060*	0.050	0.008	–0.016	–0.007	–0.016	0.033	–0.014
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)
East Midlands	0.095***	0.049	0.011	0.025	0.035	0.050	0.059	0.061	–0.014
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
West Midlands	0.072**	0.033	0.007	0.003	0.017	0.074*	0.020	0.054	0.017
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
East Anglia	0.051	–0.010	0.019	–0.005	0.016	0.032	0.029	0.067*	0.007
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)

Rest of South East	0.036	–0.015	–0.009	–0.019	–0.016	–0.011	–0.035	0.005	0.016
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
South West	0.084**	–0.002	0.009	–0.029	–0.044	0.014	–0.018	0.021	–0.018
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Wales	0.121***	0.041	–0.003	–0.004	0.037	0.061	0.046	0.075*	0.044
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Scotland	0.048	0.010	–0.018	–0.011	–0.051	–0.010	–0.046	0.009	0.003
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
1+ cars in household	–0.058**	–0.076***	–0.075***	–0.117***	–0.122***	–0.119***	–0.093***	–0.093***	–0.136***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Poor health	0.123***	0.123***	0.140***	0.170***	0.103***	0.117***	0.166***	0.124***	0.183***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Separated/divorced/widowed	0.015	0.028	–0.023	–0.075***	–0.047**	–0.020	–0.035	–0.043*	0.037
	(0.025)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Single never married	0.048*	0.035	0.012	0.008	0.029	0.018	0.066**	0.051**	0.064**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Responsible for child < 16	0.084***	0.094***	0.073***	0.085***	0.082***	0.081***	0.091***	0.096***	0.046*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Household size	0.028***	0.035***	0.028***	0.023***	0.020***	0.018***	0.018***	0.020**	0.029***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Child < 5 in household	0.157***	0.148***	0.157***	0.148***	0.153***	0.115***	0.147***	0.135***	0.101***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
F	26.975	27.726	25.880	27.010	24.770	22.934	23.392	25.017	23.533
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. persons	3845	3752	3663	3607	3578	3567	3484	3364	3568
No. HH	3391	3335	3243	3174	3119	3098	3014	2928	3218

*Notes. * p<.10, ** p<.05, *** p<.01.*

The reference categories in the probit regressions are: aged 30–49, no educational qualifications, arrived (or born) in the UK before age 15, house is owned outright, government region is London, no cars available to household, not in poor health, living with partner (legally married or cohabiting), no responsible for a child aged under 16 years, youngest child in household aged over 5 years (if children present). See main text for definitions of explanatory variables.

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Limiting long-term illness and subjective well-being in families

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Abstract

The definition of subjective well-being (SWB) includes subjective perceptions of moods such as happiness and cognitive judgements of life satisfaction coupled with an absence of negative feelings. Little is known about levels of well-being within families when other family members have a limiting long-term illness. This paper explores these associations. Data come from year 1 wave 1 of Understanding Society, a new longitudinal UK-representative household panel survey. Subjective well-being of adults (≥ 16 years) was measured using the GHQ-12, the Short Warwick-Edinburgh Mental Well-being Scale and a life satisfaction question. The Strengths and Difficulties Questionnaire measured well-being in youth (aged 10 to 15 years). Self-reported limiting long-term illness (LLTI) was the measure of illness. Latent variable models were used to explore associations between partners (N=5,236) and among older parent's LLTI and adult children's SWB (n=184). A two-level, one-with-many model was used to examine associations between parents illness and youth SDQ total difficulties scores (n=1,491). Associations between adult child LLTI and older parent SWB were also explored as well as the relationship between having a young child with needs in the household and parent SWB. LLTI in one member of a cohabiting partnership was negatively associated not only with their own well-being but also that of their partner. This association appeared to be confounded by the severity of their illness. There was no association between a parent's LLTI and their adult child's well-being. There was a significant association between a parent's LLTI and SDQ total difficulties score for youth. This association was reduced when controlling for caring for the youth, and further attenuated by the physical and mental functioning of the parent. There was no association of adult child LLTI with older parents' SWB. The findings from this study indicate that the limiting illness of one family member has a differential association with the well-being of other family members. Partners, youth and parents of youth had lower levels of SWB when a family member had a LLTI. These associations were largely accounted for by caring behaviours and physical and mental functioning. SWB among adult children and older parents was unchanged whether or not one resided with a person (older parent or adult child) with a LLTI.

Keywords: limiting long-term illness, subjective well-being, family, *Understanding Society*

Introduction

Subjective well-being (SWB) is a multi-dimensional, multi-component construct that has been associated with changes in a person's life. There are two main components to SWB, 1) Emotional or affective responses and 2) Cognitive responses (Diener 1994). Positive affect (i.e. happiness, joy, contentment etc) and negative affect (i.e. sadness, anxiety, depression etc) comprise the emotional or affective component, while life and domain satisfaction (i.e. work, family, health etc) assessments comprise the cognitive component (Diener 1994 ; Diener et al 1999 ; Cronin de Chavez et al 2005). Exploring intrapersonal changes in well-being in response to different stressors or events has long been a subject of research (Diener 2000 ; Clark et al 2001 ; Lucas et al 2003 ; Cronin de Chavez et al 2005 ; Lucas 2005 ; Luhmann and Eid 2009 ; Clarke and Georgellis 2010). More recently however researchers have begun to look at intrapersonal changes in SWB due to events experienced by others in their familial or social networks (Berg and Upchurch 2007 ; Fekete et al 2007 ; Giannakopoulos et al 2009 ; Pruchno et al 2009 ; Dorros et al 2010 ; Sieh et al 2010).

Much of this work has looked at couple relationships and the effect of a specific illness in one partner on the well-being or coping behaviour of their partner. The health conditions examined include dementia (Lieberman and Fisher 1995 ; Poulin et al 2010), end stage renal failure (Pruchno et al 2009), congestive heart failure (Luttik et al 2009), psychosis (Kuipers et al 2007), lupus (Fekete et al 2007) and cancer (Banthia et al 2003 ; Dorros et al 2010). With one exception, these studies of patient and spousal caregiver dyads investigated relationships between factors such as coping style or type of support on well-being. They did not quantify the potential impact of chronic illness per se on the couple's well-being. The study by Luttik et al (2009) was the exception. It compared couples with an ill partner with matched healthy partner dyads, finding small differences in well-being between the two groups. This study, in common with others based on patient samples, relied on small numbers of partner dyads. Also, because many of the criterion disorders were conditions that predominantly occur in later life, the couples were sampled from the older population. Most studies did not report on the impact of the ages of the couple, but those that did were inconclusive (Gerstorf et al 2009 ; Poulin et al 2010). It remains unclear whether these previous findings can be generalised. Does limiting long-term illness (LLTI) have negative ramifications for the partnership's well-being and are effects different for older and younger pairs?

While the effects of LLTI on well-being within partner relationships are important, there may be other members of the household who could also be affected by an illness in the family. A few studies have examined the association between parental illness and child well-being with varied results. In adult children, no association was observed between severity of parental dementia and child well-being (Lieberman and Fisher 1995). However, the adult children in their study were living away from their parents. We found no published data on the impact of a parent's limiting long-term illness with respect to adult children living in the same household. Younger children on the other hand, do seem to be affected by parental ill health, with decreases in quality of life and increases in problem behaviours (Giannakopoulos et al 2009 ; Kelly and Bartley 2010 ; Sieh et al 2010). This raises the question of whether adult children living with an ill parent will have poorer well-being or not. In the United Kingdom (UK) there are approximately 28 million households with dependent children and around 3 million adult children, aged 20-34 years, living with their parents (Office for National Statistics 2009b ; Office for National Statistics 2010). The 2001 UK census found that around 15 percent of 30-59 year old adults had a LLTI. Therefore there are large numbers of children of all ages who could be affected by poor health in the family.

Parental well-being while caring for a chronically sick or disabled child has also received some attention. One study found little difference in family functioning between families with and without a child with a chronic condition, although this was not confirmed in a recent large study which found that caregivers of children with health problems had more than twice the odds of reporting physical and mental health problems than caregivers of healthy children (Rodrigues and Patterson 2007 ; Brehaut et al 2009). Mothers of sick or disabled children had poorer well-being than mothers of healthy children (Hirst 2005). In fact this study found women to be more affected than men

across a range of caring situations. The caregiving role as the mechanism relating illness and well-being within the household or among family members has been the focus of much research (Lieberman and Fisher 1995 ; Kuipers et al 2007 ; O'Reilly et al 2008 ; Siegrist and Wahrendorf 2009 ; Llewellyn et al 2010 ; Poulin et al 2010). Familial caregivers experience increased stress and poorer health due to the requirements of their roles, compared to family members who are not caregivers (Stajduhar et al 2010). Yet recent research has shown that caregivers have lower mortality risks than non-caregivers (O'Reilly et al 2008). Cross-national European research has also shown differences in the quality of life between informal helpers, voluntary workers and caregivers (Siegrist and Wahrendorf 2009). The number of informal caregivers is expected to increase in the UK with the ageing of the population over the next two decades (Office for National Statistics 2009a). Therefore it is important to examine these associations in a representative UK population and to understand whether well-being outcomes are explained by the caregiving role or not. Even when the mechanism appears to be related to caregiving, it is possible that this is confounded by the degree to which one's illness impacts on daily living (Lieberman and Fisher 1995). More disruptions to daily activities by one's illness is likely to be associated with greater functional limitations. Functional problems reduce opportunities for social engagement among other family members, besides the affected individual.

The research to date raises several unanswered questions which this study seeks to address. We examine the relationship of limiting long-term illness (LLTI) with SWB between partners, as well as the effect of parental LLTI on adult and younger children and the SWB of parents caring for a child with illness or disability.

The specific research questions were:

1. Is there an association between illness of:
   a. One partner and the well-being of the other partner?
   b. A parent and the well-being of their children?
   c. A child and the well-being of their parents?
2. What is the effect of caregiving or being cared for on these associations?
3. Are there gender differences in these relationships?
4. Are there age differences in that:
   a. The associations are greater or smaller for partners above retirement age compared to partners below retirement age?
   b. The associations are greater or smaller for young children compared to adult children?

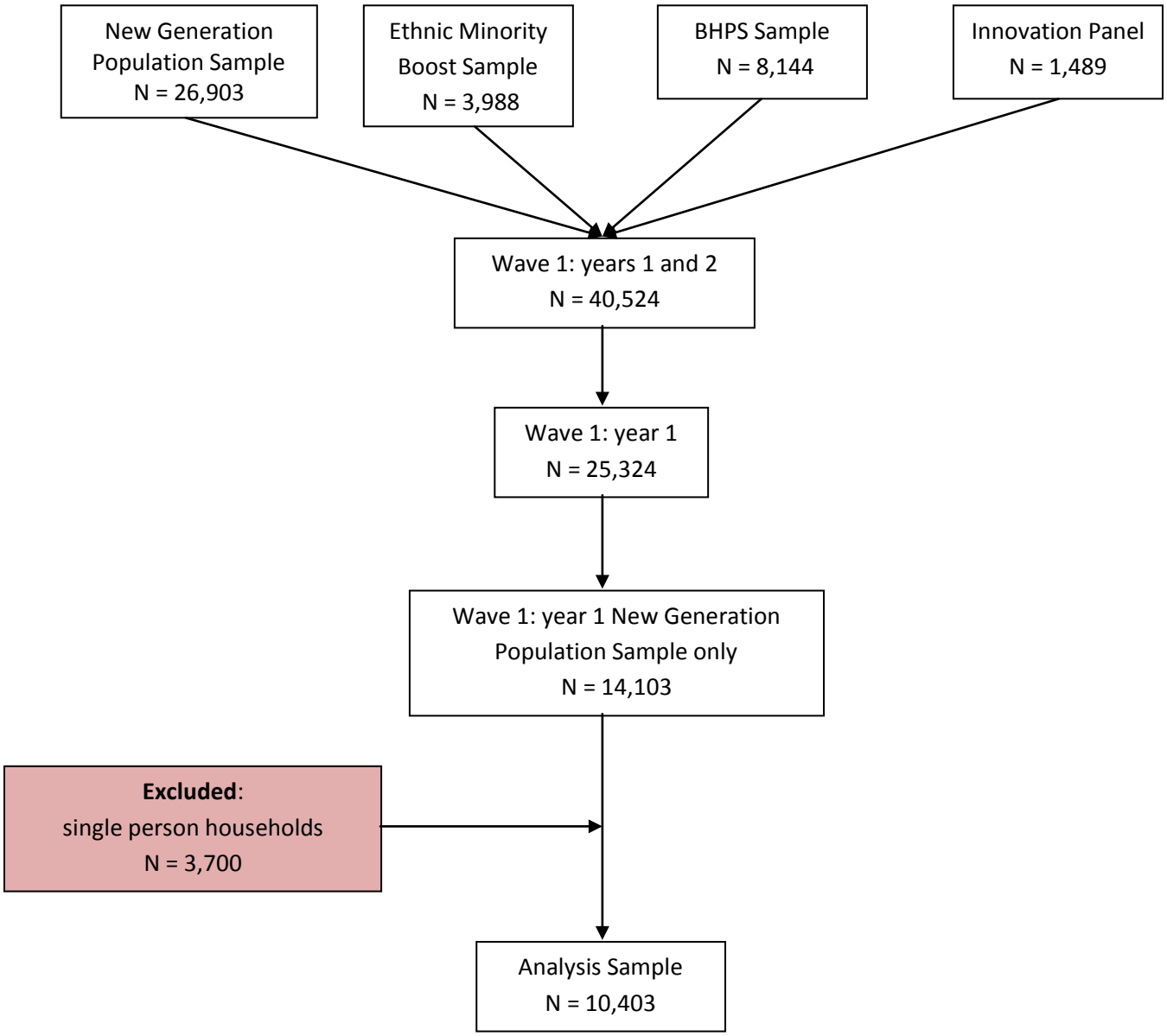
Methods

Participants

Data for this study come from first year of the first wave of *Understanding Society*, the UK Household Longitudinal Study (UKHLS). The UKHLS is a nationally representative longitudinal household study, which began in 2009. With an aim of recruiting over 100,000 individuals in 40,000 households, the data collection period takes two years to complete one wave of the study; thus at the time of writing, only one half of the first wave has been released for analysis. More detailed information on the sampling frame and data collection procedures are available (Burton et al 2011).

Flow charts of the data sources and sample sizes for the full first wave and the data used in this study are provided in figures 1a and 1b. In total over 40,500 households were interviewed in wave 1, of these 25,324 were interviewed in year 1. The data used in this study come from the New Generation Population Sample only, a nationally representative sample of 14,103 households. The exclusion of single-person households provided an analysis sample of just over 10,000 households.

Figure 1a. *Understanding Society* household sample size flow chart



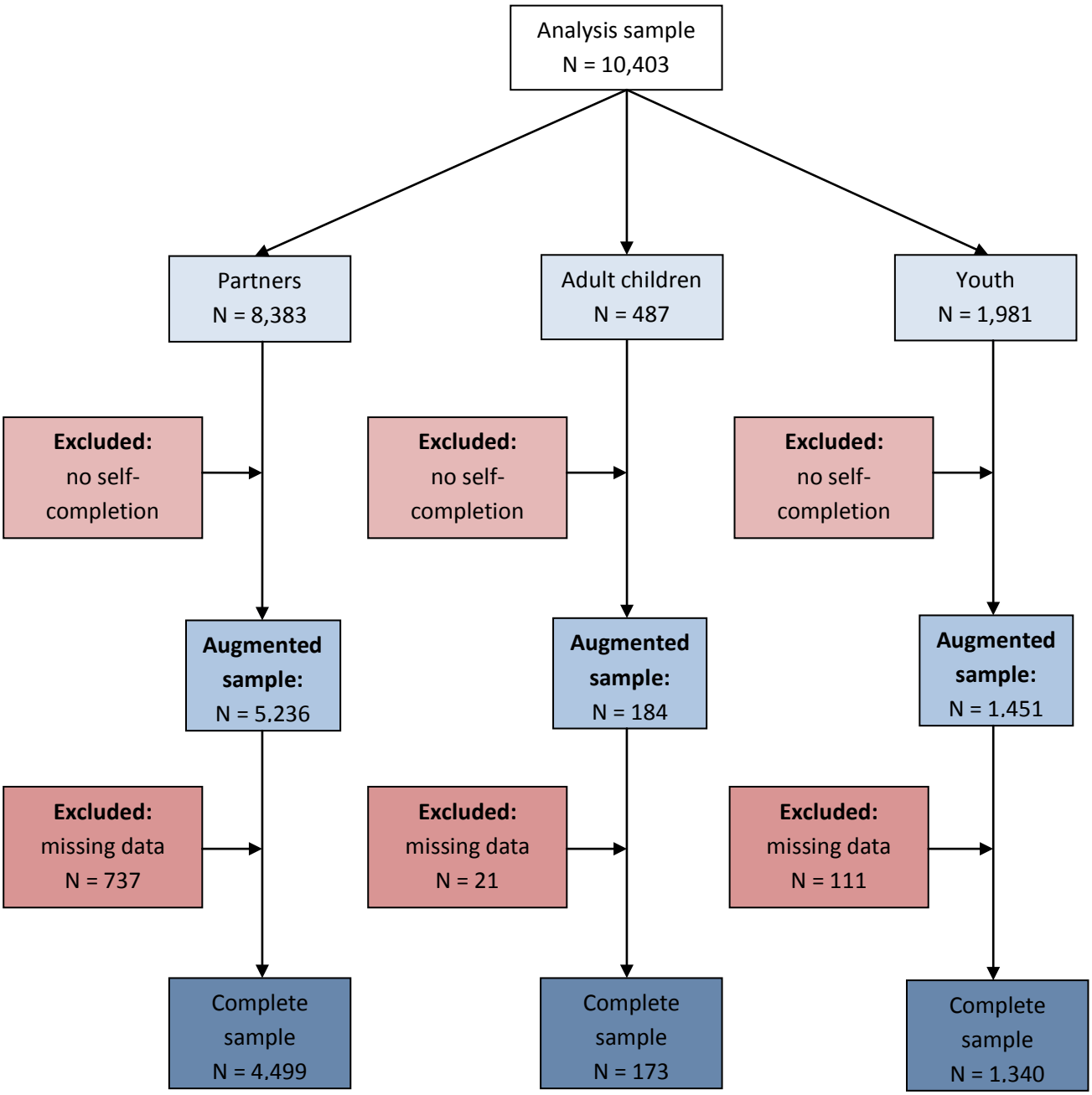
The analysis sample was then split into three sub-samples, figure 1b. The couple sample consists of all cohabiting partners, irrespective of marital status or gender. The adult child sample consists of adult children who lived with a parent over the current UK retirement age of 60 for females and 65 for males. We wished to differentiate between households with adult children who had yet to leave the family home, and households where an older parent had perhaps returned to live with their married offspring. There were too few of the former type of household where a parent had a LLTI for analysis, so we focus on households where there was a parent over retirement age. The youth sample is drawn from all young people aged 10-15 years who lived with one or more parents.

All persons in the household aged 10 and older are eligible to be surveyed annually. Young people, aged 10-15, are given a self-completion youth questionnaire. This survey asks questions about their daily activities, health behaviours, and family and peer relationships. Adults, 16 and older, are given a combination of computer-assisted personal interview (CAPI) and self-completion questionnaire. The topics covered include subjective well-being, employment status, health status and various other economic and social topics.

As can be seen in figure 1b, additional cases were excluded for various reasons. The majority of these cases were excluded due to non-completion of the self-completion portion of the survey by one or more parties. Over 3,000 households were excluded from the partners sample, 303 from the adult children sample and 530 households from the youth sample. The outcomes of interest, described later, are all assessed in the self-completion portion of the survey.

The augmented samples include the missing data which has been imputed. Thus for the partner sample, with imputation there are 5,236 partners, however, complete case analysis had only 4,499 partners. Imputation of the adult children sample added 21 cases, while 111 cases were added for the youth sample.

Figure 1b. Analysis sample size flow chart



Measures

Adult measures

Limiting long-term illness

Limiting long-term illness (LLTI) status was a dichotomous variable determined from two questions. The first question asks "Do you have any long-term physical or mental impairment, illness or disability? By 'long-term' I mean anything that has troubled you over a period of at least 12 months or that is likely to trouble you over a period of at least 12 months." If the participant answered yes to this question then they are asked about the type of impairments/disabilities that may limit or cause "substantial difficulties" in their life. Participants who experienced any limiting impairment/disability were categorized as having a LLTI, while all others were categorised as not having a LLTI.

These questions and definitions of LLTI have been utilised in UK and international cross-sectional and longitudinal surveys and have been validated in several studies for both elderly and adult populations (Cohen et al 1995 ; Payne and Saul 2000 ; Power et al 2000 ; Manor et al 2001).

Subjective well-being

Three different measures of subjective well-being (SWB) were used to create a latent construct of adult well-being. The GHQ-12 was used to measure psychological distress (Goldberg and Williams 1988 ; Goldberg et al 1997). The responses to the 12 items are scored on a 0-1-2-3 scale and summed to produce a total score ranging from 0-36; this is known as the GHQ Likert-scoring method. A higher score indicates higher levels of psychological distress or poorer well-being.

The 7-item Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) (Stewart-Brown et al 2009) was used as a measure of positive psychological well-being. The items, with responses from "none of the time" to "all of the time," are scored on a Likert scale from 1 to 5. The items are summed to give a total score, ranging from 7 to 35, where higher scores indicate higher levels of well-being.

The final measure of SWB was life satisfaction. This single item question worded "Please tick the number which you feel best describes how dissatisfied or satisfied you are with the following aspects of your current situation" was asked of respondents who scored the question on a 7-point Likert scale ranging from 1 (Completely dissatisfied) to 7 (Completely satisfied).

Youth measures

Limiting long-term illness

Youth were not asked about their health status. As a proxy for LLTI among youth, we used information on caring, asked of parents. All adult participants were asked whether they cared for someone in their household who was "sick, disabled or elderly," and who that person in the household was. If a parent indicated that they cared for a child aged between 10 and 15, then the child was deemed to have a LLTI.

Strengths and Difficulties Questionnaire

The Strengths and Difficulties Questionnaire (SDQ) is an instrument used to screen for behavioural problems in children aged 3 to 16 years (Goodman et al 1998 ; Goodman 1999). The SDQ is made up of 25 items which are scored on a 3-point Likert scale and can be summed into five subscales (Emotional problems, Conduct problems, Hyperactivity/inattention, Peer relationship problems and Pro-social behaviour). The first four subscales are summed to create a total difficulties score, which is used in this study. The SDQ was completed by the young person as part of the self-completion questionnaire.

Covariates and potential confounders

Four analyses were carried out: LLTI and SWB between couples; parental LLTI and adult child well-being; parental LLTI and younger child well-being; and child LLTI with parent well-being. A variable that measures c*aring for one's partner* was included as a potential confounder in the couple analysis. For the parental LLTI and adult child well-being analysis, *caring for one's parent* was included. As the caring question was only asked of adults 16 and older, there is no equivalent information on whether youth cared for a parent. For the child LLTI with parent well-being analysis, a variable was created to indicate whether any children in the household, under the age of 16, required care. All variables were scored 0/1 with 1 indicating caring.

The 12-item Short Form Health Survey (SF-12) is an instrument used to measure health functioning in a general population sample (Ware et al 2001). The p*hysical* and *mental component summary scales* (PCS and MCS) were employed here. Both scales have scores that range from 0 to 100. These scores were normalised to the 1998 United States population to have a mean of 50 and a standard deviation of 10 (Ware et al 2001). Both the PCS and

MCS were included in models as potential confounders.

Age, *age squared*, *gender, highest attained education, and previous month household income* were included as covariates. Age was included as a continuous variable centred on the grand mean. An age squared term, of the centred age variable, was included to examine whether there were any non-linear relationships between SWB and age. Gender was dichotomised with female as the reference group. Highest attained education was a derived variable scored on a 6-point scale with a low of "no qualifications" to a high of "degree." Previous month household income was also a derived variable that included all sources of income from the month prior to interview. Previous month household income was adjusted for inflation and household size using the modified OECD scale (OECD 2009) and then log-transformed.

While length of partnership may also be considered as a covariate for the partnership data, preliminary analysis showed that length of partnership and age were highly correlated, κ = 0.85 p-value <0.0001. Therefore length of partnership was not included.

Statistical analyses

Four types of model were used in the analysis of the data: a latent variable actor-partner interdependence model (APIM) for the couple's analysis; a latent variable one-with-many design for the parent-adult child well-being analyses; an observed variable one-with-many design for the parent-younger child well-being analyses; and a clustered latent variable model for the child-parent well-being analyses. Full information on the modelling strategy can be found in Appendix 1.

The latent variable APIM (Cook and Kenny 2005 ; Kenny et al 2006), used to observe associations between the LLTI status and subjective well-being of partner dyads, is comprised of two parts: a measurement model describing the relationship between a latent well-being variable and the three indicators of well-being (GHQ-12, SWEMWBS and life satisfaction), and a structural model that estimates the paths between dependent and independent variables, the variance and covariance between independent variables and the variance of the error in the dependent variable (Kline 2010).

In order to explore the relationship between the LLTI of parents over retirement age and their co-resident adult children's well-being, a one-with-many design was used. This was specified as a two-level latent variable model, with children at level 1 nested within parents at level 2.

The third type of analysis examined the association between parents' LLTI status and their young child's SDQ total difficulties score. This one-with-many model was again estimated using a two-level model, with children at level 1 nested within parents at level 2. While SWB was measured using a latent variable in the adult child analysis, here observed SDQ measures indicate younger children's well-being.

The fourth and final type of analysis was that used to model the relationship between having a child in the household in need of care, and the well-being of their parents. A latent variable model is estimated, taking account of the clustering of mothers and fathers within households.

Three models were fitted successively for each type of analysis: 1) a baseline model examining effects on latent/observed SWB as the dependent variable(s) associated with own and other family members LLTI as independent variables (IVs) , controlling for household income, gender, linear and quadratic terms for age, and highest attained education of the family members; 2) the baseline model with added covariate(s) showing if the family member whose well-being is being assessed is a carer for the family member with a LLTI ; and 3) a final model with, additionally, the health functioning score(s) of the family member with a LLTI.

Multiple imputation was conducted using the ice command (Royston 2009) in STATA (StataCorp 2009), to create 20 augmented datasets. Descriptive analyses were conducted in SAS Version 9.1 (SAS Institute Inc. 2003). All modelling was carried out using MPlus 6 software (Muthén and Muthén 1998-2010). All models were estimated using the robust maximum likelihood option which provides "maximum likelihood parameter estimates with standard errors and chi-square tests of model fit that take into account non-normality of outcomes and non-independence of observations due to cluster sampling" (Muthén and Muthén 1998-2010). All regression estimates and standard errors provided are from multiply imputed data. Descriptive statistics given in the paper are based on the imputed cases, descriptive statistics for the complete case data can be found in Appendix 3.

Results

Table 1. Descriptive statistics of partners by age group*

	Overall N = 5236		16-59/64 n = 3953		60/65+ n = 1283		p-value+
LLTI (% Yes)							
Partner 1	24	--	18	--	40	--	
Partner 2	28	--	25	--	40	--	
Care for Partner (% Yes)							
Partner 1	6	--	4	--	12	--	
Partner 2	5	--	3	--	12	--	
Age							
Partner 1	49.04	3.38	42.30	7.78	69.83	5.87	<0.0001
Partner 2	49.39	3.39	42.82	8.42	69.61	6.35	<0.0001
GHQ Score							
Partner 1	10.78	4.94	10.93	11.47	10.32	9.98	0.0001
Partner 2	10.81	6.55	11.02	12.59	10.16	10.17	<0.0001
SWEMWBS							
Partner 1	18.40	4.39	18.19	10.24	19.06	8.90	<0.0001
Partner 2	18.61	5.58	18.42	11.31	19.19	9.00	<0.0001
Life Satisfaction							
Partner 1	5.42	1.42	5.32	3.28	5.72	2.85	<0.0001
Partner 2	5.39	1.41	5.29	3.29	5.66	2.86	<0.0001
SF-12 Physical Functioning							
Partner 1	49.61	11.02	51.54	24.39	43.68	21.14	<0.0001
Partner 2	51.76	9.22	51.24	21.21	53.36	18.37	<0.0001
SF-12 Mental Functioning							
Partner 1	48.79	14.76	50.17	30.13	44.57	23.80	<0.0001
Partner 2	51.90	15.52	51.39	23.69	53.48	19.38	<0.0001

* *Age, Partner 1 and 2 GHQ-12 Score, Partner 1 and 2 SWEMWBS Score and Partner 1 and 2 Life Satisfaction Score are means and standard deviations; SWEMWBS = Short Warwick-Edinburgh Mental Well-being Scale; LLTI = Limiting Long-term Illness; SF-12 PCS and MCS = Short Form 12-item Physical and Mental Component Scores*

+ *p-value for Age, Partner 1 and 2 GHQ-12 Score, Partner 1 and 2 SWEMWBS Score, Partner 1 and 2 Life Satisfaction Score and Partner 1 and 2 SF-12 Physical and Mental Functioning based on mean comparisons*

Partners and LLTI

There were 4,499 partner dyads with complete data, however this increased to 5,236 with imputation. Table 1 provides overall descriptive statistics for all individuals in the partner dyads and stratified statistics by age (those who are younger than the current UK retirement age and those who are of retirement age or older). While the majority of partners fall within the same age group, about 8% of the partnerships have one partner who is in a different age group than the other. As expected, more participants over the retirement age had a LLTI than those who were younger. A greater proportion cared for their partner in the older group as well. Both partners in the older group had significantly better well-being across all SWB measures compared to partners from the younger age group. This was despite the older group having significantly worse physical functioning, as measured by the SF-12, than the younger group. Consistent with their better well-being, the older group also had significantly better mental functioning than the younger group.The fit of the measurement models for latent SWB was assessed prior to modelling the full latent variable models. Well-fitting measurement models were found for all family models. Standardised estimates for the measurement model for the APIM model for the younger and older age groups are given in Appendix 2.

Table 2 provides the results for the three models fit to the partner data, stratified by actor (partner 1) age group. Model 1 is the baseline model which controlled for the age, age squared, gender, education of both partners and household income. In both age groups there was a negative association between own and partner's LLTI, and own and partner's latent SWB. However the effect of partner's LLTI was weaker than the effect of own LLTI (i.e. partner 2 illness on partner 1 well-being was smaller, coefficient = -0.63 Standard Error (SE) = 0.21, than the association between partner 2 illness and partner 2 well-being, coefficient = -0.43 SE = 0.20). Model 2 includes a potential confounder, partner caring. In the younger cohort, there was slight attenuation of the association between LLTI and SWB for both partners. Being cared for by one's partner showed a large and significant negative relationship with SWB for both partners, coefficient = -3.52 SE 0.63 for partner 1 care for partner 2, and coefficient = -2.95 SE 0.43 partner 2 care for partner 1. There was no association between caring for one's partner and own SWB. Similar results were observed in the older cohort with one exception. Like the younger group, being cared for resulted in lower SWB but the effects were not as strong as for the younger cohort. Dissimilar to the younger age group, there was a significant negative association between partner 2 caring for partner 1 on partner 2 SWB, coefficient = -0.99 SE = 0.33, but no reverse association was found.

In the final model (Model 3), SF-12 physical and mental functioning scores were included. For both partners and age groups, PCS and MCS, higher functioning was associated with better SWB. Following the pattern of Model 2 there was further attenuation of the association between LLTI and SWB for both partners in the younger age group. In fact the association between partner's LLTI and own SWB became non-significant for partner 1 but not for partner 2, coefficient = -0.33 SE = 0.15. The relationship between own LLTI and own SWB was much smaller than that seen in Models 1 and 2 and became non-significant for partner 2. The effects of being cared for by one's partner on own SWB became non-significant for partner 1; however for partner 2 the association was only reduced, coefficient = -0.87 SE = 0.37. In the older cohort, there was complete attenuation of all associations for both partners.

Table 2. Structural Equation Model Estimates for Associations Between Partner's Illness and Subjective Well-being[+]

	Model 1 (M1): Baseline				Model 2 (M2): M1 + Caring				Model 3: M2 + Functioning			
	Partner 1 SWB		Partner 2 SWB		Partner 1 SWB		Partner 2 SWB		Partner 1 SWB		Partner 2 SWB	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Age 16-59/64												
Partner 1 LLTI	-2.42****	0.19	-0.43*	0.20	-2.17****	0.19	-0.90****	0.20	-0.41***	0.14	-0.33*	0.15
Partner 2 LLTI	-0.63***	0.21	-2.15****	0.25	-0.13	0.21	-1.59****	0.25	0.05	0.14	-0.31	0.18
Partner 1 Care for Partner 2					-0.58	0.45	-3.52****	0.63	-0.12	0.31	-0.87*	0.37
Partner 2 Care for Partner 1					-2.95****	0.43	-0.05	0.40	0.13	0.32	0.16	0.27
Partner 1 PCS									0.06****	0.01		
Partner 1 MCS									0.24****	0.01		
Partner 2 PCS											0.05****	0.01
Partner 2 MCS											0.23****	0.01
Age 60+/65+												
Partner 1 LLTI	-1.94****	0.21	-0.43*	0.20	-1.53****	0.21	-0.30	0.21	-0.30	0.16	-0.20	0.15
Partner 2 LLTI	-0.54***	0.20	-2.21****	0.22	-0.68***	0.23	-1.49****	0.22	-0.20	0.16	-0.23	0.17
Partner 1 Care for Partner 2					0.51	0.32	-1.94****	0.38	0.20	0.22	-0.38	0.29
Partner 2 Care for Partner 1					-2.45****	0.45	-0.99***	0.33	-0.31	0.34	-0.14	0.23
Partner 1 PCS									0.06****	0.01		
Partner 1 MCS									0.18****	0.01		
Partner 2 PCS											0.06****	0.01
Partner 2 MCS											0.18****	0.01
CFI	0.939				0.937				0.956			
TLI	0.921				0.917				0.942			
X^2	(d.f. = 126, N = 5236) = 579.83 , p < 0.0001				(d.f. = 142, N = 5236) = 624.86, p < 0.0001				(d.f. = 176, N = 5236) = 684.29, p < 0.0001			
RMSEA	0.037				0.036				0.033			

[*] <0.05; ** <0.01; *** <0.001; **** <0.0001

[+] *All models controlled for Partner 1 and Partner 2 Age, Age squared, Gender, Education and Household Income; SWB = Subjective Well-being; 95% CI = 95% Confidence Interval; SE = Standard Error; PCS = Physical Component Score; MCS = Mental Component Score; d.f. = Degrees of Freedom; RMSEA = Root Mean Square Error of Approximation*

Adult children and retirement age parents with a LLTI

Table 3 provides descriptive statistics for adult children living with their parents who were of retirement age and older. Preliminary analysis of the data showed no difference by parental gender in the association between parental LLTI status and adult child's well-being, so both mothers and fathers are pooled in this analysis.

Among the adult children, there were no significant differences for any of the variables of interest between males and females. Analysis of the associations between parental LLTI and adult child SWB resulted in no significant associations (results not shown): illness of parents did not have any effect on their adult children's well-being.

Table 3. Descriptive Statistics of Adult Children and Youth by Gender*

	Overall		Males		Females		p-value+
Adult Children (n = 254)							
Gender (%)			57	--	43	--	
Adult Child LLTI (% Yes)	36	--	36	--	34	--	
Parent LLTI (% Yes)	43	--	40	--	46	--	
Care for Parent (% Yes)	18	--	16	--	21	--	
Age	36.47	7.96	36.75	13.89	36.08	32.68	0.80
GHQ-12 Score	11.5	6.59	11.38	8.86	11.67	13.59	0.74
SWEMWBS Score	17.47	5.47	17.16	7.22	17.88	11.42	0.32
Life Satisfaction Score	5.07	1.60	4.95	2.13	5.23	3.20	0.16
Youth (n = 3074)							
Gender (%)			51	--	49	--	
Cared for by Parent (% Yes)	2	--	3	--	1	--	
Parent LLTI (% Yes)	19	--	21	--	18	--	
Age	12.49	0.05	12.43	0.01	12.55	0.21	0.19
SDQ Total Diffculties Score	11.16	5.60	11.35	7.91	10.96	11.21	0.05
Parent SF-12 PCS	51.79	9.91	51.73	13.62	51.85	19.36	0.74
Parent SF-12 MCS	49.52	10.12	49.40	14.20	49.63	20.16	0.53

* *Age, SDQ Total Difficulties Score, GHQ-12 Score, SWEMWBS Score and Life Satisfaction Score are means and standard deviations; SDQ = Strengths and Difficulties Questionnaire; SWEMWBS = Short Warick-Edingburgh Mental Well-being Scale; LLTI = Limiting Long-term Illness; SF-12 PCS and MCS = Short Form Physical and Mental Component Scores*

+ *p-value for Age, GHQ-12, SWEMWBS, Life Satisfaction, SDQ Total Difficulties Score and Parent SF-12 Physical and Mental Functioning based on least squares mean comparisons*

Youth and parents with a LLTI

Among youth, there were an equal proportion of boys and girls and the mean age was not significantly different between genders (Table 3). Parents reported caring for boys more (3%) than girls (1%). Unfortunately, we have no information on whether a child cared for their parent. More boys had parents with a LLTI (21%) than girls (17%). There was no difference between boys' and girls' SDQ total difficulties scores. There were also no significant differences in parental physical or mental functioning scores by child gender.

The results from the three models that were estimated for youth are provided in Table 4. Again, preliminary analysis of the data showed non-significant differences in the association between parental LLTI status and youths' SDQ scores by the gender of the parent, therefore the associations are pooled. There was an association between parents'

LLTI and youth SDQ total difficulties: the children of ill parents had higher SDQ scores than children with non-ill parents, coefficient = 1.05 SE = 0.29. In Model 2, parental caring for the child was included as a potential confounder. Both parental LLTI, coefficient = 0.83 SE 0.28, and caring for child, coefficient = 5.01 SE = 0.77, were significantly associated with higher SDQ scores, but there was some attenuation of the former association between parental LLTI and the SDQ.

Table 4. Structural Equation Model Estimates for Associations Between Parent's Illness and Youth's Well-Being[+]

	Model 1 (M1): Baseline Youth SDQ		Model 2 (M2): M1 + Caring Youth SDQ		Model 3: M2 + Functioning Youth SDQ	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Parent's LLTI	1.05****	0.29	0.83***	0.28	0.13	0.35
Care for Child			5.01****	0.77	4.84****	0.76
Parental SF-12 PCS					-0.03*	0.01
Parental SF-12 MCS					-0.05****	0.01

[*] <0.05; ** <0.01; *** <0.001; **** <0.0001

[+] *All models controlled for Parent and Child Age, Age squared, Gender, Parent Education and Household Income; SDQ = Strengths and Difficulties Questionnaire; SE = Standard Error; LLTI = Limiting Long-term Illness; SF-12 PCS and MCS = Short Form Physical and Mental Component Scores*

The final model included the SF-12 PCS and MCS functioning scores of the parent. There was complete attenuation of the effect of parental LLTI on youth SDQ scores with the addition of these scores. In both cases, there was a significant negative association between SF-12 functioning score and youth SDQ total difficulties score, PCS coefficient = 0.03 SE = 0.01; MCS coefficient = 0.05 SE = 0.01. Parental care for the youth remained a significant predictor of SDQ difficulties, coefficient = 4.84 SE = 0.76.

Retirement age parents of adult children with a LLTI

In the final set of analyses we examined the associations between adult child illness and parental SWB. The sample used to examine the association between adult children and parents was the same as that used to examine parental LLTI on adult child SWB.

We found no association between adult child LLTI and parental SWB.

Parents of young children in household in need of care

The final set of analyses also examined the associations between having a child in the household in need of care and parental SWB. A larger sample was used to examine the association between caring for a young child in the household and parental SWB. As there is no direct measure of LLTI for young children in *Understanding Society*, child illness was identified according to whether the child required care or not. Therefore we examined whether there were any young children, i.e. those of 15 years of age and younger, in the household and in need of care.

There was an association between having a child in the household who required care and parental SWB, Table 5, coefficient = 0.92 SE = 0.30.

Table 5. Structural Equation Model Estimates for Associations Between Child in Household in Need of Caring and Parent's Subjective Well-being[+]

	Model 1 (M1): Baseline Parent SWB	
	Coefficient	SE
Ill Child in Household	-0.92**	0.30
CFI	0.973	
TLI	0.953	
X^2	(d.f.=12, N = 6938) = 171.09, p < 0.0001	
RMSEA	0.044	

[*] <0.05; ** <0.01; *** <0.001; **** <0.0001

[+] *All models controlled for Parent Age, Age squared, Gender, Parent Illness and Household Income; 95% CI = 95% Confidence Interval; SE = Standard Error; SWB = Subjective Well-being; d.f. = Degrees of Freedom; RMSEA = Root Mean Square Error of Approximation*

Discussion

This study has examined the link between illnesses in one family member and the well-being of other members of the household. It takes a life course perspective, examining influences between and across generations, from youth to the post-retirement years. The findings were able to provide answers to our four research questions.

With respect to the first question, the findings show cross-partner associations between illness and subjective well-being in earlier and later adult life. An association between parental illness and youth well-being was also observed, as well as an association between having an ill child in the household and parental well-being. However there was no observed relationship between older parents' illness and their adult children's well-being or of adult children's illness and their older parents' well-being. The patterns of these findings suggest that there may be differential associations of illness on well-being depending on the familial relationship and the age of the family members, addressing the fourth research question. Consistent inter-relationships between health and well-being were observed for older and younger couples. Yet, while youth had more difficulties, adult children did not appear to be affected by their parents' LLTI. Similarly, parents had lower well-being when there was an ill child in the household, but older parents of adult children with a LLTI did not.

We were interested in examining the effect of being a carer or receiving care as stated by the second research question. Evidence of the impact of caring was observed in two of our analyses. Among partners, the intra-individual relationships between illness and well-being were attenuated by being cared for. These findings suggest that among those who are ill, needing to be cared for by a partner may be more strongly linked to well-being than being ill but still able to care for oneself. These relationships were further attenuated by physical and mental health functioning. This suggests that pathways from functioning of the individual are driving effects on subjective well-being. In other words, the worse the physical and mental functioning of one partner, the more likely it is that they are: 1) cared for by the other partner and 2) have lower well-being. This confounding effect was observed in both older and younger couples. While functioning still confounded the relationship between health and well-being, in the younger group there remained an independent association between own limiting illness and own SWB. This could be because of normative expectations of good health during this period in the life course. Such attitudes might not be maintained later in life.

Further exploration of caring and functioning was done to examine what impact a clinically meaningful change in mental health functioning would have for SWB. A clinically meaningful change

in health functioning has been recommended to be .5 standard deviates (sd) (Wywich et al 1999; Sacker et al 2008). Our findings showed that caring for a partner with a clinically meaningful change in mental functioning had a four-fold reduction in SWB, compared to caring for a partner without a clinically meaningful change in mental functioning. The small impact of caring on SWB, lends support to recent findings that have shown caregivers to have lower risk of mortality than non-caregivers (O'Reilly et al 2008). The findings suggest that it is not the act of caring that has a large impact on SWB and possibly mortality, but rather the functioning of one's partner that has a larger impact.

Associations between illness and well-being have been seen in other areas of research. A study of women with breast cancer found that an interaction between levels of women's depression and stress contributed to their partner's lower levels of well-being (Dorros et al 2010). An additional finding suggested that the combination of higher levels of depression in the cancer sufferer and increased partner stress was associated with poorer physical health in the partner (Dorros et al 2010). However, another study of older people with diabetes and their partners found significant associations between distress relating to diabetes management and depressive symptoms of the partner with diabetes, but only marginal effects on the other partner's depressive symptoms (Franks et al 2010).

Even though almost half of the adult children living with retirement-aged parents had a parent with a LLTI, there was no association between parental illness and their subjective well-being. It is likely that there was not enough power due to small sample size to observe an association. It may also be possible that the adult children were not affected by their parent's illness because they had become used to dealing with any difficulties affecting their parent(s). The cross-sectional data do not allow for further exploration of the immediate and long-term effects of parental LLTI incidence. This lack of association between parental illness and adult child well-being has been found previously (Lieberman and Fisher 1995). In their study, adult children of dementia sufferers had significantly worse somatic symptoms the more severe their parent's dementia, however no significant associations between dementia severity and anxiety and depression or well-being were observed (Lieberman and Fisher 1995). As noted previously, one of the major differences between the referenced paper and this study is where the adult children lived. In this study the adult children lived with the parent with a limiting illness, whereas in the Lieberman and Fisher paper(1995), the only requirement for selection into the study was that the adult child lived within a 50-mile radius of the ill parent. It might be expected that a non-resident carer would not experience the same impact on their own well-being as they would have if they were caring for the ill parent in the same household (Lieberman and Fisher 1995). In support of this argument, the non-resident carers spent on average 6.1 hours per week caring for their parent. A resident child however, would most likely have daily interactions with the ill parent, and more caring duties to perform, so it is somewhat surprising that their well-being was not affected. Future waves of *Understanding Society* will be able to address whether there are any immediate changes to SWB in association with onset or deterioration of health problems in a co-resident parent, or with changes in household composition due to a sick parent moving into or out of the household.

In contrast to the adult child findings, the analyses of youth found that illness of a parent was associated with an increase in SDQ total difficulties score. These associations were weakened if the child was being cared for by the parent. One possible reason for these findings is that youth, with their own needs which were cared for by a parent, may experience increased difficulties over and above those that came from having an ill parent. There was also an effect of parental physical and mental functioning on the relationship between parental illness and youth SDQ total difficulties score. Youth with parents who had worse functioning had higher SDQ total difficulties scores. This indicates that parents with poor physical or mental functioning may find it more difficult to provide for the emotional needs of the child. It may also be that there is no one else in the household to help provide care for the parent, and the young person is forced into a role of caregiver that they are not emotionally prepared for. While these analyses did not differentiate between lone parent and two-parent households, preliminary analysis found no statistical difference in the SDQ total difficulties score of children of a lone parent with a LLTI, and children in a two-parent household with a LLTI. Similar findings were observed for children of

healthy parents in a one- or two-parent household. The findings from the youth analysis are consistent with findings from other studies. In another cross-sectional analysis, Giannakopoulos and colleagues (2009) observed associations between parental functioning and different adolescent health quality of life measures although their study did not allow for parental gender effects to be examined. We found that it made no difference which parent was ill, although another study found that mothers' health had a greater impact on young children's SDQ scores than fathers' health (Kelly and Bartley 2010). A recently published meta-analysis by Sieh et al. (2010) also found that children of chronically ill parents had more problem behaviours than children of healthy parents, especially among girls and if the mother was ill. However, it was not possible to ascertain if parental gender had different effects for younger or older children. Since life course development of problem behaviours is known to differ by gender (Cohen et al 1993 ; Verhulst 1995), the excess risk of maternal ill health for their children's well-being may also be moderated by age.

Analysis of children's illness on parental well-being yielded conflicting results. There were no significant associations between adult child LLTI and parental SWB. This may be due to the small sample size and a lack of power to observe associations. It may also be that similar to the adult children's well-being having no significant associations with parental LLTI, parents of an adult child with LLTI have adapted to the situation so that their well-being was not any worse than parents living with a healthy adult child. By contrast, having a young child in the household who required care was associated with a significant reduction in parental SWB.

One of the limitations of this study, in common with much of the literature on this subject, is that the analyses are based on cross-sectional data. No conclusions can be made with respect to causality. We were also not able to look at patterns with respect to duration or severity of LLTI. It is possible that there are initial decreases of SWB with onset of illness, that may level off or rebound after family members have made appropriate adjustments to living with a partner, parent or adult child with a LLTI. Conversely, for some people the longer the duration a LLTI, the more disruptive and debilitating the illness becomes, requiring care and perhaps reducing well-being in the family members. Searches of the literature have provided few longitudinal studies examining inter-personal effects of illness on SWB. Future data from *Understanding Society* will be able to address some of these issues as well explore some of the mechanisms through which illness affects SWB.

Care must be taken when generalising these findings, especially those of the adult children and parents of the adult children. While the data came from the nationally representative New Generation Population Sample of *Understanding Society* there was a larger percentage of excluded data due to missing self-completion surveys and therefore missing outcome data. There were also few adult children living with their over retirement age parents, however, recent figures show that the number of people over the age of 65 in the UK living with others (excluding spouse or partner) is among the lowest in the European Union (Iacovou and Skew 2010). Thus the numbers in this sample appear to be representative. As noted earlier, the small sample size may have resulted in low power to detect associations between adult child and older parent illness and SWB.

Conclusions

The findings show associations between partner illness and partner SWB, parental illness and youth SDQ total difficulties score, and living with an ill child and parental SWB. There were also potential confounders of these relationships that should be addressed further. It is therefore important that future studies not only examine the relationship between illness and well-being in the ill person, but also to explore the immediate and long-term effects on the well-being of those living with the person with a LLTI. Better understanding of these effects may help to inform mental health care workers and other professionals who may be tasked with helping family members care for and cope with their loved one's illness.

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Appendices

Appendix 1. Statistical analyses

This appendix provides detailed descriptions of the measurement and structural models estimated in this paper. Five total measurement models were estimated. Two for the partners, one for each age group; one for the adult children, one for parents of young children and one for the older parents of adult children.

Partner health and well-being model

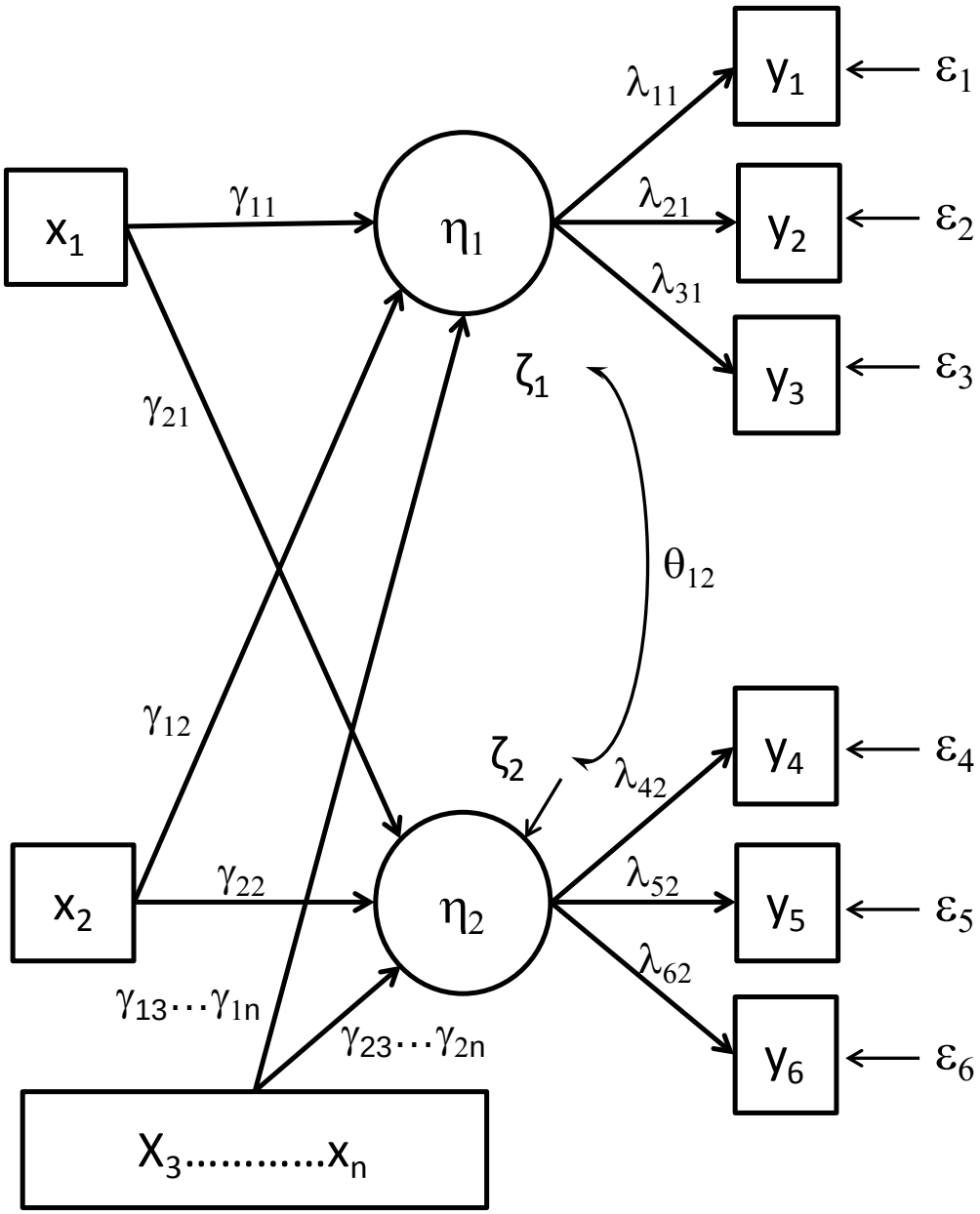
The latent variable Actor-Partner Independence Model (APIM) (Cook and Kenny 2005 ; Kenny et al 2006) is comprised of two parts: a measurement model describing the relationship between a latent well-being variable and the three indicators of well-being (GHQ-12, SWEMWBS and life satisfaction) and a structural model that estimates the paths between dependent and independent variables, the variance and covariance between independent variables and the variance of the error in the dependent variable (Kline 2010). The measurement and structural models are estimated simultaneously and are represented by equations (1) and (2) respectively:

$$\mathbf{\Upsilon_i} = \mathbf{\Lambda}\boldsymbol{\eta_i} + \boldsymbol{\varepsilon_i} \qquad (1)$$

$$\boldsymbol{\eta_i} = \mathbf{\Gamma X_i} + \boldsymbol{\zeta_i} \qquad (2)$$

The subscript i refers to the observational unit, in this case, the partnership. $\mathbf{\Upsilon}$ is a 6 x 1 matrix of dependent variables (y_1 ….. y_6). These are the 3 measures of SWB for the two partners. $\mathbf{X}$ is a q x 1 matrix of independent variables (X_1…..X_p), i.e. LLTI of the two partners and the model covariates. $\boldsymbol{\eta}$ is a 2 x 1 matrix of latent variables, i.e. the SWB of each partner. Then $\mathbf{\Lambda}$ is a 6 x 2 matrix of factor loading coefficients, $\mathbf{\Gamma}$ is a 2 x q matrix of regression coefficients and the $\boldsymbol{\varepsilon}$ and $\boldsymbol{\zeta}$ are 6 x 1 and 2 x 1 matrices of normally distributed residuals with mean 0 and variance covariance 6 x 6 matrix Θ and 2 x 2 matrix Ψ, respectively. A graphical representation of the APIM model is given in figure A1.

Figure A1. The actor-partner interdependence model of subjective well-being (SWB) and limiting long-term illness (LLTI)



Key: x_1 actor LLTI; x_2 partner LLTI; x_3.....x_n covariates; η_1 actor latent SWB; η_2 partner latent SWB; y_1 actor GHQ-12; y_2 actor SWEMWBS; y_3 actor life satisfaction; y_4 partner GHQ-12; y_5 partner SWEMWBS; y_6 partner life satisfaction; λ_{11}.... λ_{62} are the loadings of actor and partner latent SWB on the observed measures; γ_{11}.... γ_{2n} are the regression effects of the covariates on actor and partner latent SWB; ε_1..... ε_6 dependent variable residuals; ζ_1, ζ_2 latent SWB residuals.

Parent health and adult children's well-being model

In order to explore the relationship between the LLTI of parents over retirement age and their co-resident adult children's well-being, a one-with-many design was used. This was specified as a two-level latent variable model, with children at level 1 nested within parents at level 2. The observed indicators of adult children's SWB (y_1 y_2, y_3), can be decomposed into two components: the family means of each indicator and individual deviations from the family means, such that

$$\boldsymbol{Y} = \boldsymbol{Y_1} + \boldsymbol{Y_2} \qquad (3)$$

The equations for level 1 of the latent variable model are then:

$$\boldsymbol{\Upsilon_{1ij}} = \boldsymbol{\Lambda_1 \eta_{1ij}} + \boldsymbol{\varepsilon_{1ij}} \qquad (4)$$

$$\boldsymbol{\eta_{1ij}} = \boldsymbol{\Gamma_1 X_{1ij}} + \boldsymbol{\zeta_{1i}} \qquad (5)$$

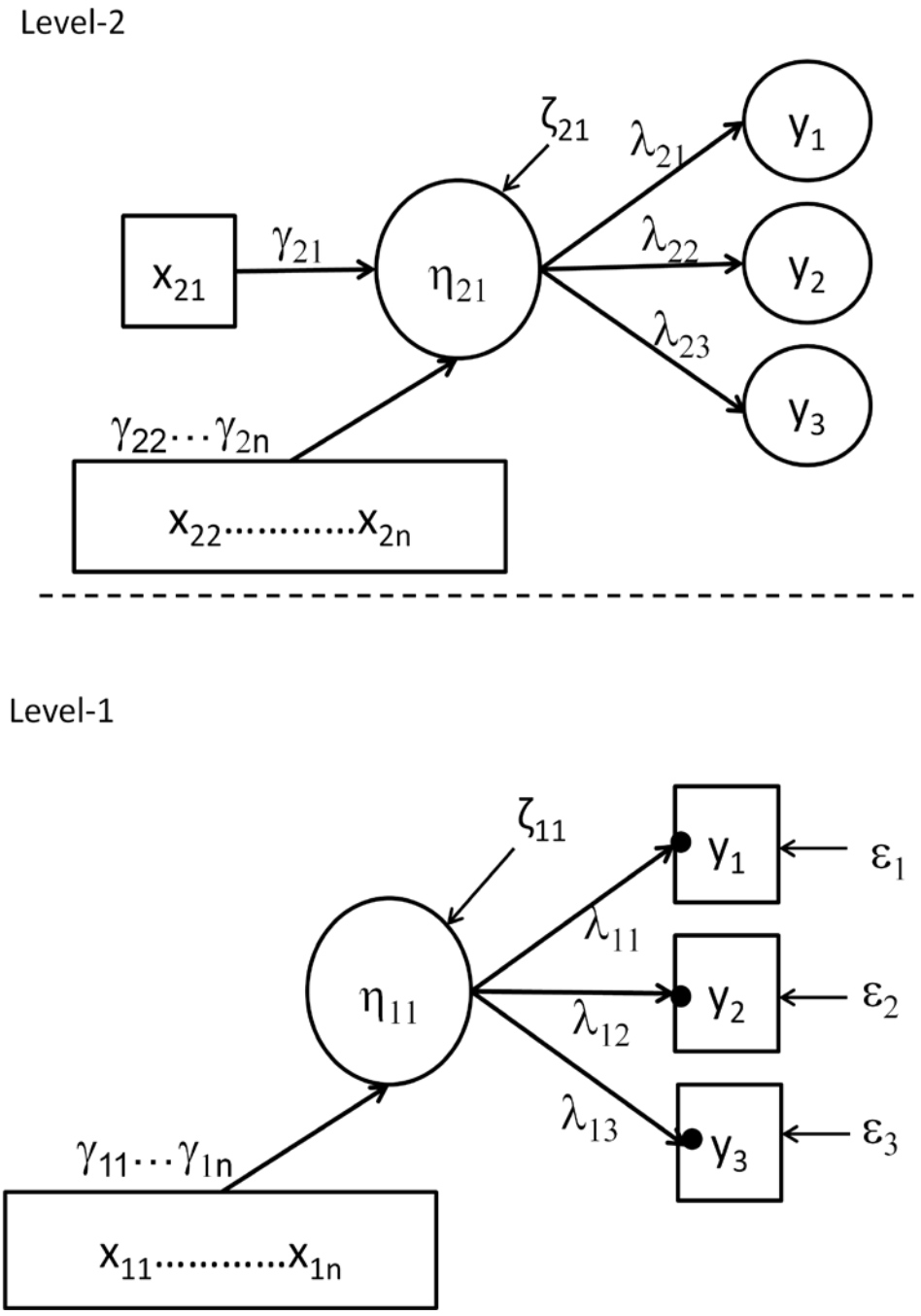
And the equations for level 2 are:

$$\boldsymbol{Y_{2i}} = \boldsymbol{\upsilon} + \boldsymbol{\Lambda_2 \eta_{2i}} + \boldsymbol{\varepsilon_{2i}} \qquad (6)$$

$$\boldsymbol{\eta_{2i}} = \boldsymbol{\Gamma_2 X_{2i}} + \boldsymbol{\zeta_{2i}} \qquad (7)$$

The subscript i refers to the level 2 unit, in this case, the parent and the subscript *j* refers to the level 1 units, the adult children. $\boldsymbol{\Upsilon_1}$ is a 3 x 1 vector of within family variation of the dependent variables (y_1 ….. y_3) with zero means. $\boldsymbol{\Upsilon_2}$ is a 3 x 1 latent variable vector of between family variation in the dependent variables (y1 ….. y3) with $\boldsymbol{\upsilon}$ a 3 x 1 vector of their intercepts. $\boldsymbol{X_1}$ is an n x 1 vector of independent child variables (x_1…..x_n), and $\boldsymbol{X_2}$ is an m x 1 vector of independent parent variables, i.e. LLTI of the parent and the family level covariates. $\boldsymbol{\eta_1}$ is a latent variable, i.e. the SWB of the children. Then $\boldsymbol{\Lambda_1}$ and $\boldsymbol{\Lambda_2}$ are 3 x 1 vectors of factor loading coefficients with a 3 x 1 vector of residual variances, $\boldsymbol{\varepsilon}$. $\boldsymbol{\Gamma_1}$ and $\boldsymbol{\Gamma_2}$ are 1 x n and 1 x m vector of regression coefficients and $\boldsymbol{\zeta_1}$ and $\boldsymbol{\zeta_2}$ are the residual variances in SWB at level-1 and level 2, respectively. A graphical representation of the latent variable one-with-many model is given in figure A2.

Figure A2. The one-with-many model of limiting long-term illness (LLTI) in a parent and subjective well-being (SWB) of adult children



Key: x_{21} parent LLTI; x_{22}.....x_{2n} parent covariates; x_{11}.....x_{1n} child covariates; η_1 child SWB; y_1 child GHQ-12; y_2 child SWEMWBS; y_3 child life satisfaction; λ_{11}.... λ_{31} are the loadings of child latent SWB on the observed measures; γ_{11}.... γ_{2n} are the regression effects of the covariates at level-1 and level-2 on adult child latent SWB; ε_1..... ε_3 dependent variable residuals; ζ_{21}, ζ_{22} latent SWB residuals. The filled circles at the end of the arrows in the level-1 model represent random intercepts. In the level-2 model the random intercepts are shown as latent variables labelled y_1 y_2 y_3.

Parent health and adolescent children's well-being model

The third type of analysis is used to examine the association between parents' LLTI status and their adolescent child's SDQ total difficulties score. This one-with-many model was again estimated using a two-level model, with children at level 1 nested within parents at level 2. While SWB was measured using a latent variable in the adult child analysis, here observed SDQ measures indicate younger children's well-being. The equations for the two-level or random intercepts model are:

$$\boldsymbol{y_{ij} = \Gamma_1 X_{1ij} + \varepsilon_{ij}} \quad (8)$$

$$\boldsymbol{y_i = B + \Gamma_2 X_{2i} + \upsilon_i} \quad (9)$$

$\boldsymbol{y_{ij}}$ is the SDQ score for child *j* in family *i*, $\boldsymbol{y_i}$ is the mean SDQ score for children in family *i*, $\boldsymbol{X_1}$ is an n x 1 vector of independent child variables (x_1.....x_n), and $\boldsymbol{X_2}$ is an m by 1 vector of independent family variables. Then $\boldsymbol{B}$ is the overall SDQ intercept, $\boldsymbol{\Gamma_1}$ and $\boldsymbol{\Gamma_2}$are 1 by n and 1 x m vectors of regression coefficients and $\boldsymbol{\varepsilon}$ and $\boldsymbol{\upsilon_i}$ are the residual variance in SDQ at level 1 and level 2, respectively.

Child health and parents' well-being model

The fourth and final type of analysis is that used to model the relationship between child health status and the well-being of their parents. A latent variable model is estimated, taking account of the clustering of mothers and fathers within households. The equations are of the form shown in (1) and (2), but here, the subscript *i* refers to the parent. So $\boldsymbol{\Upsilon}$ is a 3 x 1 vector of dependent variables (y_1 ..... y_3), the 3 measures of SWB for the parent. $\mathbf{X}$ is a q x 1 vector of independent variables (X_1.....X_p), i.e. any child in the household with a LLTI and the model covariates. $\boldsymbol{\eta}$ is a latent variable, i.e. the SWB of the parent. Then $\boldsymbol{\Lambda}$ is a 3 x 1 vector of factor loading coefficients, $\boldsymbol{\Gamma}$ is a 1 x q vector of regression coefficients and the $\boldsymbol{\varepsilon}$ and $\boldsymbol{\zeta}$ are the residuals of $\boldsymbol{\Upsilon}$ and $\boldsymbol{\eta}$, with mean 0 and 3 x 3 variance covariance matrix Θ and variance Ψ, respectively.

Appendix 2

Measurement model estimates

This appendix provides a table of the standardised estimates for the five measurement models described in Appendix 1.

The well-being measures loaded well onto the latent variable for all models. The positive measures, SWEMWBS and life satisfaction fell between 0.54 and 0.85 while the GHQ-12 fell between -0.69 and -0.78.

Examination of the modification indices only yielded significant results for the partner model. The suggestions resulted in the addition of two covariances, one between Partner 1 and Partner 2 GHQ-12 variance and the second between Partner 1 and Partner 2 life satisfaction variances. These covariances indicate that there may be a correlation between the distress or life satisfaction of one partner and the distress or life satisfaction of the other partner. Essentially, partner's scores of these two well-being measures are more similar than non-partnered persons.

Table A1. Standardised estimates for measurement models

	Partner Model									
	16-59/64 Age Group		60/65+ Age Group		Adult Child Model		Parent of Adult Child		Parent of Youth	
	β	SE	β	SE	β	SE	β	SE	β	SE
Path										
γ_1	-0.76****	0.01	-0.75****	0.02	-0.77****	0.05	-0.69****	0.06	-0.78****	0.01
γ_2	0.82****	0.01	0.71****	0.02	0.85****	0.04	0.78****	0.06	0.81****	0.01
γ_3	0.61****	0.01	0.53****	0.02	0.72****	0.05	0.59****	0.06	0.64****	0.01
γ_4	-0.77****	0.01	-0.75****	0.02						
γ_5	0.80****	0.01	0.73****	0.02						
γ_6	0.60****	0.01	0.54****	0.02						
Variance										
ε_1	0.43****	0.02	0.44****	0.02	0.41****	0.06	0.52****	0.08	0.39****	0.02
ε_2	0.33****	0.02	0.50****	0.03	0.27****	0.07	0.40****	0.09	0.35****	0.02
ε_3	0.63****	0.01	0.71****	0.02	0.48****	0.07	0.65****	0.07	0.59****	0.01
ε_4	0.41****	0.02	0.45****	0.03						
ε_5	0.35****	0.02	0.47****	0.03						
ε_6	0.64****	0.02	0.70****	0.02						
ζ_1	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
ζ_2	1.00	--	1.00	--						
Covariance										
η_1,η_2	0.38****	0.02	0.45****	0.04						
$\varepsilon_1,\varepsilon_4$	0.10****	0.04	0.10*	0.05						
$\varepsilon_3,\varepsilon_6$	0.13****	0.02	0.04	0.03						
CFI	0.99				1.00		1.00		1.00	
TLI	0.98				1.00		1.00		1.00	
χ^2	(d.f.=22, N = 5236) = 98.63, p < 0.0001				(d.f.=0, N = 254) = 0.00, p = 0.00		(d.f.=0, N = 254) = 0.00, p = 0.00		(d.f.=0, N = 3074) = 0.00, p = 0.00	
RMSEA	0.04, 95% CI = (0.03, 0.04)				0.00		0.00		0.00	

* <0.05; ** <0.01; *** <0.001; **** <0.0001

d.f. = Degrees of Freedom; RMSEA = Root Mean Square Error of Approximation

Appendix 3

Descriptive statistics for imputed data

Tables A2 and A3 provide the descriptive statistics from the complete case data for partners and children, respectively. Table A4 provides the correlations of variables which construct the outcome latent variable for partners, calculated from the imputed data.

Table A2. Descriptive statistics of partners by age group*

	Overall N = 4499		16-59/64 n = 3496		60/65+ n = 1003		p-value+
LLTI (% Yes)							
Partner 1	23	--	18	--	40	--	<0.0001
Partner 2	23	--	19	--	38	--	<0.0001
Care for Partner (% Yes)							
Partner 1	5		4		10		<0.0001
Partner 2	4		3		10		<0.0001
Age							
Partner 1	47.95	15.16	43.07	11.72	70.59	5.95	<0.0001
Partner 2	48.46	15.49	43.58	12.25	71.07	5.94	<0.0001
GHQ Score							
Partner 1	10.76	4.79	10.92	4.89	10.21	4.38	<0.0001
Partner 2	10.75	4.85	10.93	5.00	10.13	4.25	<0.0001
SWEMWBS							
Partner 1	25.41	4.20	25.20	4.15	26.16	4.30	<0.0001
Partner 2	25.59	4.22	25.39	4.26	26.29	4.04	<0.0001
Life Satisfaction							
Partner 1	5.43	1.31	5.34	1.30	5.76	1.28	<0.0001
Partner 2	5.42	1.33	5.33	1.34	5.75	1.22	<0.0001
SF-12 Physical Functioning							
Partner 1	50.18	10.58	51.57	9.43	43.75	12.98	<0.0001
Partner 2	49.97	10.85	51.20	10.00	44.24	12.69	<0.0001
SF-12 Mental Functioning							
Partner 1	51.77	8.84	51.31	8.74	53.90	8.98	<0.0001
Partner 2	51.77	8.97	51.30	8.94	53.96	8.77	<0.0001

* *Age, Partner 1 and 2 GHQ-12 Score, Partner 1 and 2 SWEMWBS Score and Partner 1 and 2 Life Satisfaction Score are means and standard deviations; SWEMWBS = Short Warwick-Edinburgh Mental Well-being Scale; LLTI = Limiting Long-term Illness; SF-12 PCS and MCS = Short Form 12-item Physical and Mental Component Scores*

\+ *p-value for Gender, Partner 1 and 2 Illness, Partner 1 cares for Partner 2 and Partner 2 cares for Partner 1 based on* X^2*; p-value for Age, Partner 1 and 2 GHQ-12 Score, Partner 1 and 2 SWEMWBS Score, Partner 1 and 2 Life Satisfaction Score and Partner 1 and 2 SF-12 Physical and Mental Functioning based on least squares mean comparisons*

Table A3. Descriptive statistics of adult children and youth by gender*

	Overall		Males		Females		p-value+
Adult Children (n = 234)							
Gender (%)			56	--	44	--	0.07
Adult Child LLTI (% Yes)	25	--	26	--	24	--	0.75
Parent LLTI (% Yes)	44	--	40	--	50	--	0.17
Care for Parent (% Yes)	20	--	17	--	24	--	0.16
Age	37.06	12.29	36.89	11.85	37.29	12.88	0.80
GHQ-12 Score	11.29	6.01	11.12	5.38	11.50	6.74	0.64
SWEMWBS Score	24.49	4.75	24.27	4.83	24.77	4.65	0.42
Life Satisfaction Score	5.07	1.50	4.92	1.48	5.27	1.52	0.07
Youth (n = 2594)							
Gender (%)			50	--	50	--	0.88
Cared for by Parent (% Yes)	2	--	3	--	1	--	0.001
Parent LLTI (% Yes)	19	--	21	--	17	--	0.01
Age	12.98	1.40	12.95	1.46	13.02	1.44	0.19
SDQ Total Diffculties Score	11.04	5.45	11.02	5.66	11.05	5.23	0.89
Parent SF-12 PCS	51.69	9.49	54.49	9.73	51.89	9.26	0.29
Parent SF-12 MCS	49.54	9.95	49.46	9.62	49.63	10.26	0.65

** Age, SDQ Total Difficulties Score, GHQ-12 Score, SWEMWBS Score and Life Satisfaction Score are means and standard deviations; SDQ = Strengths and Difficulties Questionnaire; SWEMWBS = Short Warwick-Edinburgh Mental Well-being Scale; LLTI = Limiting Long-term Illness; SF-12 PCS and MCS = Short Form Physical and Mental Component Scores*

˙ p-value for Gender, Adult Child and Parent LLTI and Care for Parent/Cared for by Parent based on X˂; p-value for Age, GHQ-12, SWEMWBS, Life Satisfaction, SDQ Total Difficulties Score and Parent SF-12 Physical and Mental Functioning based on least squares mean comparisons

Table A4. Correlations of outcome variables - partners, by age group

	Partner 1 GHQ-12	Partner 1 WEMWBS	Partner 1 Life Satisfaction	Partner 2 GHQ-12	Partner 2 WEMWBS	Partner 2 Life Satisfaction
Partner 1 GHQ-12	--	-0.55	-0.35	0.27	-0.22	-0.17
Partner 1 WEMWBS	-0.62	--	0.41	-0.21	0.28	0.18
Partner 1 Life Satisfaction	-0.45	0.49	--	-0.17	0.18	0.14
Partner 2 GHQ-12	0.25	-0.25	-0.22	--	-0.54	-0.39
Partner 2 WEMWBS	-0.18	0.25	0.19	-0.62	--	0.42
Partner 2 Life Satisfaction	-0.19	0.21	0.25	-0.49	0.47	--

*Upper = 60/65+, lower = 16-59/64

Understanding sleep among couples: gender and the social patterning of sleep maintenance among younger and older couples

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Abstract

Sleep, which is vital for health and wellbeing, is influenced by a complex array of (neuro)biological and social factors. Previous research has suggested that these factors vary across the life course, as well as being affected by transitions, such as parenthood, care-giving and widowhood. This research has also suggested that many of these transitions have a greater affect on women's sleep. Yet much of this research has focused on women and one-sided reports of partner behaviours. This paper draws on data from Wave 1 of the Understanding Society Survey to examine gender differences in sleep maintenance within younger and older heterosexual couples. Data were collected in 2009 from a representative sample of households in Britain with a response rate of 59%. Sleep maintenance, namely waking on 3 or more nights per week, was included in a self-completion module. A series of logistic regression models are run using sleep maintenance as a dependent variable; i) a two level model for couples where the male is aged 50 or less (n=2452 couples); ii) a two level model for older couples where the male is aged above 50 (n=1972 couples); iii) bivariate models which allow for odds to be calculated separately for male and female partners. Results from the couple level models illustrate how both younger and older women have increased odds of difficulties with sleep maintenance (as compared to their male partners). Poor sleep maintenance is also associated with poor health, own unemployment, dissatisfaction with income, having had a previous cohabiting relationship and having younger children for both men and women. Reports by the husband of frequency of coughing/snoring at night is significantly associated with their wives' sleep maintenance among younger couples and vice versa; but among older couples there is only a significant association of husband's snoring on wife's sleep. Whilst the current analysis is cross-sectional, further understanding of the dynamic relationships of sleep will be revealed through longitudinal analysis as Understanding Society moves through future waves.

Introduction

Sleep is vital for health and wellbeing. As Marmot (2010) suggests, too little or too much of it is a 'cause' of ill health and a 'symptom' of certain disorders. It is now widely reported that quantity and quality of sleep are predictors of type 2 diabetes and that a decrease (or increase) in sleep duration affects all-cause mortality (Cappuccio and Miller 2010). Sleep disturbance is also embedded within discussions of depression; with the former included in diagnostic criteria for the latter (Weich 2010). As well as being a 'cause' and 'symptom', poor sleep is considered to be 'consequence' of 21st century western worlds. At the same time as being told that sleep is the ultimate performance

enhancer, it is also claimed that there exists a 'macho culture of sleeplessness' (Appleyard 2002) and that we live "in an incessant or unremitting society, which has steadily 'colonized' night in a variety of ways, from the humble electric light bulb, to shift-work, night-clubs, 24 hour television and convenience stores" (Williams and Boden 2004).

The link between sleep and health is influenced by a complex array of (neuro)biological and social factors. As we discuss in the next section of this paper, there are strong indications that these factors vary across the *life course*, as well as being affected by *transitions*, such as parenthood, care-giving and widowhood (Williams et al 2010). Further to this, sleep for most adults is a dyadic experience, yet there has been little quantitative (survey) analysis to examine the effects of partner behaviours on each others' sleep; nor how these couple effects vary across the trajectory of the couple relationship.

Couples and sleep across the life course

Within their discussion of sleep and ageing, Hislop and Arber (2006) propose 'four key temporal dynamics' for studying sleep and ageing, comprising: i) *Biological or physical ageing*; ii) *Institutional structures*, such as engagement with paid work or education; iii) *Relational structures*, such as those associated with the individual's roles and relationships with partners and children; and iv) *Biographical transitions*, such as those associated with marriage, parenthood and retirement.

The first suggested 'temporal dynamic' is non-contentious. The deterioration of sleep quantity and quality is largely considered to be a part of 'normal' ageing. Older people spend much less time in slow wave sleep (Bliwise 2005; Whalley 2001). The suprachiasmatic nucleus has also been shown to deteriorate with ageing and contribute to detrimental changes in circadian rhythms (Dijk et al 2000). These processes intersect with an increased prevalence of chronic ill-health, disability and impairment which can all cause pain and discomfort at night adversely affecting sleep (Vitiello et al 2002).

The remaining temporal dynamics have also been shown to be salient when considering the health/sleep nexus. The 'institutional structure' of employment can negatively impact on an individual's sleep quality and quantity. In 1986, 26 per cent of men and 18 per cent of women in the US labour force reported working variable shifts (Gordon et al 1986). In 2001, approximately one in five workers in Europe were employed on shift patterns involving night work (Harrington 2001). Those working shifts are more likely to complain of fatigue, anxiety and report a reduction in quality and quantity of sleep (Harrington 2001). Further to this, punishing work schedules and the accompanying stresses can impact negatively upon sleep even where individuals work 'normal' hours. Thus, Linton (2004) found that stress in the form of 'poor' psychosocial work environment increased the risk of sleep problems. Somewhat similarly, Akerstedt et al (2002) identify how high work demands and physical effort at work are risk indicators for disturbed sleep, and Cropley et al (2006) illustrate how teachers with high job strain report poorer quality sleep (see Williams 2005 for a discussion of how the prevalence of sleep problems may vary by occupation). Unemployment is also associated with poor sleep. As Arber et al (2009) report, the unemployed have significantly elevated odds of reporting sleep problems, even after controlling for worries, smoking, depression, health and a range of socio-economic factors.

Retirement and the biographical transitions which accompany retirement do not necessarily remove the link between work and sleep quality. Henry et al (2008) conducted interviews with 24 patients (19 female and 5 male) who were receiving treatment for insomnia. They found that patient explanatory models of insomnia revolved around 'work'. Work was offered as the primary causal agent in the development of insomnia, the primary reason for needing good sleep, the reason for seeking medical help and the reason why individuals complied with medical regimens. As the authors identify "even retired informants couched their illness experience in terms of work, further evidencing the powerful internalizing role of labor in experiences of insomnia, and the long-term impact of contemporary working lifestyles on sleep" (Henry et al 2008: 724). Lallukka et al (2010) also found that prior economic difficulties in childhood remain associated with insomnia even into adulthood.

Gender underpins all aspects of Hislop and Arber's (2006) model of how 'temporal dynamics' impact on sleep. In their qualitative study of mid-life women's sleep, Hislop and Arber (2003) found that women prioritise their partner's and children's sleep above their own. The interaction of the

physical and emotional labour involved in caring for babies, young children and teenagers, and the worries and concerns associated with family responsibilities, work, and caring for ageing parents, are said to compromise women's access to quality sleep and in particular their *sleep maintenance*. From this, Hislop and Arber conclude that being "female within a family structure can thus be synonymous with a loss of [fundamental human] sleeping rights" (Hislop and Arber 2003). Similarly, Venn et al's (2008) qualitative study of working age couples found that women undertake a 'fourth shift' of night time care for children, while prioritising their partners' sleep.

Implicit within Hislop and Arber's (2006) model is also the idea that the couple relationship is an additional temporal dynamic for many. Most adults share their sleeping space with a partner and there are normative conventions requiring couples to sleep in the same bed. As Venn (2007) notes in her discussion of snoring:

> *"The integrity of the couple relationship is also at risk when, because of snoring, couples relocate to a different bed or bedroom, so that both husbands and wives felt the need to assert that relocation was a last resort, and not something either wanted to do."*

The strength of this normative convention appears to change over the life course of the individual and the couple relationship. Older women have been shown to be more able to embrace behaviours that challenge these conventional norms and relocate to another bedroom (Hislop and Arber 2006). Hislop and Arber (2006) report that 28% of partnered women aged over 60 sleep separately from their husbands, compared to only 7% in their late forties or fifties. Similarly, the impact of snoring within a couple can change over time. At the beginning of a relationship, couples are said to be more alert to the embarrassment that accompanies burping, snoring or farting in bed, yet as the relationship develops couples learn to 'fit together', and to 'mutually adapt' (Meadows et al 2008).

Partners come together with their own notions of what is normative regarding sleeping behaviours of themselves and their partners. These are influenced by at least two things: (prior) knowledge of others' sleep, and clear notions of what makes sleeping bodies 'unattractive' (such as farting, snoring). The longer the duration of the relationship, the greater the potential that couples 'routinize' their experience of each other. This may be via an 'acceptance', an emphasis on 'mutual inconsideration', 'normalization' or the 'neutralizing' of potentially embarrassing events (Meadows et al 2008).

Much of the work cited above has focused on sole reports from women and has been qualitative rather than based on representative surveys of men and women, with very few studies of couples. The present paper explores the associations between sleep maintenance and gender, health, socio-economic status and a range of relational variables (such as partner snoring) – using data from *both* men and women within the same couples, and examines different subsets of couples (younger and older). The paper examines the following research questions i) does the magnitude of gender differences in sleep maintenance differ between younger and older couples?; and ii) do social factors, such as presence of a child, employment status, partner behaviours such as partner's snoring, impact on men and women's sleep maintenance differentially? Whilst the analysis presented here is necessarily cross-sectional, as it moves through future waves *Understanding Society* will provide a unique source of data which will enable the relationship between temporal dynamics (including the couple relationship) and changes in sleep over time to be fully explored.

Methodology

This paper draws upon data from the first year of Wave 1 of the new *Understanding Society* survey. Data were collected in 2009 from a representative sample of households in Britain, with a response rate of 59%, resulting in an interviewed sample of 14,065 households and 22,265 individuals aged 18 and over (McFall and Garrington 2011; Table 1a below). The *Understanding Society* survey included 7 questions on sleep quality/quantity, as well as a range of socio-economic and demographic questions and modules on marital and cohabitation history. The sleep questions, and the response categories, mirror some aspects of the clinically validated Pittsburgh Sleep Quality Index (Buysse et al 1989). There are also similarities to the Jenkins Sleep Questionnaire (Jenkins et al 1988), which asks whether individuals have experienced trouble falling asleep, trouble staying awake, waking up at night, and waking up feeling tired.

The paper focuses on sleep maintenance; that is how often the respondent reported they 'had trouble sleeping during the past month because they wake up in the middle of the night or early in the morning?' Our focus on self-reported nocturnal awakenings reflects the attempt to capture aspects of sleep which have been suggested to be gendered (for example, nocturnal child care, partner disturbances through snoring, work stresses). Data was collected using self-completion response categories which ranged from 'Not during the past month' to 'More than once most nights'. A dichotomised variable was created which identified those who experienced awakenings less than 3 nights per week (0) and those who experience awakenings on '3 or more nights' per week (1). This recoding reflects DSM-IV-TR criteria which define a sleep problem as one which is present for 3 or more nights per week for at least 1 month (Lallukka et al 2011).

Table 1. Number of individuals within the whole sample and analysis subsample of couples

(a) Numbers for Individuals on sleep items for whole sample

	(b)
No. of interviews (aged 18+)	22,265 individuals within 14,065 households
No. of individuals responding to sleep module	19,694 individuals (11.5% unit non-response)
No. of individuals responding to 'sleep maintenance' item	18,388 individuals (6.6% of unit respondents had item non-response)
No. of individuals responding to 'wakes self through snoring/coughing/ item	16,407 individuals (16.7% of unit respondents had item non-response)

(b) Analysis sub-sample of couples

No. individuals interviewed who indicate that they are living with a spouse/partner or living as a couple	13,975 individuals
No. of individuals where both partners in couple were interviewed	11,306 individuals within 5,653 couples
No. of individuals where both partners in *Heterosexual* couple were interviewed	11,208 individuals within 5,604 couples
No. of individuals in heterosexual couples who answered 'sleep maintenance' item	9,615 individuals within 5,175 couples
No. where both partners in heterosexual couples answered 'sleep maintenance' item	8,848 individuals within 4424 couples
No. of individuals in 4,424 heterosexual couples who answered 'wakes self through coughing/snoring' item	7,925 (10% item non response in this sub-sample)

As the main concern of this paper is to examine *gender* within couples, the present analysis is restricted to a specific sub-group of respondents – heterosexual couples where data exists for both partners. Individuals who identified that they were living with a spouse (n=11,263), or living as a couple (n=2,712), were identified. A further step then identified those where data was available from both partners in a couple, and a unique identifier was given to each dyad (n=5,653 couples). Further steps

then identified couples where both partners within *heterosexual* couples had given an answer for the dependent variable (n=4,424 couples; see table 1b).

Models were run separately for those couples where the male was aged 50 and under (n=2,452 couples) and those couples where the male was aged over 50 (n=1,972 couples). There is obvious potential for multi-collinearity when examining predictors which involve 'time' in a cross-sectional analysis. We would expect factors such as length of relationship, marital status, and number of divorces to be affected by increasing age. Within the present dataset, there is a close association between age of individuals and length of current partner relationship (correlation coefficient of 0.862; p<0.001). There is also, an expected, close association between age, marital status and length of relationship. The decision to separate the age groupings at 50 reflects earlier research which suggests qualitative difference between these two age groups related to childcare responsibilities and causes of poor sleep. Williams et al (2010), for example, note in their analysis of the *Psychiatric Morbidity Survey* 2000, that up to age 50 'worries' is by far the most frequently cited cause of sleep problems. However, later in life, 'worries' are surpassed by 'illness/discomfort' as the primary reason. As noted above, later life is also accompanied by transitions in employment and childcare responsibilities; and separate models enable these variables to be adapted accordingly. The decision to select the male age was somewhat arbitrary, as partners tended to be of similar age (mean age difference, 4.7 years, SD 4.8 years), but reflected the fact that men were older in 68% of the partnerships.

Analysis Approach

Standard correlation analysis techniques are often applied to data on couples (Kenny and Cook 1999), in which sleep data is aggregated to give an average score for each individual within the couple. Each spouse's aggregated score would then be correlated with their partner's aggregated score. With heterosexual dyads these techniques quantify the extent to which women who receive a high score on a variable, relative to other women, are matched with men who receive a high score, relative to other men. However, this aggregation may result in cross-level errors or level of analysis errors (Gonzalez and Griffin 1997).

Within the present study, multilevel models were utilised and analysis proceeded in the following steps. First, two level (individuals nested within couples) logistic regression models were created, for each age group: which included 'gender' and the further independent variables identified below. 1st order marginal quasi-likelihood (MQL) estimates were then used as the starting point for second order predictive quasi-likelihood (PQL) estimates (Rasbash et al 2005)[i]. The proportion of variance at the couple level was calculated using the linear threshold method; with the individual level variance considered to be $\pi^2/3$.

Figure 1. Multilevel logistic model

$$Log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 x_{ij} + u_j$$

Secondly, a model was fitted that allowed for separate outcome measures for men and women within couples. This model is thus a bivariate single level logistic model and allows for a correlation between men and women which is reported in Tables 3 and 4 and is equivalent to the proportion of the total variance that is between couples in the 2-level model described above. We report the odds ratios for men and women and the correlation between male and female nocturnal awakenings.

Figure 2. Bivariate Logistic model for a single predictor

$$log\left[\frac{\pi_{1j}}{1-\pi_{1j}}\right] = \beta_{01} z_{1ij} + \beta_{11} z_{1ij} x_{ij}$$

$$log\left[\frac{\pi_{2j}}{1-\pi_{2j}}\right] = \beta_{02}(1 - z_{1ij}) + \beta_{12}(1 - z_{1ij}) x_{ij}$$

$z_{1ij} = 1$ if male, 0 if female

Variables in the models

As one aim of this paper is to explore gender differences, variables were selected based on substantive findings from earlier studies and there was not a concern with creating the most parsimonious model. Within models for age 50 and under, *individual level variables* include 'gender'; 'age'; 'highest educational qualification' (recoded into categories (0) degree or above, (1) nursing and professional, A level equivalents, (2) General Certificate of Secondary Education (GCSE) or lower, (3) none); health (SF-12 subjective general health); employment status (coded as (0) employed or self-employed, (1) retired/unemployed, (2) on maternity leave or looking after the family); satisfaction with income (recoding the original scale to identify those who are dissatisfied compared with those who are satisfied or neutral); and whether they had experienced a previous cohabiting relationships (coded into 0 for 'no' and 1 for 'yes')[ii].

Couple level variables include whether a child aged under 2 is present in the household (to measure impact of young children on sleep) and 'possible spare room'. This latter variable was created in an attempt to proximate bedsharing. It was calculated as *number of bedrooms-(number of people in the household-1)* and based on assumptions that couples will normatively share a room (see Hislop 2007), that other adults in the household would be given their own room, and that children would be given a room each if there was space. Thus, a couple with two children, living in a household with three bedrooms would have 0 spare rooms.

A *partner impact variable* was also developed which identified whether the partner reported waking because of their own coughing or snoring. Each respondent was asked whether they had trouble sleeping because they 'cough or snore loudly in the last month'[iii]. As noted in Table 1, 923 individuals within the analysis sample of 4,424 couples did not answer this item. Whilst the self-completion design does not allow us to distinguish between forms of non-response, we do suggest that there is a strong case for considering this item non-response as synonymous with 'don't know'. This is principally for two reasons: first, within the analysis sample there is minimal non-response for the other sleep items and all but nine respondents answered the sleep quality item. This would suggest that non-response on the 'cough or snore' item is not linked to satisficing behaviour and that there is something specific about the 'snore/cough' question. Second, we know from previous qualitative research, that respondents from 'normal' populations often suggest that they 'do not know' whether they cough or snore at night. In studies of couples, individuals often look to their bed partner to answer this question for them (see Venn 2007 for examples). A similar difficulty can be found within clinical populations. Obstructive sleep apnoea – which is linked to snoring and micro arousals – is often said to remain under-diagnosed because the patient is unable to remember the "active state of the disease" during sleep (apneos.com 2003).

For the models for age over 50, several variables were altered to map onto the changes that accompany mid– and later–life. As a higher proportion of couples aged over 50 were retired, employment was coded into 2 categories ('employed' or 'not employed'). Similarly, the children variable was adapted to become 'child of any age in the household'.

Results

Table 2 shows the gender and age group distributions of the variables used in the models; and the proportion of men and women within each category reporting sleep maintenance problems on 3 or nights per week.

Table 2. Descriptive statistics: % of men and women in 4,424 heterosexual couples reporting sleep maintenance problems by age group

	Couple age 50 and under					Couple over age 50				
	N	men		Women		N	men		women	
		n	% wake	n	% wake		n	% wake	n	% wake
Reported sleep maintenance problem	4,904	2,452		2,452		3,944	1,972		1972	
Yes	1,758	787	32%	971	40%	1,890	913	46%	977	49%
No	3,146	1,665		1,481		2,054	1059		995	
Education										
Degree	1,452	673	27%	779	34%	674	398	41%	276	41%
A level equivalent	1,087	491	30%	596	40%	631	269	42%	362	49%
GCSE and lower	1,824	959	34%	865	43%	1,024	451	45%	573	48%
No qualifications	540	329	43%	211	47%	1,608	851	50%	757	53%
Employment status										
Employed	3,955	2158	30%	1797	36%	1715	873	42%	842	46%
Unemployed/Retired	486	277	48%	209	55%	2077	1,092	50%	985	53%
Maternity leave/Looking after family	463	17	41%	446	46%	151	6	33%	145	50%
Income satisfaction										
Satisfied	3,389	1664	27%	1725	36%	3076	1,520	44%	1,556	48%
Not satisfied	1,475	760	42%	715	49%	816	433	56%	383	57%
Subjective health										
Excellent	1,002	501	24%	501	28%	557	270	36%	287	37%
Very good	1,873	915	29%	958	35%	1,225	589	38%	636	44%
Good	1,384	721	35%	663	45%	1,157	598	48%	559	49%
Fair	493	248	46%	245	55%	683	326	54%	357	63%
Poor	152	67	61%	85	74%	320	189	72%	131	72%
Had a previous cohabiting partner										
No	3,379	1,692	29%	1,687	37%	2,973	1,465	45%	1,508	49%
Yes	1,514	754	38%	760	46%	966	505	51%	461	51%
Child (less than 2 for younger couples) - Any child <18 for older couples										
No	3,752	1,876	31%	1,876	38%	3,622	1,811	47%	1,811	51%
Yes	1,150	575	36%	575	46%	322	161	42%	161	38%
Possible Spare Bedroom										
No	2,258	1,129	35%	1,129	42%	1,502	751	46%	751	50%
Yes	2,640	1,320	29%	1,320	38%	2,440	1,220	47%	1,220	50%
Partner reports waking due to own cough/snore										
Not in last month	2,885	1,632	29%	1,253	36%	1,740	960	45%	780	47%
Less than once a week	641	260	33%	381	39%	452	205	40%	247	51%
Once or twice a week	416	169	43%	247	40%	407	173	47%	234	50%
Three or more times a week	307	115	37%	192	46%	272	107	50%	165	56%
More than once most nights	381	135	46%	246	52%	419	138	53%	281	58%
Do not know	274	141	41%	133	38%	654	389	50%	265	51%

In younger couples (where the male is aged 50 or under, n=4,904 individuals within 2,452 couples in the models), the average duration of the couple relationship was 10.5 years (SD 7.49) and 32% of men and 40% of women reported sleep maintenance problems on '3 or more nights' per week' within the last month.

The multilevel logistic regression analysis of younger couples (age 50 and under) in Table 3 shows that women have higher odds of reporting sleep problems (OR 1.38). Within the couple model, individuals who are unemployed or retired (OR=1.51) and those dissatisfied with their income (OR=1.47) are more likely to have sleep maintenance problems. A health gradient is also strongly evident, with those reporting poor health having an odds ratio of 4.02 compared to those reporting excellent health. As expected, the presence of a child under 2 years of age also increases the odds of poor sleep maintenance (OR=1.49). The presence of a partner who reports trouble sleeping because of coughing or snoring is strongly associated with their partner's sleep maintenance; this reveals an odds ratio of 1.72 where their partner reports loud cough/snoring more than once on most nights. The proportion of variance which remains at the couple level is 2%.

Table 3. Odds ratios for sleep maintenance for couples where the male is aged 50 or less (shading indicates significance at p<0.05), n=2,452 couples

	Both partners (Two level model)			Men (Bivariate model)			Women (Bivariate model)		
	β	SE	OR (95% CI)	*β*	SE	OR (95% CI)	*β*	SE	OR (95% CI)
Female	0.33	0.07	1.38(1.21, 1.58)						
Age(centred)	0.01	0.00	1.01(1.00,1.02)	0.02	0.01	1.02(1.01, 1.03)	0.01	0.01	1.01 (1.00, 1.02)
Degree									
A level equivalent	0.07	0.09	1.07(0.899,1.28)	0.00	0.14	1(0.76,1.31)	0.14	0.12	1.14(0.91,1.45)
GCSE and lower	0.1	0.08	1.14(0.97,1.33)	0.06	0.12	1.06(0.84,1.34)	0.18	0.11	1.20(0.97,1.49)
None of the above	0.2	0.12	1.25(1, 1.58)	0.26	0.16	1.29(0.95,1.75)	0.11	0.17	1.11(0.80,1.56)
Employed									
Unemployed/Retired	0.4	0.11	1.51(1.22, 1.88)	0.43	0.15	1.53(1.15,2.04)	0.41	0.16	1.51(1.10,2.06)
Maternity leave/Looking after family	0.2	0.11	1.28(1.02, 1.59)	0.08	0.52	1.09(0.39,2.99)	1.96	0.12	7.10(5.61,8.98)
Dissatisfied with income	0.4	0.07	1.47(1.28,1.68)	0.44	0.10	1.55(1.27,1.88)	0.22	0.10	1.24(1.03,1.50)
Subjective health - excellent									
Very good	0.3	0.09	1.31(1.09,1.57)	0.26	0.13	1.30(1,1.68)	0.27	0.12	1.31(1.03,1.66)
Good	0.5	0.10	1.70(1.41, 2.05)	0.45	0.14	1.57(1.20,2.06)	0.61	0.13	1.83(1.42,2.37)
Fair	0.9	0.12	2.38(1.87,3.03)	0.78	0.18	2.18(1.55,3.07)	0.91	0.17	2.48(1.78,3.44)
Poor	1.4	0.20	4.02 (2.70,5.97)	1.09	0.29	2.99(1.69,5.28)	1.68	0.28	5.37(3.11,9.27)
Had a previous cohabiting partner	0.3	0.07	1.32(1.15,1.51)	0.27	0.10	1.31(1.08,1.58)	0.25	0.10	1.29(1.07,1.55)
Child < 2 in the household	0.4	0.08	1.49 (1.32, 1.79)	0.35	0.11	1.42(1.14,1.77)	0.45	0.11	1.57(1.26,1.97)
Possible Spare room	-0	0.07	1.00 (0.86, 1.12)	-0.08	0.10	0.92(0.76,1.11)	0.04	0.09	1.04(0.87,1.24)
Partner reports wake/cough/snore not in last month									
Less than once a week	0.1	0.10	1.14(0.94,1.38)	0.11	0.15	1.11(0.83,1.49)	0.11	0.13	1.12(0.87,1.42)
Once or twice a week	0.3	0.11	1.32(1.06,1.65)	0.48	0.17	1.62(1.16,2.28)	0.11	0.15	1.12(0.84,1.50)
Three or more times a week	0.2	0.13	1.28(1,1.65)	0.19	0.21	1.20(0.79,1.83)	0.22	0.16	1.24(0.90,1.71)
More than once most nights	0.5	0.12	1.72(1.37,2.16)	0.46	0.19	1.59(1.09,2.31)	0.52	0.15	1.68(1.26,2.25)
Do not know	0.2	0.14	1.24(0.95,1.62)	0.43	0.19	1.54(1.07,2.23)	0.01	0.20	1.01(0.68,1.49)
Intra-Class Correlation/Correlation (unconditional model)	----------0.06----------			----------0.08----------					
Intra-Class Correlation/Correlation (full model)	----------0.02----------			----------0.03----------					

Table 4. Odds ratios for sleep maintenance for couples where the male is aged over 50 (shading indicates significance at p<0.05), n=1,972 couples

	Both partners (Two level model)			Men (Bivariate model)			Women (Bivariate model)		
	B	SE	OR (95% CI)	*B*	SE	OR (95% CI)	*B*	SE	OR (95% CI)
Female	0.17	0.01	1.19(1.17,1.20)						
Age(centred)	0.01	0.01	1.01(1.00,1.02)	0.01	0.01	1.01 (1.00, 1.03)	0.00	0.01	1.00(0.99,1.01)
Degree									
A level equivalent	0.09	0.12	1.09(0.86,1.38)	0.01	0.17	1.01(0.73,1.39)	0.18	0.17	1.19(0.86,1.65)
GCSE and lower	0.09	0.11	1.09(0.88,1.36)	0.07	0.15	1.07(0.80,1.42)	0.13	0.15	1.14(0.84,1.54)
None of the above	0.14	0.10	1.15(0.95,1.40)	0.10	0.13	1.11(0.85,1.44)	0.21	0.16	1.23(0.90,1.67)
Not in employment	0.01	0.09	1.01(0.85,1.21)	-0.03	0.12	0.97(0.77,1.24)	0.02	0.12	1.02(0.82,1.28)
Dissatisfied with income	0.30	0.09	1.35(1.12,1.62)	0.35	0.12	1.41(1.12,1.78)	0.21	0.12	1.24(0.98,1.57)
Subjective health - excellent									
Very good	0.14	0.11	1.15(0.93,1.43)	0.05	0.16	1.05(0.77,1.42)	0.21	0.15	1.24(0.92,1.66)
Good	0.44	0.11	1.55(1.25,1.93)	0.45	0.16	1.56(1.15,2.12)	0.39	0.15	1.48(1.10,2.00)
Fair	0.81	0.13	2.25(1.74,2.90)	0.66	0.18	1.93(1.37,2.72)	0.89	0.17	2.44(1.74,3.41)
Poor	1.44	0.17	4.22(3.02,5.89)	1.38	0.22	3.99(2.60,6.12)	1.37	0.24	3.92(2.43,6.32)
Had a previous cohabiting partner	0.21	0.08	1.23(1.05,1.44)	0.31	0.11	1.36(1.10,1.69)	0.07	0.11	1.07(0.86,1.34)
Child (any age) in the household	-0.24	0.14	0.79(0.60,1.03)	-0.07	0.19	0.94(0.65,1.35)	-0.42	0.14	0.65(0.49,0.87)
Possible spare room	0.07	0.08	1.07(0.91,1.26)	0.09	0.10	1.10(0.90,1.35)	0.03	0.10	1.03(0.84,1.26)
Partner reports wake/cough/snore not in last month									
Less than once a week	0.01	0.11	1.01(0.81,1.26)	-0.19	0.16	0.83(0.60,1.14)	0.17	0.15	1.18(0.88,1.58)
Once or twice a week	0.08	0.12	1.08(0.86,1.36)	0.07	0.17	1.07(0.77,1.50)	0.11	0.15	1.12(0.83,1.52)
Three or more times a week	0.23	0.14	1.26(0.96,1.65)	0.07	0.21	1.07(0.71,1.63)	0.31	0.18	1.36(0.96,1.95)
More than once most nights	0.30	0.12	1.35(1.08,1.69)	0.16	0.19	1.17(0.80,1.71)	0.34	0.15	1.40(1.05,1.87)
Do not know	0.07	0.10	1.07(0.88,1.30)	0.05	0.13	1.05(0.82,1.35)	0.03	0.15	1.03(0.77,1.39)
Intra Class Correlation/Correlation (unconditional model)	----------0.06----------			----------0.1----------					
Intra Class Correlation/Correlation (full model)	----------0.05----------			----------0.06----------					

Comparing the findings noted above with findings from analysis of couples aged over 50 suggests some *prima facie* differences (Table 4). Among the 3,944 individuals within 1,972 older couples, relationships have lasted for an average of 34.9 years (SD 14.1) and there is a much higher

prevalence of problems maintaining sleep (with 46% of men and 49% of women reporting difficulty on 3 or more nights a week, Table 2). We would expect the prevalence to be higher in the older couples. In a clinical sense, this question positions closely to the idea of 'sleep maintenance insomnia' which is more prevalent in older couples.

Whilst the gender effect appears smaller in this age group, women continue to have higher odds of sleep maintenance problems (OR=1.19). Among older couples, education, and satisfaction with income and health are associated with greater sleep problems. Those dissatisfied with income (OR=1.35) and in poor health (OR=4.2) report frequent sleep maintenance problems. The association between sleep maintenance problems and previous cohabitation (OR=1.23) also remains within the older age group; as does the impact of a partner who reports nightly snoring/coughing (OR=1.35). The proportion of variance which remains at the couple level is 5%.

When bivariate models are run to obtain estimates for husbands and wives separately within younger couples (columns 2 and 3 in Table 3), the correlation between male and female reported sleep maintenance is 0.08. This reduces to 0.03 when the social factors are entered into the model. In essence, within the younger couples both men and women are affected by the same factors – although there are stronger effects for men for satisfaction with income, and higher odds for women with a child less than 2 years of age in the household.

When models are run which enable estimates to be obtained for older husbands and wives separately (columns 2 and 3 in Table 4), the correlation between male and female reported sleep maintenance is 0.1. This only reduces to 0.06 when the social factors are entered into the model. It can be seen that whilst health remains important for both partners, men have higher odds of poor sleep maintenance if they are dissatisfied with income (Men OR=1.41; Women not significant) or have experienced a previous cohabitation (Men OR=1.36; Women not significant). For women, having a partner who reports waking through coughing/snoring more than once most nights (OR=1.40) is strongly associated with poor sleep maintenance; but there is no significant effect of wives' snoring on their husband's sleep maintenance.

With respect to our research questions, the above findings suggest that, firstly, gender differences in problems in sleep maintenance are greater in younger couples. Formal tests confirm a significant interaction between gender and age; with the effect of being 65 and over significantly altering between men and women (β -0.373; *s.e.* 0.145). Secondly, with younger couples the same social factors entered into the models, impact on *both* husband and wives sleep – although to different magnitudes, whereas among older couples, men's and women's sleep becomes both more similar in terms of sleep maintenance problems, and more 'differentiated' with, for example, women's sleep maintenance more likely to be associated with their partner's snoring.

Discussion and conclusions

This paper has reported findings from analysis of younger (aged 50 and below) and older (aged over 50) couples. Many of the findings confirm earlier research showing the poorer sleep of women and the relationship between poor sleep and socio-economic status and health. Those with no educational qualifications, those in poor health and those dissatisfied with their income are also more likely to report problems with sleep maintenance.

The present study also reported novel findings from quantitative data on the associations of young children in the household, previous cohabitating partnerships and partners' snoring on both men and women's sleep – especially in younger couples. Whilst there is now a wealth of understanding which demonstrates strong bi-directional links between both sleep quality and quantity and a range of chronic and acute illnesses, much of this research ignores the fact that many individuals exist within dyads. Examining data from both partners within a couple sits more comfortably with theoretical notions that 'gender' is relational, and provides a more detailed examination of the role that marriage/marital status may play in health status. Within this paper, two key claims are made with respect to gender. First, in younger couples, whilst women report greater sleep problems, *both* men and women's sleep maintenance shows associations with a wide range of social factors entered into the model and with the frequency of their partners' snoring. Second, the gender dynamic within couples does interact with age, and within older couples, women's sleep maintenance

appears more likely than men's to be associated with their partners' snoring/coughing.

These findings add to previous research on gender and sleep. Venn et al (2008), for example, used qualitative interview data from 26 healthy, heterosexual couples with children, to illustrate how physical and emotional care for young children at night was largely provided by women, disturbing women's own sleep. In particular, there was a lack of explicit negotiation between partners about who provided this care, with mostly tacit understandings that women would get up in the night to deal with, for example, nappy changing or settling anxious children. Even when women returned to employment or fulltime education, they continued to undertake most of the child care at night. Whilst this may certainly be the case, findings from the present analysis suggest that husbands' self-reported sleep maintenance is also associated with the presence of a young child. Similarly, Arber et al (2007), used survey data to show that women's subjective sleep quality was primarily influenced by how their partners slept, how their children slept, and their own worries. Within the present study, an association is found between sleep maintenance and partner reports of coughing/snoring for both men and women[iv].

Results from the present analysis also suggest that temporal dynamics exist in sleep maintenance. Following Hislop and Arber (2006), our analysis confirms the impact of biological or physical ageing (age and health status), institutional structures (employment), relational structures (presence of a child less than 2 and partner reports of snoring) and biographical transitions (impact of previous cohabitation). Results also suggest a temporal dynamic to the couple relationship; with the relationship between gender and sleep maintenance altering by age and with older women's sleep associated more with her partners' reports of his own snoring.

However, this analysis is limited by the fact that *Understanding Society* presently only allows for cross-sectional analysis of sleep. The true potential *Understanding Society* offers will be realised in future waves. The present analysis has also purposefully focused on a specific subset of *Understanding Society*; and couples where both partners complete the survey may be atypical. We would suggest that two particular lines of analysis will become especially valuable in future waves. First, analysis can fully explore the way that gender impacts on sleep quality and quantity within couples and how this may change over time. Second, as *Understanding Society* also contains questions about relationship satisfaction, prospective analysis will be able to explore the associations between sleep, health and changes in marital relationships in greater depth.

Recent literature suggests that married individuals report fewer sleep problems than their unmarried counterparts (Arber et al 2009). Troxel et al (2009) found that maritally happy women report fewer sleep disturbances; whilst Troxel et al (2010) suggested that there are sleep advantages for women who have a stable relationship history, as opposed to those who had lost or gained a partner over the same period. Drawing on longitudinal data from mid-life women, Troxel et al (2010) identified those women who were married/living as married at baseline, and those who were not, and traced them across 8 years, creating categories 'consistently married', 'consistently unmarried', 'lost a partner' and 'gained a partner'. Cross-sectional analysis comparing 'married' with 'unmarried' women found that currently being married was associated with better sleep, but that this was only in unadjusted models. Marital trajectories were important, however, with 'consistently married' women showing a relative advantage in sleep quality and quantity as compared to the other groups. As Hale (2010) suggests, whilst Troxel et al's findings do not suggest causality, they hint towards part of the explanation for the enduring positive association between marital status and health. As both Hale (2010) and Troxel et al (2010) note, however, there is a need to explore this further using different subpopulations (which include men) and to examine relationship satisfaction concurrently. There is also much that can be gained by analysing differences within those who are currently married/cohabiting and the underlying qualitative dimensions of high quality marital relationships (Troxel et al 2010).

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Endnotes

[i] As second order PQL is known to be biased, models were also run using MCMC estimation. Results were comparable. We report the PQL results in the paper to enable replication of analysis.

[ii] Wave 1 of *Understanding Society* also collected data on sleep medication use; asking how often respondents took any prescribed or over the counter medication in the past month to help them sleep. As our primary focus is on gender differences within self reports of sleep maintenance problems across different couple types, we do not include medication use in the models presented here. However, unreported analysis confirms that the odds ratios remain essentially of the same magnitude if sleep medication use is included in the models

[iii] Data were checked to examine whether there was a correlation between an individual's sleep maintenance and their answer to whether they 'wake through snoring'. A strong correlation could suggest a problem with including this in the models; as at the couple level both partners' sleep maintenance is being considered. Coefficients for the data set as a whole were 0.252, which whilst significant ($p<0.05$) suggests that it is not overly problematic to include 'partner reports of snoring' in the models.

[iv] This is not necessarily to suggest that partner behaviours are 'causing' nocturnal awakenings. As one of the reviewers usefully pointed out, those who spend more time awake for other reasons will be more likely to hear and report their partner snoring, even if it is relatively unobtrusive. Whilst we acknowledge this – and are grateful that the reviewer requested that we clarify this point - it is interesting that the association is with partner reports of snoring (not individuals reporting that their partner snores). We also acknowledge that a person's own snoring can impact on their sleep. We did not include this in models as our focus was principally on gender difference in the social factors entered and the possible differences between younger and older couples.

Developing ethnic identity questions for *Understanding Society*

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Abstract

Ethnic identity, its formation, expression and consequences are sources of extensive discussion and debate within multicultural societies. Analysis of identity is increasingly finding its way into survey-based analysis and is being explored by disciplines beyond psychology, and qualitative and theoretical sociology. However, effective and appropriate survey measures of ethnic identity that are suitable for inclusion in a general purpose sample survey and which allow estimation of change and development across the age range are in short supply. Here, we describe the process of development of a series of new ethnic identity questions, designed specifically for inclusion in Understanding Society but with applicability for longitudinal studies further afield. We detail the rationale for the development and the process by which the final set of questions was arrived at, and outline the implications for future research agendas.

Keywords identity; measurement; ethnicity; UKHLS; survey;

1. Introduction

Ethnic identity is a source of extensive discussion and debate within multicultural societies. Movements of people as a result of forced and economic migration bring into relief ethnic identity through consciousness of difference and awareness of others' reactions and ascriptions (Jenkins 1994). Ethnic conflicts and genocides highlight the extreme consequences that can ensue from the construction of ethnic boundaries and from investment in identification with one's own 'group' while denying the value – or even humanity – of outgroupers (Banton 2000; Brubaker and Laitin 1998; Olzak 2006). At an individual level, identification with a dominant or marginalised group has been shown to have consequences for self-esteem and can affect achievement and well-being in very tangible ways. Issues of group belonging and identification are thus highly significant for individuals and can have consequences for societies; but they also become more or less salient according to location and context.

Within Western European countries, the maintenance of minority ethnic identities can be experienced or perceived as both threatening and adaptive. Claims associating strong ethnic identification with both positive and negative individual and social outcomes abound and are contested. Increasingly, researchers seek ways to explore and address such claims. For example, there are ongoing debates about social and spatial ties among minority ethnic groups and whether these lead (negatively) to self-segregation or (positively) to cohesion. See, for example, Georgiadis and Manning 2011; Battu and Zenou 2010; Finney and Simpson, 2009, for various takes on such debates. Yet clear interrogation of the nature and strength of specific ethnic identifications, and their consequences, is

hampered within quantitative social science by lack of direct measures of ethnic identity – alongside lack of consensus as to the forms in which identity is itself constituted.

There are a range of psychological measures of identity or orientation towards ethnic group (Phinney 1992), and there is also a wealth of qualitative research material exploring how particular ethnic groups express or understand their ethnic identity. But despite the need for appropriate measures (Aspinall 2000), and increasing interest among researchers (Manning and Roy 2010; Constant and Zimmerman 2008), there are no comprehensive suites of questions on ethnic identity in social survey research, outside a small number of specialist surveys. Even within specialist studies of migration, questions on ethnic identification are often scarce or unidimensional (Güveli and Platt 2011). Researchers therefore typically have to make do with proxies of ethnic identity or with simple categories.

The aim of the research outlined in this paper was, therefore, to explore and develop survey measures for application in general purpose surveys. It worked with a concept of ethnic identity that was explicitly multifaceted and multidimensional. It also employed an approach that was intended to meet the varying needs of researchers with different questions to answer and with different preconceptions about what ethnicity and identity mean. Thus, while drawing on insights from psychology, economics and sociology, the measures were not intended to represent a single uniform concept of ethnicity, but instead to work flexibly with existing and emerging research concerns that located ethnic identity or proxied it in: patterns of association, religious affiliation, cultural practices, individual expression, national origins and transnational interchanges, and in all or some of these dimensions of self-hood and identification.

Ethnic identity is formed or shaped relationally, through interaction with others (Barth 1969). Other actors contribute to maintenance or subversion of ethnic identity through acceptance or rejection of expressed identity, and through processes of ascription. This can include, though is not limited to, discrimination and ethnic hostility. To understand the development of identity it is therefore also critical to have some understanding of social context and others' perceptions. Nevertheless, it is a complex question how these can adequately be measured in tandem with expressed identities (Heath and Cheung 2006).

We were concerned to locate ethnic identity in relation to individuals' social identities more broadly and to recognise that ethnic identity was just one element of people's sense of self – and not necessarily, or always, the most important. Ethnic identity intersects with other aspects of social identity, both ascribed, such as gender, and chosen such as sports or music preferences. Depending on context, these may be felt as more salient to an individual than their ethnic identity, or shift in relative strength. Nevertheless, while locating ethnic identity within a broader concept of social identity, the main aim of the process described here was to measure ethnic identitity(ies) specifically.

Tajfel (1981) described social identity as "that part of an individual's self-concept which derives from his knowledge of his membership of a social group (or groups) together with the value and emotional significance attached to that membership". Tajfel highlighted the important distinction that has been extended in more recent research between what Turner et al (1994) describe as "self-categories" that define the individual as a unique person in terms of his or her individual differences from other (in-group) persons, and social identity that represents "social categorisations of the self and others".

An alternative formulation of the private/public self distinction was put forward by Abrams (1996) who distinguished a private self that "contains knowledge of one's own attitudes, traits, feelings and behaviour" and a social self consisting of group memberships or categories. Abrams introduced the notion of process to the private–social dichotomy, whereby people can shift between feeling that their characteristics are part of their private self to asserting them as a social category, depending on the context. A category such as national origin can be internalised as a private characteristic, or a characteristic such as professional status can be externalised as a social grouping.

Phinney (1990) found that while researchers into ethnic identity by and large agreed with Tajfel's definition, they tended to focus on different "components" of identity, such as personal affiliation, practices, patterns of association, feelings of belonging to one's own ethnic group,

and so on.[1] These *components* may be temporarily specific and shift with context in different ways.

Ethnic identity is formed and develops. This is regarded as occurring primarily during adolescence as part of the general process of identity formation (Erikson 1963). But affiliation to a group and strength of identification with that group may change throughout life. Specifically, it could change in response to both events in an individual's life (such as migration or marriage, or experience of discrimination) and to external events, such as war and other political events (Ahmad and Evergeti 2010; Birt 2009), changes in law and the public sphere, and neighbourhood and wider demographic change.

Changes in strength of identification both as part of identity development and in response to changes in context may take the form of accentuation of one or more of the components of ethnicity. Moving to a new country, for example, a person may slowly change her food and dressing habits to reflect the practices of that country, but she may still retain a strong sense of belonging to her country of origin and interact frequently with others from that country (see also Schaafsma et al 2010). By contrast, another immigrant may choose to express her national identity by her dress and food, even if she does not interact frequently with others from her homeland. There is no reason to believe *a priori* that changes in people's identification with their ethnic group operate through similar patterns of change across components of identity.

For these reasons, as well as allowing flexible survey measures that would meet different conceptions of ethnicity and address varying questions on ethnic ties, boundaries, self-concept, and emotional significance, we sought to develop a series of measures that would be susceptible to changes in experience and context and would allow researchers to investigate such change.

2. Approaching ethnic identity measurement

In seeking models of identity measurement, we explored, but also moved beyond, existing survey measures that attempt to enumerate mutually exclusive ethnic group categories mostly for demographic (counting) purposes. These measures aim to capture some degree of stability in identification and group belonging. While necessary for the construction, implementation and evaluation of public policies, they fall short of being good measures of *ethnic identity* particularly because they ignore the dynamic, fluid and multidimensional nature of ethnic identity (Burton, Nandi and Platt 2010) and can treat different aspects of identity as if mutually exclusive. There is also a paucity of measures which can capture the range of *components* through which ethnic identity is expressed.

It was hoped that the new measures would meet a swiftly expanding research agenda into the formation, expression and consequences of ethnic identity and, in the process, go some way towards engaging a wider range of ethnicity researchers with survey research. No single ethnic group question is likely to be sufficient to match the interpretation and theorisation of ethnicity of different disciplines and researchers. Allowing researchers maximum flexibility in how they can construct groups and giving them a large range of potential *dimensions* of ethnicity (e.g. language and religion) and across *components* (e.g. self-concept and belonging) was felt to be optimal in constructing identity questions.

For developing such an ambitious suite of ethnic identity questions, the application to a multi-purpose longitudinal household study such as *Understanding Society* offered both constraints and opportunities. In terms of constraints:

- it was critical that any questions should be comprehensible to participants in a natural setting with little explanation
- they should be acceptable to participants (Aspinall 2002)
- they should be relatively mode invariant to allow for future replication regardless of any changes of interview mode within the survey
- they should absorb a relatively short amount of time.

In terms of opportunities, the survey offered the potential:

- for repeating these questions over time and therefore capturing development of identity especially among groups thought to

be most sensitive to change and development (young adults and migrants)

- to draw on existing answers to questions on specific dimensions of ethnic identity such as religious affiliation or categorical measures of ethnic group that had been collected in earlier sweeps of the survey
- for complementing ethnic identity questions with those that were collected on other aspects of identity and behaviour, such as on gender identity, occupation, gender role attitudes etc.[2]
- to look at identity across a wide age range, across different ethnic groups, first and second generation migrants
- to use the questions on ethnic identity to understand how strength and nature of ethnic identity of different members of a family compare.

We approached the task of question development through a series of questions which we aimed to answer using different methods that were appropriate to each question. We also drew as far as possible on existing insights (Burton, Nandi and Platt 2010) and research and survey practice to inform an appropriate development strategy.

The questions that guided our research were:

1. Can identity questions generally command an acceptable level of response (i.e. close to 100%) and incorporate sufficient variance to render them suitable for analysis?
2. Can we ask ethnic identity questions such that they are likely to be mode invariant?

These two questions we addressed by fielding a suite of simple strength of identity questions (including but not restricted to ethnic identity) in the Innovation Panel of *Understanding Society* (see section 3).

3. Can people agree on what constitutes an ethnic group or their ethnic identity?

To address this question we ran a series of focus groups in order to understand how people debated their understandings of ethnicity and the extent to which they could develop a common position (see section 4).

4. How best is it possible to ask questions that accommodate people's desire to assert multiple identities?
5. How would it be best to ask questions to measure different *components* of ethnicity?

These questions were addressed through a series of semi structured interviews (see section 5).

6. Can questions be made comprehensible and work in a survey style setting?

To address whether the measures we had developed over the preceding stages could actually deliver and be comprehensible to participants, we cognitively tested them with different respondents, mimicking the survey setting and then addressing suitability and comprehensibility (see section 6).

3. Testing general identity questions in the Innovation Panel

We initially looked for existing identity measures that could be modified to measure ethnic identity, and that we could test for their robustness within the *Understanding Society* survey context. In addition to finding ideal measures of ethnic identity, we wanted to place these within the context of a comprehensive identity module that would include other dimensions of identity, such as gender, age and life stage, occupation. The Innovation Panel, a panel of 1500 British households interviewed in the year prior to the main *Understanding Society* survey to test methodological issues, provided the ideal opportunity for such testing (see Buck and McFall, this issue).

Our review of existing questions led us to a module of questions on identity (across different domains) fielded in the *Citizenship Survey*[3] (via face-to-face interviews). The question asked respondents to say how important each of the domains was to their sense of who they were on a four point scale (see Appendix). As these questions had been carried in the *Citizenship Survey* for a number of years and had been subject to prior testing we could assume that they worked reasonably well. But some domains were difficult to interpret and few key domains were missing. Also,

we did not know whether responses would differ by interview mode.

So, we decided to ask these questions across a modified set of domains (see Appendix) in the second wave of the Innovation Panel sample, which had the added advantage of being conducted face-to-face and by telephone. We reduced the number of response options from four to three, since mode differences are less for fewer response options (De Leeuw 2005).

We found that these questions worked well and with very modest mode effects (Nandi and Platt 2011). Overall, the results suggested that the questions were by and large suitable for inclusion in *Understanding Society*; but feedback from interviewers was that the module length was burdensome for respondents. The recommendation for the general identity module was to ask a smaller number of items and in a self-completion format, which would reduce further any effects associated with mode of delivery.

4. Focus group research

We aimed to establish the extent to which people could express common understandings of ethnicity and ethnic identity and to draw out what was salient to different individuals. We wanted to establish the extent to which a public consensus could be reached as well as being able to highlight which *dimensions* of ethnic identity individuals spontaneously drew attention to. Focus groups allowed us to identify what is socially acceptable, which can differ from what people will disclose in a one-to-one situation. In line with practice for ensuring the effective working of the focus groups and the possibilities of reaching consensus within each group, we aimed for relative homogeneity, while seeking diversity across the groups (Bloor et al 2001). Homogeneity was constructed in terms of education, age, and whether minority or majority ethnicity and diversity by conducting focus groups in different regions (London, Colchester and Sheffield). Within the minority group focus groups, we allowed diversity in terms of categorical ethnic group origins, to help foster debate and discussion (see Table 1).

Table 1. Sample characteristics of the focus groups

Location	Age and gender	Socio-economic class	Ethnic categories
London	Young men and women	Middle to lower social class	Different non-white minority ethnic groups
London	Young men and women	Middle to higher social class	Minority ethnic white and non-white ethnic groups
London	Older men	Middle to lower	Different non-white ethnic groups
Colchester	Young men and women	Mixed educational levels	White British
Colchester	Older men and women	Middle to lower social class	White British
Sheffield	Older and middle aged women	Middle to lower social class	Pakistani
Sheffield	Older and middle aged women	Middle to lower social class	Black African and Black Caribbean

There were four main discussion points in these focus groups. [4] The first related to the domains of identity ("key things about ourselves"). The groups discussed: why the aspects mentioned were important to them. They also debated how important these different aspects were in relation to one another. The second discussion point revolved around the meaning of 'ethnicity / ethnic identity' and its dimensions. The third element involved discussing participants' own ethnic identity. They talked about the importance of ethnicity to their sense of self; what they thought ethnicity said about them; and whether the importance of ethnicity varied in different contexts and with others' expectations and with their life course stage. They also considered whether their perception of their identity had changed in recent years, and if so how and why. The final discussion point took the existing 2001 Census classification as its starting point. Participants reflected on it in light of the preceding discussion.

Each focus group was recorded (with participants' permission) and transcribed in full. The authors read the transcripts, reinforced by listening to the tapes, and highlighted themes and observations. These were then discussed and reviewed in an iterative process to enhance validity and robustness of interpretation (Morse et al 2002; Fossey et al 2002).

The first key point to emerge was that there was no agreement either within or across participants about what constitutes an ethnic group. For some it was roots: for example, one participant spoke about "*where I come from*". For others, it was captured in terms of language, religion, nationality, skin colour, shared values and attitudes. Some understood ethnicity as combining these different aspects. Participants in one group considered the different positions put forward, with one then asserting *"You can break down ethnicity into attributes likes colour, race and language*". No consensus emerged as to the core features of ethnic group, though there were recurrent elements that were acknowledged by the whole group.

Participants provided extensive information on how and why different dimensions of ethnicity (roots, religion, skin colour) were important to them. For example, in one discussion a participant cogently summarised the centrality of skin colour to his specific British identity: *"So the Black comes with the British for me."* Aided by the focus group format, participants discussed what information they wanted to convey to others, such as pride in *"being who you are*", and their sense of cultural difference. They linked these communicative aspects of ethnicity back to the various different dimensions that they had discussed. A key point of discussion (sometimes heated) in several of the groups was the feeling that certain values and beliefs were absolutely integral to their ethnic identities and this was, critically, what they expected to transmitted to their children. One participant expressed this conception of ethnicity in the following terms: *"In ethnicity, it brings me back to the values. Ethnicity propels you proper on how you must live, and work is included. It's not separate."* However, the strength of conviction expressed here was not common to all the respondents, even though the relevance of values was a common theme across the groups.

Some aspects, that we had not anticipated, came up spontaneously, such as how participants' identities were expressed through particular foods. This came up in almost every group and not just in relation to religious proscriptions. One participant summed up this prevailing relation of food to ethnicity when she said: *"I've always cooked Jamaican food and give my grandchildren Jamaican food – I'm a Jamaican."* Furthermore, one group discussed how ethnic identity could travel back to the land of their ancestors *"…but I think that I'm an African, whether unfortunately I was taken, or my forefathers were taken to the West Indies or America or left Africa or taken to Haiti or Jamaica, that's not going to change who I am*".

For minorities, there was substantial evidence of the centrality of ethnic identity, even if aspects of it were felt to be adaptable. They were largely at ease in discussing their ethnicity and what it meant for them, because it was ever-present in their lives. One said: *'Ethnicity for me is as important as my name because it is my identity. It's a part- on a larger scale it is my identity.'* While another: '*It always matters where you come from what origin you are; and tradition and culture it changes with time.'* By contrast, for majority (and to a certain extent for white minority) respondents, ethnicity was a property of 'others' (typically 'immigrants'). Being the majority and the perceived 'norm', respondents struggled to find ways of expressing their identity or even to talk about its lack of

salience. One group attempted to move away from self-scrutiny and to talk about the 'proper' subjects of any discussion on ethnicity (i.e. minorities); although in the other majority group, there was a greater attempt to engage with the fact that ethnicity was little considered and largely not meaningful in their personal constructions. This comes through in the following quotation: '*I don't think much about my ethnic group…. It's the obvious thing for me, I'm white, I cannot change it and probably it influenced who I am at the moment, shaped me somehow, but I just don't know.'*

There was also substantial discussion of other central aspects of identity across the groups. Those characteristics emphasised varied across the groups, but included gender, politics, family status, interests, work and a very strong emphasis in certain groups on educational level as fundamental to both identity and interpersonal relations. Groups also discussed how they could 'use' things about themselves to find points of connection with others; and how ethnicity, or *components* of ethnicity, related to other parts of their identity. We were also struck by the strength of regional identities across our respondents: "I *wouldn't see it in terms of nationality, wouldn't be like I'm British or Irish, I wouldn't be proud of that. It wouldn't kind of occur to me. I'd much rather describe myself, for example, as a Londoner."*

In taking forward our findings by this point and in formulating the next stage of the research, we came to the following conclusions. First, we concluded that while ethnic identity is largely salient for minorities, ethnicity or ethnic group is not a concept that we should be directly asking respondents about in those terms. Second, we noted that the different *dimensions* of ethnicity that were emerging as significant for respondents were country of origin, skin colour, language, nationality, regional identity, roots (family origins), ancestry. Third, the *components* of ethnic identity that people (largely) agreed upon were belonging, shared values, pride, ethnicity as communication, private sense of defining principles, association, differentiation, communal activities including cooking and eating, and familiarity. These cross the private/public dichotomy presented by Abrams and discussed in the introduction. Finally, the participants, debating the issue in a communal context were clear that the views of others mattered and that their identity expression was not, and could not be, independent of that external gaze.

5. Semi-structured interviews

We wanted to move on from the insights achieved in these relatively free discussions to explore whether some of the expressions of identity would work in a one-to-one interview context. That is, to examine if particular forms of questions were meaningful, would be acceptable and would also produce sufficient variation in responses across a selection of respondents. While the *Citizenship Survey* offered us one model form for asking questions of ethnic identity, we wished to extend the coverage in depth and range, i.e., across different *dimensions* and *components*. It is worth noting that these interviews were just one particular stage in our question design process, and allowed us to engage with respondents whom we felt might engage with our provisional questions in particular ways, including by challenging them (as a number did). We used these semi-structured interviews (with cognitive probes) to access more highly educated, professional respondents, because they had not featured greatly in our focus groups (such respondents are typically much harder to recruit to focus groups). We also thought they might have relatively greater investment in their professional identities as core to their self-concept, leading them to give a rather different perspective from the focus groups.

We prepared an interview schedule containing both semi-structured questions and prompts, alongside sample questions with specific probes to test specific question wording (Collins 2003; Presser et al 2004). The schedule went through ten versions before it was piloted. Further iterations and modifications took place as the researchers reflected on each interview.

In total we conducted 14 interviews where the respondents differed by gender, age, ethnicity and country of birth, employment and marital status (see Table 2).[5] They were educated to Bachelor level or above, with many having Masters level qualifications, had stayed in the UK for different periods, and had different mother tongues (Bengali, Cantonese, English, German, Gujarati, Hindi, Turkish, Urdu). The interviews predominantly lasted for between 60-90 minutes; four had shorter durations and there was an outlier which lasted 146 minutes. Interviews were transcribed and the transcripts were circulated among the researchers for identification of key issues, interpretation and reflection.

Table 2. Characteristics of semi-structured interview respondents

Sex	Age	Ethnic group (self-ascribed)	Employment status	Marital status
Male	21-30	Asian (born in Pakistan)	Student	Married, no children
Female	31-40	White other (born in Germany)	Employed, Researcher	Married, no children
Female	31-40	Turkish/Dutch	Employed, University lecturer	Married, no children
Female	21-30	Indian / Asian (born in India)	Employed, Lawyer	Married, no children
Female	31-40	Chinese (born in Malaysia)	Employed, software developer	Divorced, one child
Female	21-30	Black Caribbean (born in UK)	Employed, women's rights charity	Married, no children
Female	51-60	Anglo American (born in US)	Employed, researcher	Divorced, one child
Male	21-30	Pakistani (born in Pakistan)	Employed, software developer	Married, no children
Male	41-50	Black British (born in UK)	Employed	Single, no children
Female	31-40	Indian (born in India)	Architect	Married, one child
Female	31-40	Indian (born in India)	Employed, financial analyst	Married, two children
Male	31-40	Bangladeshi (born in Bangladesh)	Employed (part-time), waiter	Married, no children
Female	21-30	South Asian / Canadian (brought up in Canada)	Employed, women's rights campaigner	Single, no children

As noted, it had become clear to us that it did not make sense to ask people directly about their 'ethnic identity' or 'ethnic group'. Instead we wanted to capture the dimensions that had emerged as important, regardless of whether respondents considered them to be part of 'ethnicity' or not. We tested the following dimensions: language (brought up in), national language of communication (English), religion (practised or brought up in), national identity, Britishness / Britain / being a Briton, country of birth, region currently living in, region brought up in, country of birth of parents/grandparents, nationality/citizenship, skin colour / appearance, identification as 'Black', and land of ancestors. While there were existing questions about the 'content' of most of these dimensions in the first wave of *Understanding Society* (i.e. which country

they were born in, what their religion was, and so on), we had to develop ways of asking about language, ancestral land, region, skin colour and whether they self-perceived as 'Black'. For region and skin colour, we did not propose to collect the 'content' to which their replies related; but for language it was important to have some knowledge of which language people were referring to in order to analyse this dimension of their ethnicity. We therefore had also to develop a question defining their 'language brought up in'.

As well as these *dimensions* of ethnicity we wanted to explore various *components* of ethnicity that the earlier stages had demonstrated as being salient to ethnic identity and which also reflected the existing literature, namely: (i) personal identification / 'internal' importance to 'sense of who you are'; (ii) group belonging / connection / affinity; (iii) shared values; (iv) patterns of association; (v) pride. We derived the wording for the personal identification questions from those in the *Citizenship Survey* and already tested in the Innovation Panel (see Section 2).

We paid some attention to the problem of how best to capture group belonging, and how to distinguish it from personal identification, thus separating the private and social elements of identity. The interviews were, moreover, designed to test whether that distinction worked in practice for our respondents.

Box 1 gives the actual questions tested and explored during these interviews. These questions were preceded by some questions about their socio-demographic characteristics and each set of questions was followed by probes.[6] The first question (QV2_1) was designed to measure personal identification. In one variant, interviewees were asked about personal identification as the first question and "sense of belonging" as a follow-up probe. In others, we reversed this approach. The follow-up questions were designed to measure degree of interaction (meeting and communicating) with members of 'own group' (QV2_2A) as identified by their responses to the first question, the extent of commonly shared values and beliefs with own group (QV2_2B), and pride in that group (QV2_2C).

Box 1. Excerpt from the semi-structured interview schedules

QV2_1. I will now read out a set of questions. Please answer yes or no to each of them.

(1) Is the language that you spoke at home as a child important to your sense of who you are?

(1_add) And can I just check: what language was that_____

(2) *If (1) is not English:*

Is English important to your sense of who you are?

(3_filter) And can I ask, do you have or were you brought up in a religion? Yes/No

If yes, and what is that? _____

(3) Is your religion important to your sense of who you are?

Most people who live in the UK might see themselves as British in some way:

(4) Is being British important to your sense of who you are?

(5) Is the city/region where you live now important to your sense of who you are?

(6_filter) Where were you born? _____

(6) *If outside UK:* Is the country where you were born important to your sense of who you are?

(7_filter) And what region were you brought up in?

(7) *If different from 5:* Is the region in the country where you were brought up important to your sense of who you are?

(8_filter) Where was your father born? _____

(8) *If different from the country where R was born:* Is the country where your father was born important to your sense of who you are?

(9_filter) Where was your mother born? _____

(9) *If different from the country where R or R's father were born:* Is the country where your mother was born important to your sense of who you are?

(10_filter) Is the land of your ancestors different from where you or your parents were born? *If yes:* And what would you say is the land of your ancestors? _____

(10) *If Yes:* Is _____ (land of your ancestors) important to your sense of who you are?

(Box 1 cont'd)

(11) Is your skin colour or other visible characteristics important to your sense of who you are?

(12_filter) And would you (ever) call yourself Black?

(12) *If yes:* Is being Black important to your sense of who you are?

For each X that R answered with YES or MAYBE/PARTLY/SOMEWHAT in QV1_1 or QV2_1

QV2_2. You mentioned that X is important to your sense of who you are or that you feel a sense of belonging to X. Thinking about that please answer the following questions:

(A) Do you interact a lot with those who come from/are/speak/have the same _X_?

(e.g., language/religion/country of birth…)

1. Yes, a lot

2. Yes, a little

3. No

Question A changed in revised interview schedule

(A') D you feel happy when you meet someone who speaks the same X / has the same X / comes from the same X etc as you?

1. Yes

2. No

(B) Do you share many values and beliefs with those who come from/are/speak/have the same _X_? *(e.g.,* language/religion/country of birth…)

1. Yes, a lot

2. Yes, a few

3. No

(C) Do you feel proud to be _X_? *(e.g.,* language/religion/country of birth…)

1. Yes

2. No

3. Yes and No

4. Indifferent/don't care

Early interviews showed that sense of self and belonging did seem to capture different ways of thinking about ethnic identity, and that there was variation across respondents in the relative weight accorded them. When the responses were probed, difference was expressed in terms of importance to sense of self being about '*identity*', '*personal*', '*what 'shapes me*'. By contrast 'belonging' was felt to be about groupness, relationships, '*being subservient to a bigger entity*', things '*bigger than self*', '*comfort*', ease and '*warmth*'. As one respondent said: '*So they are two different things. So the first question is asking whether India is within me and the second question is- whether I am thinking am I part of India*.' Another respondent reflected a shift in the relationship between the two over time when he said '*I feel I belong less to Kashmir but Kashmir is more in me*.'

For some respondents the phrasing of belonging to a sometimes rather large grouping (Indian, Muslims) made the question awkward to answer in the form we had posed it. From the language of respondents, usually spontaneous, about feelings of warmth, or the pleasure they felt when they made contact with someone similar to them in some way (*"if you saw another black person you were grinning your face off, in fact that's how I met my best friend"*"), we developed a further variant which asked about how happy people felt when they met someone who shared the *dimension* with them (see question QV2_2A in Box 1).[7] This was very successful in the later interviews, in that it appeared to strike a chord, and in two cases elicited a spontaneous illustrative anecdote.

Pride was associated with achievement for some and thus was not felt to be relevant to their ethnicity; for others it expressed a satisfaction or ease with who they were. Given that it was not salient in all cases and also the observation from a number of respondents that they didn't want to imply 'shame' by not expressing pride, a 'neither / nor' category seemed important to adequately capture this qualitative experience of pride. Interestingly, even among those who claimed that pride was concerned with achievement and so it was impossible to be proud of things that were just 'givens', there were still occasions when expressions of pride in such givens seemed very vital. One respondent explained this in terms of 'process' and psychological development, consistent with psychological theory: *"If you were to say am I proud of being a black Caribbean woman then I would say 'yes' because there's been a process there, I've had to get to that point when I feel proud."* We also found that pride did reveal a different pattern of response compared to 'importance to sense of self'. This became clearer when one respondent talked about how her identity changed with age and now she accepts certain things as part of her identity even if she is not proud of or agrees with those aspects.

When questioned about the extent of 'interaction' with those who were like the respondents in some dimension, several respondents found the question too broad or the response categories insufficiently specific. There was confusion about what type and frequency of interaction this question referred to – talking over the phone, meeting people every day, and so on. Some thought it needed to be comparative (more interaction with one group than another), or to work on a scale where they could specify a level – *"such as 6.5."* Others found this question not very relevant, especially with respect to current region of residence: *"Yeah, a kind of silly question. It may make sense for religion etc. but this question should not apply to a place you are at that moment, right."*

The question on shared values and beliefs also failed to achieve acceptability. Often the groupings were, respondents thought, too large to have a cohesive set of core values and ideals. They found it difficult to pin-point what those core values and beliefs were for each group. This was less problematic in relation to religion but even here, some respondents found that the group was too diverse to make sense as having a common set of values: "*It depends, even though they're [religion] we talk about the same stuff but we understand differently and sometimes we share some of the stuff but not all the stuff."*

Following discussion and reflection on these two sets of questions we determined that these areas were better captured directly by questions on own values and on actual patterns of association and good information on social networks.[8] It would then become an empirical question for researchers to ascertain the extent to which people did share values or associates within their 'group', however defined.

One of the key purposes of asking these questions in a longitudinal survey like *Understanding Society* is to measure change. So, we

probed our respondents as to whether they would have answered differently at another time or in a different context. Some respondents said that they would have answered differently had they been asked at a different age, in different country or even at a different marital status: '*I think it changed because I think later on when I married someone outside my community and then I really found what it was like*'.

To summarise, we concluded that:

- Personal *identification* and *belonging* are distinct and both relevant aspects of identity
- Expression of 'importance to sense of self' appeared to work for personal *identification*; as did 'happy to meet someone who…' for *belonging*
- Language of upbringing was meaningful to respondents as linking to formative experiences
- Similarly *religion of upbringing*, for those who didn't see themselves as currently religious still had the potential to be seen as part of identity and 'shaping self'
- *Religion, region currently living in, region of upbringing, country of birth, and parental country of birth* all made sense to respondents as potential *components* of identity, while actual affinity with any one of them varied substantially across individual respondents
- *Colour* was important, even if it was self-evident to most respondents. And there was no indication that they experienced discomfort in answering about it
- *Pride* produced varied responses – suggesting it can differentiate forms of identification. For some it made obvious sense, for others it was not appropriate as a way of thinking about their ethnicity
- *Graduations* (or more options) in response categories, including, for example a 'yes and no' middle response, were felt potentially important for pride, belonging, and importance to sense of self questions.
- The connection between *food* and culture / identity was spontaneously made by the majority of the respondents once again.

On the other hand,

- *Black* was rarely used in a political sense, and was predominantly understood as reflecting African or Caribbean heritage
- *Britishness* was overwhelmingly associated with civil status rather than culture or values
- It became clear that it is not appropriate to measure social interaction through subjective appraisal: it is not possible to get a single question that provides a meaningful measure. Instead, *interaction* should be measured directly, through questions on social networks and their composition
- It is an empirical question, not an attitudinal one whether *values and beliefs* are shared across 'groups', however they are constructed

6. Proposed ethnic identity questions, cognitive testing and final recommendations

The aim of the next stage was to put together a refined suite of questions, framed as 'final' and apparently suitable for fielding in a general survey context, to explore how these performed across a heterogeneous sample (see Appendix).

Our research so far led us to include questions on personal identification, belonging and pride with a gradation of responses. The recurrent spontaneous mention of food as a vehicle of transmission of ethnic identity and the interest in dress as one other potential aspect of ethnicity among researchers with whom we consulted on the prototypes, led us to develop specific questions on these topics.[9] We also concluded that as part of the context for the more specific ethnic identity questions, a limited set of general identity questions, i.e., questions about the *domains* of identity such as gender identity, occupational identity, should also be asked.

We, along with four other researchers,[10] cognitively tested a subset of these questions for comprehension and comfort level (using follow-up probes) on a sample of 22 persons of different ethnicity, age and generation (see Table 3).[11] Respondents also varied by their mother tongue as measured by the main language spoken at home during childhood: Arabic, English, Oriya, Punjabi, Spanish, Swahili, Shanghaiese (dialect of Mandarin) and Urdu and by occupation and educational level. Interviews were recorded, and the interviewers wrote up notes on the responses, which were then discussed.

Table 3. Characteristics of cognitive interview respondents

Gender	Age group	Born in UK	Ethnic group (self-ascribed)
Female	16-20 yrs	Yes	Indian
Male	20-29 yrs	No	Indian
Male	20-29 yrs	No	Arabic Middle Eastern
Male	20-29 yrs	No	Pakistani
Male	20-29 yrs	Yes	Black Caribbean
Female	30-39 yrs	No	Chinese
Female	30-39 yrs	No	Pakistani
Male	30-39 yrs	No	Non-white
Male	30-39 yrs	No	African
Male	40-49 yrs	No	Middle Eastern
Male	40-49 yrs	No	Venezuelan
Female	50-59 yrs	No	German and Latin American
Male	50-59 yrs	No	Pakistani
Male	50-59 yrs	No	Black Caribbean
Male	50-59 yrs	No	Indian
Female	40-49 yrs	No	Libyan
Female	20-29 yrs	Yes	White
Female	30-39 yrs	Yes	White
Male	30-39 yrs	No	White
Female	40-49 yrs	No	White
Male	40-49 yrs	Yes	White
Female	50-59 yrs	Yes	White

Table 4 lists the questions that were cognitively tested and those that were finally recommended for inclusion in the second wave of *Understanding Society*.

Table 4. Summary of final set of questions that were cognitively tested and those that were recommended for inclusion in *Understanding Society*[1]

Questions cognitively tested	Questions recommended for *Understanding Society*	Comments on / outcome of cognitive testing
Ethnic Identity Module (face-to-face)		
How important is _____ to your sense of who you are? • the main language spoken at home during your childhood • the country where you were born • the region or city where you grew up • the colour of your skin • land of your ancestors (this was filtered on "Would you say that the land of your ancestors is different from where you or your parents or your grandparents were born?")	How important is _____ to your sense of who you are? • the main language spoken at home during your childhood • English language • your religion/religion brought up in • the region or city where you live • the country where you were born • the region or city where you grew up • the country where your mother was born • the country where your father was born • the country where your mother's mother was born • the country where your mother's father was born • the country where your father's mother was born • the country where your father's father was born • the colour of your skin	These questions worked well except for the dimension "land of your ancestors"
Do you feel proud of _____ • the main language spoken at home during your childhood • the region or city where you were brought up in • Black (filtered on "do you consider yourself to be Black?") • White (filtered on "do you consider yourself to be White?")	Do you feel proud of _____ • the main language spoken at home during your childhood • English language • your religion/religion brought up in • the region or city where you live • the country where you were born • the region or city where you grew up • the country where your mother was born • the country where your father was born • the country where your mother's mother was born • the country where your mother's father was born • the country where your father's mother was born	Worked well except for the dimension "White" and "Black"

	• the country where your father's father was born • the colour of your skin	
Do you feel happy when you meet someone who _____ • speaks the same language spoken at home during your childhood • has the same religion as you/as the religion you were brought up in • comes from the same region or city as you	Do you feel happy when you meet someone who _____ • speaks the same language spoken at home during your childhood • English language • your religion/religion brought up in • comes from the same country as you • comes from the region or city as you were brought up in • comes from the same region or city where you live • comes from the same country as your mother • comes from the same country as your father • comes from the same country as your mother's mother • comes from the same country as your mother's father • comes from the same country as your father's mother • comes from the same country as your father's father • has the same skin colour as you	Worked well
How often do you eat the food that is typical of • the country where you were born • the country where your mother was born	How often do you eat the food that is typical of • the country where you were born • the country where your mother was born • the country where your father was born • the country where your mother's mother was born • the country where your mother's father was born • the country where your father's mother was born • the country where your father's father was born	Worked well
How often do you wear clothes that are typical of • the country where you were born • the country where your mother was born		Did not work well

General Identity Module (in self-completion format)		
How important is _____ to your sense of who you are? • Your profession • Your level of education • Your ethnic or racial background • Your political beliefs • Your family • Your gender • Your age or life stage • Your marital or partnership status	How important is _____ to your sense of who you are? • Your profession • Your level of education • Your ethnic or racial background • Your political beliefs • Your family • Your gender • Your age or life stage	Worked well but the list was shortened for time/space constraints

[1]*All questions pertaining to parents' or grandparents' countries of birth are always filtered on that country being different from the preceding countries that were asked about. So, pride in mother's country of birth is asked only if mother's country of birth is different from own country of birth.*

We found that respondents didn't have many difficulties with the questions, didn't seem to find them uncomfortable, and could distinguish between different *components* of identity. The experience of one or two interviews suggested that the proposed language question would benefit from a slight rewording to improve clarity and specificity. Across questions, respondents tended to prefer a range of responses rather than a simple yes/no and found that such a range, for example in relation to pride, enabled them to express an ambivalence that best reflected their position. For example, one respondent said: '*From my national background of course, white is the people we don't like. You know, white is domination, colonisation, supremism, all of these sort of bad things, although having said that, there is this aspiration to be white, which is horrible. So it sort of brings up all of these things and the problem I have with whiteness*'. External consultation on the questions also elicited concerns that the responses offered for the 'Happy...' question were 'unbalanced' in the form tested. While most respondents were not uncomfortable answering it, the 'pride in being white' question did not seem very relevant to white respondents; and as 'Black' was synonymous with 'colour of skin' for respondents who regarded themselves as black, we finally decided to drop these questions.

The food question worked well but there was considerable confusion around the clothing question: some respondents interpreted it as meaning traditional clothing of the country they came from, even if rarely worn, others as the clothing worn every day (as intended). One respondent highlighted the specificity of religious as opposed to national clothing, recapitulating one of the focus group discussions and supporting our contention that questions on dress may be better suited to a suite of questions on religious practice: '*I thought about the traditional wear. I wear the scarf but I don't think that is part of traditional dress for my country. You can have a traditional outfit without the scarf in my country. The scarf is part of my religion*.' Overall, the feedback indicated that we would struggle to get consistent understandings (and therefore interpretable responses) from a clothing question. The land of ancestors question also elicited some confusion: one respondent had not heard the term ancestor before, while others interpreted the question as asking about land *owned* by their ancestors.

The general identity module tested in self-completion format worked well, except for the domain of "family or marital status" which was not considered to be relevant by those who were single.

As a result of the testing, we retained the main questions on 'importance to sense of self' and 'happy to meet someone who' and pride, but introduced some modifications to the response categories. We also made slight modifications to the language question. We dropped the questions on dress and on 'land of ancestors'. The food questions were

retained with some slight modification to the response categories. See Table 4 for the questions that were retained for inclusion in the survey. These questions have been fielded in Wave 2 of *Understanding Society* and the Wave 2 questionnaire can be found at: www.understandingsociety.org.uk.

To allow longitudinal research with a sufficiently broad population (as highlighted in Section 2), we recommended that these questions

- be asked of the ethnic minority boost sample, ethnic minorities living in areas of low minority group concentration in the main sample, a comparison sample from the general population sample and recent migrants
- be repeated at regular intervals– more frequent intervals for younger respondents and recent migrants.

7. Conclusions and recommendations

The culmination of this research process, defining general survey measures with which to measure ethnic identity, was the development of a suite of questions that were implemented in *Understanding Society*. Empirical analysis of their effectiveness is not possible until the data become available. Nevertheless, as a result of this study, we arrived at some general conclusions about which measures work, which don't, and what measures constitute the best data resource for research in this area, which can be applied more generally to other multi-purpose surveys where there is a desire or intention to engage with identity measurement. Some of our key recommendations on good measures of ethnic identity are:

- Ethnic identity measures should try to capture the different dimensions and components of ethnic identity
- Lack of consensus among researchers and respondents suggest survey questions should not impose any particular definition of ethnic identity but provide measures that allow maximum flexibility to researchers
- Ethnic identity is just one domain of identity. Therefore, questions to measure other aspects of identity should be asked simultaneously in order to place ethnic identity within the context of a person's overall identity(ies)
- Measures of identification, closeness and belonging, pride in own ethnic groups, as well as identity expressed through food, appear to capture distinct aspects of ethnic identity and can be asked directly of respondents
- Patterns of association with members of a group and their degree of shared values and beliefs are not aspects of identity *per se*, but are empirical questions on the extent to which expressed identity is consequential (or conversely structured by association and values). Values and patterns of association are therefore best measured directly and independently of identity questions.

Using multiple methods and a cumulative approach that built on successive insights, we were successful in answering the six questions we set out in section 2 and consequently in measuring different domains of identity and dimensions and components of ethnic identity. However, we were not able to develop measures for others' perceptions of a persons' ethnic identity, which is a crucial factor for understanding ethnic identity. We had explored this issue in our semi-structured interviews but were not able to learn much about how to measure this from respondents directly. Such issues can be captured in part through measures of perceived discrimination and harassment (which can and have been collected in surveys including *Understanding Society*), and through measurement of others' attitudes. However, the interplay between ascribed and owned identities remains a complex area to measure in a general household-level survey, and proved beyond the scope of this study.

We hope that the research carried out here will advance research into social identities by providing a set of model questions for other studies to employ (or adapt) in large-scale, representative surveys, and for their further evaluation and development.

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Appendix

1. Identity module in the Citizenship Survey 2007-8

SHOWCARD
We'd like to know how important various things are to your sense of who you are. Please think about each thing I mention, and tell me how important it is to your sense of who you are? Please choose your answer from the card.
Your occupation?

1 Very important
2 Quite important
3 Not very important
4 Not at all important
DON'T KNOW

Your ethnic or racial background?

1 Very important
2 Quite important
3 Not very important
4 Not at all important
DON'T KNOW

The question was then repeated for the other domains of identity: your religion, national identity, where you live, your interests, your family, your social class (working, middle), the country your family came from originally, your gender, your age and life stage, your level of income and your level of education (in that order).

2. Identity module fielded in 2nd wave of the Innovation Panel:

We'd like to know how important various things are to your sense of who you are. Please think about each thing I mention, and tell me whether you think it is important, not very important or not important to your sense of who you are?

READ OUT EACH AND CODE

1 Important
2 Not very important
3 Not at all important

(a) Your occupation? INTERVIEWER: IF DK PROBE: Is that because you are retired?

And then repeated across the other domains, which were: ethnic or racial background, religion, national identity, political beliefs, family, father's ethnic group, mother's ethnic group (if different from father's), marital or partnership status, gender, age and life stage, level of education, sexual orientation. One half of the sample received 'occupation' for the first domain, the other half received the version with 'profession'.

Follow-up:

Your ethnic background was [answer at ethnic or racial background] to your sense of self. When you think about your ethnic background, do you think of your...READ OUT

CODE ALL THAT APPLY

1 Religion
2 National identity
3 Your father's or mother's ethnic group
96 None of these

Endnotes

[1] Throughout this paper we will refer to personal affiliation to an ethnic group, participation in activities related to that group including food habits, feelings of belonging to the group, attitude towards the group etc. as *components* of identity and country or region of origin/birth, religion, ethnic or racial background, country of residence, ancestral region or country etc. as *dimensions* of ethnic identity.

[2] In this paper we will refer to these aspects of a person's overall identity, such as gender, occupation, age or life stage etc. as *domains* of identity.

[3] The *Citizenship Survey* was a large-scale, cross-sectional government survey that ran from 2001-2011. It was carried out every two years from 2001 but in 2007 moved to a continuous design. It covered issues of community, social cohesion, race equality, volunteering and active citizenship. As well as a 10,000 person population sample from England and Wales it incorporated a 5,000 person ethnic minority boost sample.

[4] Liz Spencer designed the focus group schedule and facilitated four of the focus groups. Punita Chowbey conducted 2 focus groups jointly with the authors. The authors facilitated the remaining focus group.

[5] Interviews were carried out by the two authors and by Punita Chowbey (two interviews) and Heidi Mirza (two interviews).

[6] Entire interview schedules including probes are available from the authors upon request.

[7] As questions on social interaction and shared values and beliefs were not working very well, we dropped these in this variant. We discuss this further below.

[8] These social network questions have since been implemented in the third wave of *Understanding Society.* See the Social Networks module in the adult interview questionnaire (p.98 in http://research.understandingsociety.org.uk/files/design/materials/questionnaires/wave3/Understanding_Society_Mainstage_Wave_3_Questionnaire_v01.pdf)

[9] The Ethnicity Strand Advisory Committee for the survey, with whom we had consulted, had suggested asking about clothing typical of one's ethnic background to capture another aspect of lived identity.

[10] Sarah Budd, Emily Kean, Allison Patterson, Noah Uhrig.

[11] Entire cognitive interview schedule is available from the authors upon request.

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Family factors, bullying victimisation and wellbeing in adolescents

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Abstract

Bullying victimisation during adolescence has been found to be associated with a range of individual factors. In contrast, family factors have been poorly investigated or findings have been contradictory. Even less is known about factors related to victimisation in the home by siblings. A range of family factors and their relationship to bullying victimisation in school and at home was investigated in 2,163 adolescents 10-15 years old within the Understanding Society sample. Approximately 12% were victims of bullying in school overall, 4.8% of direct and 10% of relational bullying. In contrast, sibling bullying was widespread with half of all children with siblings involved in bullying each other. In particular bully/victims at home and those victimized at school were at increased risk for behaviour problems in the clinical range and were significantly less happy. Sibling bullying was found to be related to sibling composition, in particular the number of siblings and presence of brothers and to less or negative parental involvement, while school bullying was more frequent in those growing up in material deprivation at home and who were bullied by their siblings. Strengthening families and parenting skills and increasing sibling support may reduce bullying in school and increase wellbeing.

Keywords

bullying, victimisation, parenting, family, siblings, material deprivation

Introduction

Understanding Society

Understanding Society (UKHLS) investigates whole households and includes collection of data from all adult family members and via self-completion questionnaires from children aged 10 to 15 years residing in the household. Thus it allows for the investigation of family factors on adolescents' wellbeing. One issue that has received much interest in recent years is bullying by peers in school and more recently, bullying by siblings at home (Wolke and Skew 2012). However, little is known how family factors affect adverse sibling relationships and how, in turn, these may be related to experience of bullying with peers at school and wellbeing. This is the overreaching question of the study reported here. However, for this analysis, only data from wave 1 of *Understanding Society* were available and the study outlined here is cross-sectional and thus does not allow for the examination of causal pathways with respect to family factors and sibling and school bullying. Nevertheless, this unique dataset allows for the study of associations between family factors and both sibling and school bullying, and associations between sibling and school bullying and behaviour problems and unhappiness, while controlling for family factors. Once data from waves 3 and 5 of *Understanding Society* are available, future research will be able to determine the causal nature of these relationships and incorporate additional data sources such as school, health or criminal record data.

Background

Bullying victimisation refers to children being exposed repeatedly and over time, to negative actions on the part of one or more other peers who are or perceived to be stronger (Olweus 1993). It is systematic abuse of power with three crucial elements: repetition, intention to harm, and unequal power. Bullying can be direct including verbal abuse, hitting, kicking, beating, destroying others' belongings, or blackmail. In contrast, relational bullying refers to deliberate social exclusion of children such as ignoring, excluding them from games or parties, spreading gossip, or framing them to be humiliated (Woods and Wolke 2004). Children can be involved in bullying as either the targets of bullying (victims), as the perpetrators (bullies) or being a target but also bullying others (bully/victim). Finally, most children not involved in bullying are neutrals.

Bullying victimisation is a universal problem and the prevalence of victimisation ranges from approximately 10-25% across countries (Nansel et al 2004, Analitis et al 2009, Wolke et al 2001). Both bullying others and in particular, victimisation, is moderately stable over short to moderate periods (Sapouna et al 2011, Wolke et al 2009) and even from primary to secondary school (Schafer et al 2005). Victimisation is not random but related to individual traits and experiences, some of which may be heritable (Ball et al 2008). Children who are male, either socially withdrawn, shy or impulsive in their behaviour, have no or few friends, are disliked, show easily a reaction (e.g. cry, run away) or are emotionally dysregulated and have few coping skills, have been reported to be more likely to become victims of bullying (Stassen Berger 2007, Olweus 1994, Smith 2004, Shields and Cicchetti 2001, Veenstra 2005, Williams et al 2006). Bullying and peer victimisation is likely to originate or be maintained over time as a result of the interplay between inter- and intra-individual variables (Bronfenbrenner 1979, Swearer and Doll 2001, Dishion et al 1995) with family as a primary developmental context (Stassen Berger 2007, Smith and Myron-Wilson 1998). Parents can either directly or indirectly impact on children's peer relationships (Ladd and Kochenderfer-Ladd 1998) by being role models for use of aggressive means to achieve goals (Bandura 1973), creating internal working models of relationships in their offspring (Sroufe et al 2010) or by destabilizing intra-family relationships (Ingoldsby et al 2001). However, while family factors have been investigated in relation to perpetrators of aggression such as conduct disordered or delinquent adolescents (Fergusson et al 2004), much less is known about family factors and their relationship to peer victimisation. Where they have been investigated, findings regarding the impact of socio-economic conditions (Wolke et al 2001, Due et al 2009), parenting and bullying are inconsistent (Georgiou 2008, Veenstra 2005). Some studies have found that social deprivation, low father involvement, low parent support or low levels of family cohesion (Hart et al 2000) or harsh and reactive parenting (Barker et al 2008) and maltreatment (Shields and Cicchetti 2001) predicted victimisation. In contrast, others reported that socio-economic status is not related to

victimisation (Wolke et al 2001) and that victims more often come from families characterised by high levels of cohesion (Bowers et al 1992), high levels of parental involvement and support (Bowers et al 1992, Baldry and Farrington 1998, Haynie et al 2001, Bowers et al 1994) and parental over-protectiveness (Berdondini and Smith 1996, Georgiou 2008, Perren and Hournung 2005). Finally, studies on family factors and bullying are mainly based on selected and small samples. In this study we take a nationally representative sample of UK adolescents, and examine how a range of family factors, including family structure, parenting behaviours and socio-economic status measures (e.g. household income and household material deprivation), are related to bullying at school.

We also consider how family factors are related to bullying amongst siblings within the home. Positive quality of sibling relationship and interaction can facilitate the acquisition of skills (Cicirelli 1995, Azmitia and Hesser 1993), the provision of emotional support (Stormshak et al 1996), protection from other family adversities such as adverse life events (Gass et al 2007), marital conflicts (Jenkins et al 2005) or poor peer relationships (Bowes et al 2010). On the other hand, physical aggression between siblings has been reported to be the most common form of family violence (Ensor et al 2010) and sibling aggression is experienced by up to half of all children in the course of a month (Wolke and Skew 2011, Duncan 1999). Unlike friendships but similar to peer relationships in the classroom, sibling relationships are involuntary, i.e. children cannot choose the siblings they live with, but are born into these relationships. Siblings are rarely equal in terms of age, size and physical or psychological strength; therefore there is an imbalance of power. Furthermore, the direct or indirect attacks are not single events but are frequent and repeated. Finally, similar to peers confined in the same group, siblings spend considerable amounts of time together, often in the absence of an adult, which provides significant opportunities for the bullying of one sibling by another. Time spent together leads to familiarity that can breed contempt. This means they know exactly how to provoke or upset their siblings (Ensor et al 2010). Sibling interactions are emotionally charged relationships defined by strong, uninhibited emotions of positive, negative and sometimes ambivalent quality (Brody 2004). Yet, compared to bullying at school, much less research has considered repeated intention to harm, i.e. bullying between siblings, and no previous study has considered how family factors such as parenting behaviours might be related to sibling bullying. Experience of sibling bullying, in particular as victims who also bully (bully/victim) has also been reported to increase the likelihood of being a victim of bullying at school (Menesini et al 2010, Duncan 1999, Wolke and Samara 2004). We examine this association in this study, whilst controlling for family factors.

But does bullying at home or at school matter for wellbeing? Bully/victims and those involved in both relational and direct aggression have been found to most likely exhibit externalising problems (Wolke et al 2000), anxiety and depression (Hawker and Boulton 2000) or psychotic symptoms (Bebbington et al 2004), with increasing evidence for a dose-response relationship (Wolke and Skew 2011). Longitudinal studies support these findings, with victims of bullying in primary school more often suffering internalising and externalising problems (Kumpulainen et al 2001), and more likely to have psychiatric diagnoses years later (Sourander et al 2007, Sugden et al 2010). Furthermore, a dose-response relationship was reported between multiple victimisation by adults and peers and psychosis-like symptoms (Schreier et al 2009, Arseneault et al 2011). Conversely, positive family and sibling relationships and neighbourhood support can protect children from the adverse impact of victimisation (Bowes et al 2009). Thus, are sibling and school bullying related to behaviour problems and unhappiness? Furthermore, are these relationships maintained once we control for family factors? An understanding of family factors, their relationship to bullying at home and school and adolescent wellbeing, should not only aid future longitudinal research, but provide first indications for potential family-based interventions to prevent bullying in school.

Methods

Study

Data were derived from the Youth Questionnaire, as well as the adult interview and adult self-completion questionnaire, collected as part of *Understanding Society*, the UK household longitudinal study, a new household survey which

began in 2009 and interviews 40,000 households across the United Kingdom (www.understandingsociety.org.uk/) Fieldwork for each wave of *Understanding Society* is spread over a 2 year period.

Sample

The sample is taken from the first year of the first wave, which interviewed around 14,000 households, amounting to 22,265 adult interviews and 2,163 self-completed questionnaires by youths aged 10-15. Characteristics of the youth sample, as well as characteristics of the parents of the youth sample, can be found in Tables 1 and 2 respectively, of the Early Findings report (Wolke and Skew 2011). Questions relating to bullying at school were asked of all youths completing the Youth Questionnaire. In addition, questions relating to bullying with siblings at home were asked of all those that reported having siblings at home. We restrict our analysis to include only children that had at least one sibling in the household and for which information on both sibling and school bullying was available (N=1,823), given our interest in exploring the relationship between sibling and school bullying. Dealing with item non-response on the explanatory variables of interest yielded a final sample size of 1,746 youths[i].

1. Bullying Measures

Children (with siblings) were identified as being involved in *sibling bullying,* using several questions relating to bullying perpetration and victimisation over the last six months. These questions have been used previously and are well validated (Wolke and Samara 2004, Menesini et al 2010, Wolke and Skew, 2012). Firstly children were asked "How often do any of your brothers or sisters do any of the following to you at home?" with the options "hit, kick, or push you", "take your belongings", "call you nasty names" and "make fun of you". Response categories then determine the frequency of each option: never; not much; quite a lot (more than 4 times in the last 6 months); a lot (a few times every week). Following this question children were asked whether they were the perpetrator of bullying towards their siblings "How often do you do any of the following to your brothers or sisters at home?" with the same options and response categories as mentioned above. Children who reported experiencing or perpetrating one or more of these behaviours 'quite a lot' or 'a lot' were considered as being involved in sibling bullying. Four groups were constructed: 'neutral', 'pure victim', 'bully/victim' and 'pure bully'.

2. School bullying

School bullying was determined by an adapted version of the Child Relationship Questionnaire (Wolke et al 2000, Hamburger et al 2011, p.60-63). The following question "How often do you get physically bullied at school, for example getting pushed around, hit or threatened or having belongings stolen?" and then "How often do you get bullied in other ways at school such as getting called nasty names, getting left out of games, or having nasty stories spread about you on purpose?". As with the sibling bullying questions, children were also asked whether or not they were the perpetrators of such bullying. Again, children experiencing or perpetrating one or more of these types of bullying 'quite a lot' (more than 4 times in the last 6 months) or 'a lot' (a few times every week) were considered victims or bullying perpetrators. Although we intended to construct the same groups of victim, bully/victim and bully vs. neutrals, this was not possible, as less than 1% (22 adolescents) reported frequent bullying. Thus we constructed one overall variable of any victim of bullying at school (see Figure 1).

3. Behaviour Problems

These were determined with the Strength and Difficulties Questionnaire (SDQ) (Goodman 2001) and clinically relevant total problems constructed as a total score above the 90th percentile determined within this sample.

4. Unhappiness

Youths were asked a number of questions relating to how they felt about different aspects of their life including family, friends and their life as a whole. An overall happiness scale was created by reverse coding and then combining the scores for each item (alpha 0.73) (Chan and Koo 2010). Unhappy youths were those with scores less than the 10th percentile of all *Understanding Society* adolescents (see Wolke and Skew 2011).

5. Family Factors

The family factors were obtained from the interviews with the adult household members and consisted of the type of family in which the youth

lived (i.e. whether the youth lived with two natural parents, a lone-parent or step-parent family), the type and number of siblings in the household, the ordinal position of the child compared with his/her siblings (i.e. eldest, youngest, middle/twin), the composition of siblings (brothers, sisters, mixture), parenting behaviour (mother's response to questions such as "Most children have quarrels with their parents at some time. How often do you quarrel with your child/any of your children?"; "How often do you praise your child/any of your children?"; "How often do you cuddle or hug your child/any of your children?"), household income and deprivation (see Knies 2011), parental education and finally maternal mental health, measured using the General Health Questionnaire (GHQ), which is a commonly used screening instrument for psychiatric morbidity (Bowling 2005). For the maternal GHQ scores, a threshold of four was used to determine mothers with a mental health problem (Goldberg et al 1998). Other characteristics we considered are child age, gender and UK country.

Statistical Analysis.

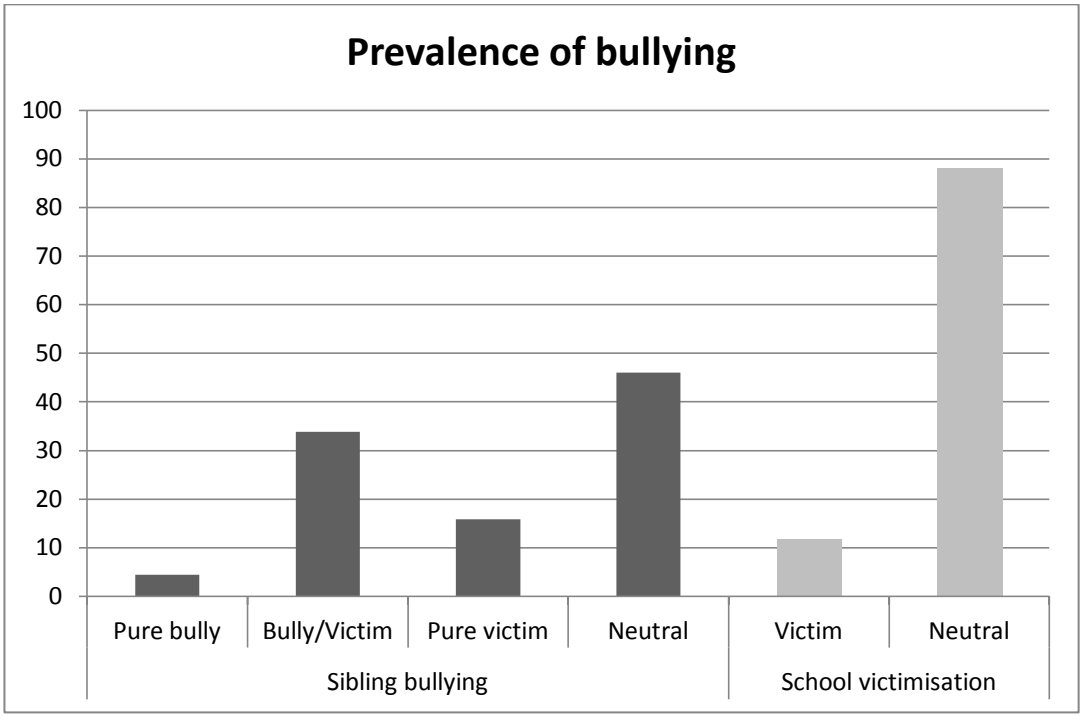
Bivariate analyses (Chi-Square, ANOVA) were used to examine the relationship between each family or individual factor and sibling bullying or school bullying (Table 1). Following this, multivariate analysis using multinomial and binary logistic regression models was applied to investigate the independent association between family/individual factors and sibling bullying (Table 2, model 1) and school bullying (Table 2, model 2). In model 3 (Table 2), in addition to family and individual factors, sibling bullying was also included as an explanatory factor. Finally, the relationship between bullying at home and/or at school and behaviour problems and happiness was investigated, using multiple logistic regression after controlling for both family and individual factors.

Results

Prevalence of sibling and school bullying

Over half of all children with siblings (54%) were involved in some type of bullying at home. Most common was to be both a bully and a victim (bully/victim: 34%), with the rest pure victims (16%) and a small proportion of pure bullies (4%) (Figure 1). At school, 12% of children reported being a victim of physical or relational bullying (Figure 1).

Figure 1. Prevalence of sibling bullying involvement and of victimisation at school by peers



Bivariate analysis of family and individual factors and sibling and school bullying

Table 1 shows the relationship between individual, socioeconomic, and family factors and bullying among siblings and at school.

Sibling bullying

No country differences in the prevalence of different types of bullying at home were found. However, males were more likely to be bullies or bully/victims, and girls more likely to be pure victims. We also found younger children (aged 10-12) were more often pure victims, whereas older children (aged 13-15) were more often pure bullies or bully/victims (Table 1).

Family or sibling types were not associated with sibling bullying, but number of siblings and composition of siblings were important. Having more than one sibling, and in particular, having brothers or a mixture of brothers and sisters, increased the chance of being involved in some sort of sibling bullying. Ordinal position was also associated with sibling bullying, with youngest children being the least likely to be involved in any kind of bullying behaviour. Household income, material deprivation and parental education levels were not associated with sibling bullying, however, youths living in a family in income poverty (household income less than 60% median income) were more likely to be involved in sibling bullying, particularly as bully/victims.

Table 1. Association of sibling bullying, bullying at school and both sibling and school bullying with family and individual factors, percentages

	Sibling bullying				School bullying		
Explanatory variable	Pure bully	Bully/ Victim	Pure victim	Neutral	Victim	Neutral	N
Country							
England	4.5	35.0	15.6	44.9	12.1	87.9	1349
Wales/Scotland/N.I.	4.8	32.5	15.6	47.1	9.8	90.2	397
Sex							
Male	5.8	35.9	14.8	43.6	12.4	87.6	881
Female	3.2	33.0	16.5	47.3	10.8	89.3	865
Age							
10-12 years	3.5	33.8	18.2	44.6	14.0	86.0	870
13-15 years	5.6	35.1	13.1	46.2	9.1	90.9	876
Family type							
2 natural parents	4.7	32.6	15.5	47.2	10.3	89.7	1083
Other	4.2	37.4	15.8	42.5	13.6	86.4	663
Sibling type							
Natural siblings	4.8	34.3	15.4	45.5	11.0	89.0	1505
Half siblings	2.9	39.1	17.8	40.2	17.2	82.8	174
Step/other siblings	3.0	25.4	14.9	56.7	10.5	89.6	67
Number of siblings							
1 sibling	4.2	30.5	15.2	50.2	11.4	88.6	889
2 siblings	5.9	37.3	15.9	40.9	10.6	89.4	577
3 or more siblings	2.9	41.1	16.4	39.6	14.3	85.7	280
Ordinal position							
Eldest	4.0	35.3	17.1	43.6	12.6	87.4	683
Youngest	4.7	31.0	13.8	50.6	11.0	89.0	617
Middle/twin	5.2	37.9	15.9	41.0	10.8	89.2	446
Sibling composition							
Brothers	5.3	35.3	16.8	42.7	10.9	89.1	644
Sisters	3.7	30.4	14.9	51.0	12.5	87.5	625
Mixture	4.6	38.6	15.1	41.7	11.3	88.7	477
Income poverty							
Not poor	4.5	32.4	15.9	47.1	10.9	89.1	1280
Poor	4.5	39.9	14.8	40.8	13.3	86.7	466
Income quintile							
1st	4.5	39.9	14.8	40.8	13.3	86.7	466
2nd	5.3	31.7	16.3	46.7	10.4	89.6	375
3rd	4.9	32.0	16.4	46.8	13.0	87.0	391
4th	3.1	32.7	18.2	46.1	9.3	90.7	291
5th	4.5	34.1	11.7	49.8	10.3	89.7	223
Parent's education							
Degree	6.1	34.6	16.0	43.3	10.2	89.8	462
Other higher qual	2.6	36.7	16.0	44.7	10.9	89.1	275
A levels	2.9	34.1	16.6	46.4	12.2	87.8	343
GCSE or lower	5.1	33.5	14.7	46.7	12.5	87.5	666
Household material deprivation (mean)	0.18	0.17	0.16	0.15	0.20	0.15	1746

(Table 1 cont'd)

Explanatory variable	Sibling bullying: Pure bully	Sibling bullying: Bully/ Victim	Sibling bullying: Pure victim	Sibling bullying: Neutral	School bullying: Victim	School bullying: Neutral	N
How often eat dinner with child/ren							
Less than 2 times	2.5	37.7	18.1	41.7	14.6	85.4	199
3-5 times	3.8	37.8	14.8	43.7	8.6	91.5	339
6-7 times	5.1	33.0	15.5	46.5	11.9	88.1	1208
Freq. leisure time with child/ren							
Once a month or less	5.1	39.4	15.8	39.6	13.1	86.9	487
Several times a month	5.0	32.2	15.5	47.4	9.7	90.3	382
About once a week	5.1	34.8	14.7	45.4	12.2	87.8	491
Several times a week	2.6	29.8	16.8	50.8	10.6	89.4	386
How often quarrel with child/ren							
Most days/more than once a week	4.7	40.4	16.0	38.9	12.2	87.8	929
Less than once a week/hardly ever	4.3	27.7	15.2	52.9	10.9	89.1	817
How often talk about important matters with child							
Most days	4.5	34.0	16.4	45.0	12.1	87.9	1102
More than once a week	4.9	32.2	13.6	49.3	11.6	88.4	450
Less than once a week	3.6	41.8	16.0	38.7	8.8	91.2	194
How often involve child in setting the rules							
Never/seldom	3.8	35.0	15.2	46.1	11.6	88.4	614
Sometimes	4.9	34.7	15.6	44.9	11.6	88.4	912
Very often	5.0	31.8	17.3	45.9	11.4	88.6	220
How often praise child							
Never/seldom/sometimes	6.9	35.2	15.0	43.0	11.5	88.5	321
Very often	4.0	34.3	15.8	46.0	11.6	88.4	1425
How often slap child							
Never	5.0	32.0	15.3	47.7	11.2	88.8	1324
Seldom/sometimes/often	3.1	41.9	16.8	38.2	12.8	87.2	422
How often cuddle child							
Never/seldom/sometimes	5.5	36.8	14.2	43.6	8.7	91.3	310
Very often	4.3	33.9	16.0	45.8	12.2	87.8	1436
How often shout at child							
Never/seldom	6.4	25.1	15.4	53.1	8.4	91.6	358
Sometimes/very often	4.0	36.8	15.7	43.4	12.4	87.6	1388
Parent has mental health problem							
No	4.0	33.7	15.4	46.8	10.9	89.1	1290
Yes	5.0	36.9	17.1	41.1	14.9	85.1	363
Missing	9.7	34.4	12.9	43.0	7.5	92.6	93

p<.05 p<0.1

Parenting behaviour including the frequency of leisure time spent with children, and how often the child's mother quarrelled with, slapped or shouted at her child/children were all significantly associated with sibling bullying. Increasing amounts of leisure time with children was associated with decreasing involvement in bullying at home. Increased occasions of quarrelling, slapping or shouting at children were associated with increased involvement in bullying behaviours, particularly as bully/victims. In contrast, parental mental health showed no association with bullying at home.

School bullying

Few individual and family factors were associated with victimisation at school. As was found with sibling bullying, older children (aged 13-15) were less likely to be a victim of bullying at school (9.1%) than younger children (14.0%). However, no gender differences in victimisation were found. Living in a step, lone parent or other type of family was associated with higher levels of victimisation, and children with half siblings were also more likely to be involved in bullying at school. Though number of siblings, ordinal position and sibling composition were important in relation to sibling bullying, they had no relationship with bullying at school. Household income, parental education and whether or not the family was in income poverty were also not associated with bullying at school. However, victims of bullying were more likely to come from families with higher levels of material deprivation compared to neutral children (Table 1). In terms of the measures of parenting behaviour, except for shouting at children which was associated with higher levels of victimisation (and weakly, frequency of eating dinner with, or cuddling children), none of the other parenting measures were significantly associated with peer victimisation. Lastly, children whose mother had a mental health problem, were more likely to be victimised at school compared with children whose mothers did not, or for which their mental health could not be determined due to missing data (though this was only significant at the 10% level).

Multivariate analysis of family and individual factors and sibling and school bullying

To determine the relationship of each of the family and individual factors with sibling and school bullying in the presence of the other variables, we carried out multinomial and binary logistic regression models, the results of which can be seen in Table 2. Included in these models are all the factors that were significantly associated (at the 5% level) with either sibling or school bullying in the bivariate analyses.

Sibling bullying and its association with individual, socio-economic, and family factors

Model 1 of Table 2 shows the relationship between the family and individual factors and sibling bullying, using multinomial logistic regression. Associations are shown in terms of odds ratios. Similar to the bivariate analysis, both sex and age were significantly associated with sibling bullying; girls were significantly less likely to be pure bullies, and older children were less likely to become the victim of sibling bullying. We find a weak indication that those living in step or lone parent families were more likely to be bully/victims, compared with those living with two natural parents. Conversely, living with step or other types of siblings (i.e. foster or a combination of different types of siblings) compared with living with only natural siblings, was associated with lower odds of being a bully/victim. Number of siblings was also associated with being a bully/victim: children with only one sibling had a lower chance of being a bully/victim relative to being neutral. Being a youngest child, relative to being the eldest, was associated with a lower chance of becoming a pure victim, however ordinal position had no association with other types of sibling bullying. Sibling composition was important for all types of sibling bullying, with youths with brothers the most likely to be involved in some sort of bullying. After controlling for family and individual factors, neither income poverty, nor household material deprivation, were significantly associated with sibling bullying.

Table 2. Multinominal and logistic regression models (odds ratios) predicting bullying at home and at school, controlling for individual and family factors (Model 1 and 2) and additionally sibling bullying (Model 3)

	Model 1: Sibling bullying and individual and family factors			Model 2: School bullying and individual and family factors	Model 3: School bullying, individual factors and sibling bullying
Explanatory variable	**Pure bully**	**Bully/ Victim**	**Pure victim**	**Victim**	**Victim**
Sex					
Male (r)	-	-	-	-	-
Female	0.54*	0.88	1.09	0.86	0.88
Age					
10-12 years (r)	-	-	-	-	-
13-15 years	1.51	1.04	0.68**	0.62**	0.62**
Family type					
2 natural parents (r)	-	-	-	-	-
Other	1.08	1.24†	1.12	1.15	1.12
Sibling type					
Natural siblings (r)	-	-	-	-	-
Half siblings	0.62	1.02	1.11	1.40	1.39
Step/other siblings	0.55	0.49*	0.68	0.89	1.00
Number of siblings					
1 sibling (r)	-	-	-	-	-
2 siblings	1.63	1.43*	1.35	1.09	1.03
3 or more siblings	0.81	1.67*	1.59	1.70†	1.60
Ordinal position					
Eldest (r)	-	-	-	-	-
Youngest	1.03	0.88	0.70*	0.88	0.89
Middle/twin	1.26	0.90	0.84	0.70	0.71
Sibling composition					
Brothers (r)	-	-	-	-	-
Sisters	0.61†	0.72*	0.75†	1.17	1.24
Mixture	0.71	0.80	0.70	0.81	0.84
Income poverty					
Not poor (r)	-	-	-	-	-
Poor	1.02	1.18	0.93	0.97	0.94
Household material deprivation	1.92	0.63	0.79	2.48*	2.58*
Freq. leisure time with child/ren					
Once a month or less (r)	-	-	-	-	-
Several times a month	0.87	0.69*	0.78	0.74	0.78
About once a week	0.93	0.76†	0.75	0.98	1.01
Several times a week	0.42*	0.59**	0.74	0.81	0.88

(Table 2 cont'd)

	Model 1: Sibling bullying and individual and family factors			Model 2: School bullying and individual and family factors	Model 3: School bullying, individual factors and sibling bullying
Explanatory variable	**Pure bully**	**Bully/ Victim**	**Pure victim**	**Victim**	**Victim**
How often quarrel with child/ren					
Most days/more than once a week	1.73*	1.69**	1.32†	0.96	0.87
Less than once a week/hardly ever (r)	-	-	-	-	-
How often slap child					
Never (r)	-	-	-	-	-
Seldom/sometimes/often	0.76	1.30†	1.13	0.97	0.94
How often shout at child					
Never/seldom (r)	-	-	-	-	-
Sometimes/very often	0.62	1.30†	0.97	1.41	1.38
Sibling bullying					
Pure bully					1.68
Bully/Victim					2.23**
Pure victim					1.61*
Neutral (r)					-

**p<.01 *p<.05 †p<0.1

Of the parenting behaviours, engaging in leisure time several times a week compared with only once a month reduced the odds of becoming a pure bully or a bully/victim. Frequent quarrelling with children increased the odds of children becoming involved in all kinds of bullying, but particularly as a pure bully or a bully/victim. Moreover, there is some suggestion from the model, that slapping (p=0.051) or shouting at the child (p=0.088) increased the likelihood of the child being a bully/victim.

School victimisation and its association with individual, socio-economic, and family factors

Model 2, Table 2 shows the odds ratios estimated from a logistic regression model predicting the probability of being a victim of bullying at school, controlling for a range of individual and family factors. The results indicate no gender differences in relation to school bullying, however, older children were less likely to be victims of bullying than younger children. As expected from the bivariate analysis, few family factors were related to bullying at school. Having three or more siblings was associated with increased odds of being a victim of bullying at school, but this was only a trend (p<.10). By contrast, increasing levels of household material deprivation were significantly associated with a higher chance of being a victim of bullying at school (Table 2).

The relationship between sibling and school bullying, controlling for individual, socio-economic, and family factors

Model 3, Table 2, further examines the association between bullying at home and bullying at school, controlling for the individual, socio-economic and family factors which were demonstrated to be associated with sibling bullying in Model 1. Model 3 shows that even after controlling for a number of family factors, sibling bullying still has a strong association with victimisation at school. Bully/victims have over twice the odds of being victims of bullying at school (p<0.001). Moreover, we found that pure victims at home have one and a half times the odds of being a victim of bullying at school (p<0.05) while bullying

perpetration was not related to victimisation at school.

Bullying involvement, behaviour problems and unhappiness

Previous analysis of bullying among youths in *Understanding Society* (Wolke and Skew 2011) indicated a strong association between bullying at home and bullying at school, and both abnormal SDQ scores and unhappiness. Taking this one step further here, it was asked whether these relationships are maintained once controlled for individual, socio-economic and family factors. Table 3 shows the results of two logistic regression models predicting firstly, the relationship between bullying within the home, and at school, and abnormal SDQ scores (Model 1, Table 3) and secondly, bullying within the home, and at school, and youth unhappiness (Model 2, Table 3), controlling for individual, socio-economic and family factors. The results indicate that controlling for family and socio-economic factors previously found to be associated with both sibling and school bullying (Table 2), did not alter the association between sibling bullying or peer bullying, and both abnormal SDQ or unhappiness. Sibling bully/victims were three times more likely to have SDQ scores in the abnormal range, and pure sibling bullies had twice the odds of abnormal SDQ scores (though this was only marginally significant p=0.052). Victims of bullying at school, have over five times the odds of abnormal SDQ scores. Similarly, the odds of being unhappy were increased five times for victims of bullying at school, and were around twice as high for children that engaged in any type of bullying within the home (victims, bully/victims, pure bully). Both sibling and school bullying experiences made an independent contribution to predicting behaviour problems and unhappiness.

Table 3: Logistic regression models predicting behaviour problems and unhappiness, controlling for individual and family factors

Explanatory variable	Model 1: Behaviour problems Odds ratios	Model 2: Unhappiness Odds ratios
Sex		
Male (r)	-	-
Female	0.95	1.20
Age		
10-12 years (r)	-	-
13-15 years	0.79	1.93**
Family type		
2 natural parents (r)	-	-
Other	0.69†	1.05
Sibling type		
Natural siblings (r)	-	-
Half siblings	2.70**	1.20
Step/other siblings	3.79**	2.22*
Number of siblings		
1 sibling (r)	-	-
2 siblings	1.14	0.97
3 or more siblings	0.75	1.18
Ordinal position		
Eldest (r)	-	-
Youngest	1.06	1.22
Middle/twin	0.94	1.30

(Table 3 cont'd)

Explanatory variable	Model 1: Behaviour problems Odds ratios	Model 2: Unhappiness Odds ratios
Sibling composition		
Brothers (r)	-	-
Sisters	1.50†	1.43†
Mixture	1.43	0.99
Income poverty		
Not poor (r)	-	-
Poor	1.11	0.71
Household material deprivation	3.67*	4.61**
Freq. leisure time with child/ren		
Once a month or less (r)	-	-
Several times a month	0.54*	0.86
About once a week	0.69	0.62*
Several times a week	0.52*	0.53*
How often quarrel with child/ren		
Most days/more than once a week	1.47†	1.46*
Less than once a week/hardly ever (r)	-	-
How often slap child		
Never (r)	-	-
Seldom/sometimes/often	1.15	1.10
How often shout at child		
Never/seldom (r)	-	-
Sometimes/very often	0.93	0.65†
Sibling bullying		
Pure bully	2.38†	2.59**
Bully/Victim	2.91**	2.25**
Pure victim	1.58	1.97**
Neutral (r)	-	-
School bullying		
Neutral	-	-
Victim	5.31**	5.10**

**p<.01 *p<.05 †p<0.1

Discussion

This is the first report of sibling and peer bullying in a representative sample in the UK. Sibling bullying is widespread and found in half of all UK families with adolescents. By contrast, school bullying is experienced by about 1 in 8 adolescents. Sibling bullying showed relationships to a range of individual and family factors. These include age of the adolescents, child sex, number of siblings, whether there were brothers, the frequency that parents engaged in leisure activities with their children, or how often parents quarrelled with them. However, school bullying showed no relationship to these family factors. Young adolescents, those growing up in higher household material deprivation and those involved in sibling bullying as bully/victims or victims, were more likely to be victims in school. Even when allowing for each other, both sibling and school bullying were

significantly related to higher behaviour problems and unhappiness.

The prevalence of sibling bullying is high, and higher than has been reported in the USA, Israel or Italy (Duncan 1999, Wolke and Samara 2004, Menesini et al 2010). A third of the adolescents both bully their siblings, and are the victims of bullying at the hands of their siblings (bully/victims). These findings are in line with the results of a U.S. study, which found that most children involved in bullying behaviour with their siblings were bully/victims (28.6%) (Duncan 1999). Two recent reviews on bullying across contexts (Monks et al 2009) and sibling bullying in particular (Wolke and Skew 2012) described that repeated aggression between siblings (bullying), differs from peer bullying in that much more perpetration and victimisation by the same child (bully/victims) is found. In contrast, the prevalence of peer victimisation and the reduction with age found here is remarkably similar to the first such survey of bullying in the UK in 1993 (Whitney and Smith 1993). This is also fairly similar to others studies that investigated both sibling and peer bullying (Wolke and Samara 2004, Duncan 1999). On the other hand, large variation in the prevalence of bullying perpetration is apparent, with between 13.1% (Wolke and Samara 2004) and 28.4% (Duncan 1999) who reported to be bullies (pure bullies or bully/victims) in Israel and the USA, but only 1% admitted to be bullying perpetrators in this study in the UK. Thus very few children admitted to bullying others, a finding replicated in other recent cohorts in the UK (Schreier et al 2009, Sapouna et al 2011). It may indicate that efforts to combat bullying in school (Samara and Smith 2008) have resulted in adolescents being less willing to admit to being perpetrators of bullying in schools in the UK.

Most notable are the different effects that family factors have on bullying at home or at school. Sibling composition has a significant effect on the amount of bullying experienced at home. Those who have brothers as siblings are at increased risk of victimisation, a finding previously reported (Menesini et al 2010). Some suggest that older brother/younger sister dyads are often characterised by higher levels of conflict and less support (Aguilar et al 2001). From an evolutionary perspective, dominance is used to gain access to increased resources and boys or older brothers often use bullying as one way to assert dominance (Pellegrini and Bartini 2001, Hawley 1999). In contrast, having only sisters or being the youngest sibling, reduces the likelihood of sibling victimisation or perpetration as shown here. Girls often show a caring attitude towards their younger siblings (Brody 2004).

Parent behaviour was also related to sibling bullying. Parents who share little leisure time with their adolescents and who quarrel often with their children, are more likely to have offspring that engage in sibling bullying. No previous study has reported on parenting behaviour in relation to sibling bullying. However, social learning theory (Bandura 1973, Monks et al 2009) suggests that behaviours learned from parents can have both a powerful negative, but also positive, influence on child behaviour. Parents quarrelling with their child may become a model for the relationship of the child with his/her siblings. In contrast, family type, income poverty or household material deprivation was not related to sibling bullying. Thus, the actual quality of the parent –child relationship rather than the economic conditions, relate to the quality of the sibling relationships.

All types of peer victimisation reduced with age. Older adolescents are less likely to become victims of either physical or relational victimisation, a finding reported previously (Whitney and Smith 1993, Smith et al 1999). Contrary to some previous studies, actual parenting behaviour was not found to be related to peer bullying (Baldry and Farrington 2005, Barker et al 2008). Instead, household material deprivation (e.g. the parents not able to afford holidays, keep the house in a good state of repair, replace worn furniture etc.) predicted peer bullying. Adolescence is a period of individuation from the parents, while on the other hand increased affiliation with peers, and adolescents want to fit in with the peer group (Waylen and Wolke 2004). Being unable to afford branded clothes or gadgets that are considered essential may put adolescents at increased risk to be victimised and socially excluded in the peer group. This is not the case within the sibling relationship, as all siblings grow up under the same material conditions. Furthermore, being a victim and in particular a bully/victim at home, was significantly associated with increased likelihood of victimisation in school. This is consistent with all previously carried-out studies of the relationship of sibling and peer bullying (Wolke and Samara 2004, Duncan

1999, Menesini et al 2010). All sibling relationships involve conflict occasionally, however, when conflicts are severe, repetitive and intentional (bullying), then it appears that these have a profound effect on peer relationships (Brody 2004). Indeed, a recent study found that sibling-directed anti-social behaviour in the family's homes at 3 and 6 years, was predictive of interaction with unfamiliar peers in an experimental setting (Ensor et al 2010). The laboratory situation consisted of three unfamiliar children invited to a triadic play situation. Those young children who showed sustained high anti-social behaviour towards their siblings (3 and 6 years) were more likely to bully or refuse to share or interact with unfamiliar peers. Thus experiences with siblings are predictive of bullying unfamiliar peers.

Finally, those who were involved in bullying at home or at school, were found to be at highly increased risk for behaviour problems and were more often unhappy. This replicates results previously reported in an Israeli sample (Wolke and Samara 2004). In particular, those who were bully/victims or bullies at home were at increased risk after controlling for a range of family and demographic variables as well as school bullying. However, school victimisation showed the strongest link to behaviour problems and being unhappy, with five-fold increased odds. This finding replicates recent evidence that school victimisation poses young people at serious risk of mental health problems (Arseneault et al 2010, Reijntjes et al 2010, Sourander et al 2009). This study adds that bullying between siblings increases the risk of becoming a victim of peers at school, and carries an additional independent risk for behaviour problems.

Furthermore, being older, growing up in a reconstituted family as a half sibling or step child, or in family material deprivation with parents who rarely engage in leisure activities with their adolescents, or quarrel with them, further increases the risk of behaviour problems and unhappiness in children. This is consistent with the literature indicating the increasing risk of internalizing and externalising problems with puberty (Waylen and Wolke 2004, Maughan et al 2004) and the adverse effects of step parenting (Dunn 2005), harsh or disengaged parenting, on behaviour and wellbeing (Belsky et al 2005, Trentacosta et al 2008, Fineknauer et al 2005).

The study has a number of strengths. It is large and representative for households in the UK and utilised interviews with parents on family factors and adolescents' self reports of bullying, behaviour and wellbeing. There are also limitations. The analysis is based on cross-sectional data and does not allow for conclusions regarding causality: Does bullying lead to behaviour problems and less wellbeing, or are children with behaviour problems more often bullied? Both have been reported (Reijntjes et al 2010). Within an observation study, repeated measures of sibling and school bullying, as well as of wellbeing and behaviour problems, are required to determine temporal precedence of bullying while controlling for pre-existing behaviour problems (Schreier et al 2009). This will be possible with future waves (wave 3, wave 5) of *Understanding Society*. Finally, the youths themselves reported about bullying experience and about their behaviour and happiness, thus potentially inflating relationships. However, previous longitudinal research has shown that whether outcomes are reported by children, mothers or clinical assessors, the results are robust (Schreier et al 2009, Reijntjes et al 2010). However, this needs to be determined in future waves.

Nevertheless, we can conclude that adolescents bullied at home or at school, and particularly victims in both contexts, have more behaviour problems and are much more often unhappy youngsters. Sibling bullying is related to sibling composition, in particular the number of siblings and presence of brothers, as well as less involved or more negative parenting, while school bullying is more dependent on material deprivation at home and negative experiences with siblings. Whether being a victim or bully/victim is a precursor or just a marker of behaviour problems, the current findings add that bullying also takes place at home. Interventions should include training in parenting skills to deal with repeated and serious conflicts between siblings (Wolke and Samara 2004). Strengthening families and parenting skills and increasing social support between siblings are likely to reduce bullying in school and increase wellbeing (Bowes et al 2010).

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Endnote

[i] For the analyses of bullying with behaviour problems and happiness, the samples were further reduced due to item non-response on these two variables, resulting in sample sizes of 1,670 and 1,734, respectively.

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Understanding panel conditioning: an examination of social desirability bias in self-reported height and weight in panel surveys using experimental data

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Abstract

Typically reliant on self-reports from panel data, a growing body of literature suggests that relative body weight can have negative effects on labour market outcomes. Given the interest in the effects of relative weight in the social sciences, this paper addresses the question of whether repeated interviewing affects the quality of these data. A theory that focuses on the sensitivity of the questions rather than the survey context is proposed. Examining experimental panel data from Understanding Society using quantile-regression, the findings for women are consistent with the argument that conditioning reduces social desirability effects. The ameliorative effects of panel conditioning on social desirability bias in self-reported height and bodyweight appear to strengthen the association between relative weight and employment for men, but not women, however.

Keywords

Understanding Society; panel conditioning; self-reported height and weight; quantile-regression; body-mass index.

1. Introduction

Since the early 1980s, researchers have examined the extent to which obesity is penalised in labour market outcomes for both men and women (McLean and Moon 1980; Puhl and Heuer 2009). In particular, obesity seems to affect employability, especially for women (Morris 2007; Sarlio-Lähteenkorva and Lahelma 1999; Viner and Cole 2005). Obesity also seems to negatively impact wages for those who *are* employed (Baum and Ford 2004; Cawley 2004; Cawley, Grabka and Lillard 2005; Morris 2006; Pagán and Dávila 1997).

This literature mainly relies on self-reported height and weight, yet validation studies of self-reported height and bodyweight usually find a bias towards cultural ideals (Bostöm and Diderichsen 1997; Spencer, Appleby, Davey and Key 2002). For many longitudinal surveys of general use, obtaining self-reported height and bodyweight is the most efficient and sustainable method of obtaining these data.

Panel surveys are a central means of understanding and explaining causal processes in human belief and action. However, the experience of being surveyed can limit valid inference about such processes in the social sciences (Kalton and Citro 2000; Sturgis, Allum and Brunton-Smith 2009). Humans are reflexive; they can integrate new information and experiences into their self-concept, their beliefs and opinions, and their behaviour. Humans can also be reactive since they often respond to situations and contexts in specifically patterned ways. Respondent reflexivity and reactivity can contribute to measurement error of

which this paper concerns itself with two flavours. First, panel conditioning is a systematic effect of participation in a previous interview on either response behaviour or on the behaviour targeted by survey measurement (Waterton and Lievesley 1989). Human reflexivity can lead to a systematic change in what is being measured or how measures work at later waves. Second, social desirability bias is a systematic effect of editing responses before answering survey questions. Respondents may be embarrassed, want to keep information private, or may want to avoid negative feelings or distress, and so they lie or otherwise misreport about something a researcher would like to know (DeMaio 1984; DePaulo, Kashy, Kirkendol, Wyer and Epstein 1996; Foddy 1993).

This paper concerns itself with the nexus between panel conditioning and social desirability within the context of self-reported height and bodyweight. Although validation has exposed bias in self-reports of height and bodyweight, little is known about their longitudinal measurement properties. Moreover, strong interest amongst both economists and sociologists in the effects of obesity on labour market outcomes, suggests that evaluating the effects of these biases on substantive relationships may be warranted. Therefore, this research aims to examine the specific question of whether biases in self-reported height and bodyweight are ameliorated by repeated interviewing. Furthermore, it explores whether these biases impact the relationship between obesity and employment.

2. The sensitivity of self-reported height and bodyweight

Questions which suffer from over- or under-reporting that might not be attributable to deficiencies in question comprehension, information retrieval or formatting are likely to be sensitive or threatening questions and hence suffer from social desirability bias (Bradburn and Sudman 1979; see also Tourangeau, Rips and Rasinski 2000). Cross-sectional validation of self-reported height and bodyweight normally finds systematic mis-reporting suggestive of social desirability bias. Bodyweight is typically under-reported, often in the range of 1/4 to 1/2 stone or about 1.5 to 3.5 kg (Borkan, Hults and Glynn 1983; Dekkers, van Wier, Hendriksen, Twisk and van Mechelen 2008; Spencer, Appleby, Davey and Key 2002). Under-reporting is consistently greater amongst those who are heavier and by women (Palta, Prineas, Berman and Hannan 1982; Rowland 1990; Stewart, Jackson, Ford and Beaglehole 1987). Both Spencer et al (2002) and Rowland (1990) find that the extent of under-reporting of bodyweight increases with increasing respondent weight, more so for women than for men. The margin of error for women is typically twice that for men at the heaviest weights. Rowland also finds that underweight men over-report their bodyweight by roughly 1/3 stone or about 2.3 kg. Validation of self-reported height finds over-reporting, though often by less than half an inch (Dekkers et al 2008; Rowland 1990; Spencer, Appleby, Davey and Key 2002). As with weight, mis-reports are associated with both gender and the true value. Greater over-reports are observed amongst shorter men – about 1.5 cm, or a little more than 1/2 inch, amongst the shortest men (Rowland 1990). Though generally of a small magnitude, Spencer et al (2002) find that men's overestimates of height are nearly twice that of women. Given these validation findings, it is clear that self-reporting height and bodyweight is sensitive for certain respondents.

3. Panel conditioning and the sensitivity of self-reported height and weight

Whether self-reported height and bodyweight continue to be biased in on-going panels is an open question. In their statement on the nexus between panel conditioning and social desirability bias, Waterton and Lievesley (1989) postulate that conditioning can be expressed as trust that develops between respondents and the survey organisation. Increased familiarity with the survey organisation and survey procedures over waves of a panel, fosters increased respondent trust. This greater trust leads to less concern over privacy and confidentiality and a greater willingness to divulge potentially unflattering information, or the experience of less threat when asked to do so. They find that respondents were significantly more willing to report racial prejudice and also to report their income at a subsequent interview (Waterton and Lievesley 1989). Similarly, Brannen (1993) finds a number of women report greater feelings of ease and willingness to talk freely to interviewers at later waves of a three year longitudinal study of mothers returning to the labour market after child-birth. However, Pevalin (2000) examines whether social

desirability affects the reporting of symptoms used to construct an indicator of mental illness in annual waves of a long-running panel, but finds no effects. Moreover, certain highly sensitive behaviours, such as drug taking, seem to suffer from greater social desirability bias at later panel waves, contrary to what would be predicted by Waterton and Lievesley's model (Fendrich and Vaughn 1994; Mensch and Kandel 1988; Wagstaff, Kulis and Elek 2009). These findings suggest that social desirability effects in panels may depend on something other than the social context of being interviewed.

Sensitive questions themselves can vary in their psychic consequences for respondents, from mild embarrassment, to feelings of intense violations of privacy or even shame, associated with providing the true answer (DeMaio 1984; Schaeffer 2000). Although people with various non-normative heights and bodyweight may be stigmatised in many interactions (Puhl and Heuer 2009), we might reasonably assume that survey questions obtaining height and bodyweight are on the lighter end of social desirability. These are questions that might elicit embarrassment, but most likely not intensely private feelings of shame which strike at the core of human identity (Tangney and Fischer 1995). Unlike shame, embarrassment is a relatively short-lived negative emotion that rarely shatters the self-concept of most who experience it (Tangney and Fischer 1995; Tangney, Miller, Flicker and Barlow 1996). Thus, panel conditioning may operate slightly differently with height and bodyweight than for more severely threatening questions such as illicit drug taking, abortion or various sexual practices.

One strategy people use to avoid or manage feelings of embarrassment, is lying. DePaulo and colleagues (1996) find that lying is often unplanned and focused on achieving psychic rewards even amongst social intimates (see also Goffman 1963). However, lying tends also to produce negative psychic consequences, such as feelings of social distance and unpleasantness in interaction (DePaulo et al 1996; Goffman 1963). One could surmise that after the initial shock of being asked for one's height or bodyweight, people may lie as they attempt to 'pass' as having a more ideal body figure than they actually possess. In a panel survey, the second time the question is asked, providing an accurate answer may not be nearly as embarrassing. Having learned that the information can be given without horrid consequences, there may be less motivation to mis-report, and indeed, the added motivation of avoiding negative feelings associated with lying may lead respondents to provide more accurate answers. Respondents may reflect on their experience of being asked certain questions, particularly those to which their answer was not entirely accurate, and be motivated to tell the truth at subsequent waves. This approach relies only on the effects of questions themselves, not on the developing relationship between panel respondents and the survey organisation.

4. Experimentation with panel content

Holt (1989) argues that most analytic designs used to examine panel conditioning are not ideal for disentangling the factors that affect survey data quality. Most frequently, researchers compare responses from some later wave of a panel to a temporally corresponding cross-sectional sample to which the same or similar questions were asked (Corder and Horvitz 1989; Menard and Elliott 1993; Osgood, O'Malley, Bachman and Johnston 1989; Silberstein and Jacobs 1989; Wilson and Howell 2005). Rotating panel designs provide a better alternative because comparisons can be made between identical survey designs, sample designs, procedures and identical questions (Bailar 1975; Cohen and Burt 1985; Ghangurde 1982; McCormick, Butler and Singh 1992; Pennell and Lepkowski 1992; Silberstein and Jacobs 1989). A third analytic strategy involves examination of a single sample and predicting specific effects, from theory, about panel conditioning (Pevalin 2000; Sturgis, Allum and Brunton-Smith 2009). In all of these approaches, the effects of conditioning are confounded with other aspect of the study design in some way. Only experimentation can pinpoint the specific nature of effects, by holding study design features constant across randomised experimental treatments. Experimentation with panel data is rare – typically limited to the effects of randomised sample selection on behavioural outcomes such as voting or obtaining health checks (Bartels 1999; Battaglia, Zell and Ching 1996; Clausen 1968; Kraut and McConahay 1973; Traugott and Katosh 1979; Wilson and Howell 2005; Yalch 1976). Bridge et al (1977) alone use an experimental design to examine conditioning on subsequent *survey* measures. Keeping all other survey conditions constant across a two- wave panel, the authors

experimentally varied survey content and their 'between wave' communication with respondents. They found that content alone can induce opinionation, particularly for topics seen as important and where opinions had not previously been formed.

Having a separate and unique sample and study design, the *Understanding Society* "Innovation Panel" (the IP) is dedicated to methodological research relevant for improving longitudinal research resources. At Waves 1 and 2, the IP contained an experimental content allocation that could be used to examine the effects of prior survey content on measurement. At Wave 1, a random half of households received survey questions to obtain self-reported height and bodyweight, while the other half of households received no such content. At Wave 2, the entire sample was asked to self-report height and bodyweight. All other survey conditions remained constant across this experimental treatment, thereby isolating the effect of prior question content in the panel.

5. Hypotheses

Considering the nature of biases in self-reported height and weight, the approach outlined in Section 3 suggests the following specific hypotheses, given the study design. Considering first the effects of conditioning on self-reported weight:

Hypothesis 1: Validation finds greater bias amongst heavier women, therefore conditioned women should report heavier weights than unconditioned women at the upper end of the bodyweight distribution.

Hypothesis 2: Validation finds that lighter men are likely to over-report their bodyweight, therefore conditioned men should report lower weights than unconditioned men at the lower end of the bodyweight distribution.

With respect to height, the effects are again likely to be gender specific:

Hypothesis 3: Validation finds that taller women under-report their height therefore conditioned women should report taller heights than unconditioned women at the upper end of the height distribution.

Hypothesis 4: Validation finds that shorter men over-report their height therefore conditioned men should report shorter heights than unconditioned men at the lower end of the height distribution.

Validation of self-reported height and bodyweight typically find that small differences in self-reports render the classification of respondents into categories of relative bodyweight significantly biased. For example, Spencer et al found that about 41 percent of obese men and 27 percent of obese women were mis-classified based on self-reports (2002). For this reason:

Hypothesis 5: Conditioned respondents of both sexes should exhibit higher body-mass index values than unconditioned respondents.

Hypothesis 6: Conditioned respondents of both sexes should be more likely to be classified as overweight or obese as compared to unconditioned respondents.

The discussion in Section 3 and these hypotheses speak to the likelihood that social desirability is expressed through lying only. However, wilfully providing inaccurate information is not the only strategy of socially desirable responding (Tourangeau, Rasinski, Jobe, Smith and Pratt 1997; Tourangeau, Rips and Rasinski 2000). Item non-response is a common method to avoid providing information which is unflattering or otherwise highly sensitive (Kennickell 1996; Moore, Stinson and Welniak 1999). Indeed, non-response often decreases over waves of data collection (Bailar 1989; Cantor 1989; Porst and Zeifang 1987; Sturgis, Allum and Brunton-Smith 2009; Traugott and Katosh 1979; Waterton and Lievesley 1989). Between height and bodyweight, bodyweight suffers from greater non-response (Rowland 1990). Respondents may choose not to respond at all. Thus:

Hypothesis 7: Both men and women who are conditioned should have lower levels of item non-response for bodyweight than unconditioned men and women.

Another strategy of socially desirable responding is to provide round values. Rounding has been shown to be problematic in survey reporting of many types of information (see e.g. Roberts and Brewer 2001). In his study of U.S. men and women, Rowland (1990) found that rounding was common in self-reported bodyweight but not in self-reported height. He found that 60 percent of respondents rounded bodyweight to a numeric value ending in 0 or 5, such as 160 lbs or 185 lbs. Rounding was more common among women and heavier respondents, and those who provided rounded values for bodyweight were significantly less accurate than those who did not:

Hypothesis 8: If conditioning affects the social desirability of reported bodyweight, then conditioned respondents should be less likely to provide rounded values for bodyweight compared to unconditioned respondents.

What are the consequences of social desirability bias for the association between body-mass and employment outcomes? Across a range of settings and time periods, research on the link between obesity and employment generally finds a negative effect, which is stronger for women than for men (Puhl and Heuer 2009). This literature relies on self-reported height and bodyweight to calculate body-mass, though recent work by Morris using anthropometric measures from the mid-1990s, finds consistently negative, but small, effects for both men and women on employment (Morris 2007). We might expect, then, that social desirability bias produces an under-estimate of the relationship between obesity and employment:

Hypothesis 9: If conditioning reveals a relationship closer to that found from anthropometrics, then the relationship between obesity and employment should be strengthened, particularly for women.

6. Data

The IP sample was recruited in January 2008 using a stratified and clustered design. In total 2,760 addresses in 120 areas of Great Britain were selected from the Postcode Address File using post-code sectors as Primary Sampling Units. Areas north of the Caledonian Canal and all of Northern Ireland were excluded from sampling. Interviews were achieved in 1,489 households for a household response rate of 59.5 percent, not counting ineligible addresses. A total of 2,393 individual interviews with adult household members aged 16+ were obtained. All people resident at the address, including children, were defined as original sample members to be followed throughout the life of the study. The second round of interviews occurred in March 2009, where interviews were conducted in 1,122 households including approximately 72 new ones due to splits from original sampled households. Including full, partial or proxy interviews, Wave 2 data was gathered for 1,870 adults. The analysis proceeds with a balanced panel of respondents interviewed at both Wave 1 and Wave 2 of the IP. Thus, 168 new respondents at Wave 2 were excluded. Since self-reported bodyweight for pregnant women is subject to different types of biases, the analysis excludes 22 women who were pregnant at Wave 2. Note, since the actual bodyweight provided at Wave 1 is irrelevant for this analysis, any pregnant women at Wave 1 were retained. Finally, cases with any missing data on any response variable or covariates were excluded.

Self-reported height was obtained with the following question “I would like to ask you about height and weight. There is interest in how people's weight, given their height, is associated with their health. How tall are you without shoes?” Self-reported bodyweight was obtained by asking “What is your current weight?” Although answers could be given in either imperial or metric units, responses were overwhelmingly provided in imperial therefore metric reports are excluded from the analysis. Three follow-up questions asked whether the respondent was fairly sure of their bodyweight or if it was an estimate, when they last weighed themselves with scales and for women, whether they were currently pregnant.

Survey data accuracy is best judged with validation data, yet such data are often a rare and prized commodity in methodological research. In the absence of validation data, an analysis of experimental data with well established biases in which we might observe improvement would be a viable alternative. If conditioning reduces socially desirable responding, the response distribution for both height and bodyweight should be affected in ways counter to observed biases. Thus, those respondents who were asked for their height and bodyweight at Wave 1, i.e. the “conditioned” treatment, should report heights and weights that are systematically opposed to the biases identified by validation.

7. Models and measures

Hypotheses 1 through 5 outlined in Section 5 address the effects of conditioning on specific social desirable responding at specific regions of the bodyweight, height and body-mass distributions. To examine these hypotheses, I use quantile regression. Where linear regression predicts mean values, quantile-regression focuses on the conditional response distribution. That is, quantile-regression can estimate a specified percentile or percentiles of a continuous response variable conditioned on a set of covariates (Hao and Naiman 2007; Koenker and Bassett 1978). For this reason, quantile-regression is more appropriate for

examining the effects of panel conditioning on social desirability bias, given that it affects specific points in the distributions of bodyweight, height and body-mass.

I specify quantile regression models for bodyweight, height and body-mass the same way. Taking weight, w_i for example, the model for the p^{th} quantile, Q_p, is commonly written (see e.g. Abrevaya 2001; Hao and Naiman 2007) as:

$$Q_p(w_i|x_i) = \beta_{0,p} + x_{i,k}\beta_{k,p} + u_{i,p}, \quad (i = 1, \dots, n) \qquad (1)$$

where 0 < p < 1 indicates the proportion of the population having weights below the quantile at p and β_p represent the marginal effects of the k covariates $x_{i,k}$ on the quantile value. Equation (1) implies that the conditional p^{th} quantile is determined by the quantile-specific parameters $\beta_{0,p}$ and $\beta_{k,p}$, and the specific values of the covariates $x_{i,k}$. An error term $u_{i,p}$ for any particular conditional quantile is assumed to be zero. Since quantile-regression estimates points in the dependent variable's distribution, it requires no distributional assumptions about the dependent variable and is robust to any skewness that may be present (Arulampalam, Booth and Bryan 2007; Buchinsky 1994; Buchinsky 1998; Koenker and Hallock 2001). To test hypotheses about the upper and lower ends of the bodyweight, height and body-mass distributions, the 25th, 50th and 75th percentiles are estimated simultaneously using Stata 10 (StataCorp 2007). These points were chosen to reflect the main junctures in the distribution, i.e. median and inter-quartile range, whilst maintaining sample size at each point.

Estimation of coefficients in quantile-regression is implemented in Stata using the method of minimum absolute deviations via linear programming. This approach to estimation was first implemented by Wagner (1959) and details of Stata's implementation of the procedure can be found in the Stata documentation (StataCorp 2007). Standard errors of the estimates for quantile regression coefficients can be obtained by various means (for a review, see Buchinsky 1995). The standard errors presented in this paper are obtained by bootstrapping (Arulampalam, Booth and Bryan 2007; Hao and Naiman 2007; Koenker and Hallock 2001). Bootstrapping is preferred because the resulting standard errors are not affected by sample size when estimating coefficients at the extreme quartiles of the distribution (Hao and Naiman 2007). To control for clustering in the sample design when estimating standard errors, primary sampling units were resampled as part of the bootstrapping procedure, rather than individuals (Arulampalam, Booth and Bryan 2007).

Hypotheses 7, 8 and 9 outlined in Section 5 suggest the use of models for dichotomous outcomes. Here, I used logistic regression to examine these hypotheses. Assume some event, *Y*, such as non-response to a bodyweight question. The dependent variable is expressed as a log transformation of the odds, ϑ, of the event:

$$\vartheta(Y = 1) = \frac{\Pr(Y=1)}{1-\Pr(Y=1)} \qquad (2)$$

Given that probabilities range from 0 to 1, the odds can range from 0, when Pr(Y = 1) = 0, to infinity when the Pr(Y = 1) = 1. By taking the natural logarithm of the odds, we obtain the *logit*:

$$L = log_e\vartheta \qquad (3)$$

This *logit* transformation of the probability is then modelled as a linear function of covariates (Hanuchek and Jackson 1977):

$$L_i = \beta_0 + \beta_k x_{i,k} + u_i, \quad (i = 1, \dots . n) \qquad (4)$$

Hypothesis 6 requires ascertaining whether conditioning effects on social desirable responding results in different classification into categories of relative weight. To test this hypothesis, I use a multinomial logistic model. This model is a generalisation of logistic regression that allows for more than two discrete outcomes. Suppose that there are *k* categorical outcomes with some base outcome as being category 1. The probability that the response for some i^{th} observation is:

$$p_{i,j} = \Pr(y_j = i) = \begin{cases} \dfrac{1}{1 + \sum_{m=2}^{k} \exp(x_j\beta_m)}, if\ i = 1 \\ \dfrac{\exp(x_j\beta_i)}{1 + \sum_{m=2}^{k} \exp(x_j\beta_m)}, if\ i > 1 \end{cases} \qquad (5)$$

where x_j is the row vector of observed values of the independent variables for the j^{th} observation and β_m is the coefficient vector for outcome *m*. Estimates for both logistic regression and

multinomial logistic regression were obtained by maximum likelihood using Stata 10 (StataCorp 2007). Standard errors in both logistic regression and multinomial logistic regression models were corrected for clustering in the sample design using established methods (Kreuter and Valiant 2007).

I examine three distinct dependent variables – self-reported height, self-reported bodyweight and calculated relative bodyweight – all measured at Wave 2. Table 1 contains descriptive statistics for key variables used in the analyses presented in this paper. Body-mass is measured by relative weight, or bodyweight in kilograms divided by height in metres-squared (Morris 2007; Morris 2006). Known as the "body-mass index" (BMI), values are ordinarily grouped into categories of underweight (BMI < 18.5), normal weight (18.5 ≤ BMI < 25), overweight (25≤ BMI < 30) and obese (30 ≤ BMI). The main covariate of interest is assignment to experimental treatment – that is, whether the height and bodyweight questions were asked of the respondent at Wave 1 or not. All respondents receiving the height and bodyweight questions at Wave 1 are treated as being "conditioned" whereas those who did not receive these questions were in the "unconditioned" group.

Table 1. Descriptive statistics of variables used in analyses

	N	**Mean/Pct**	**St. Dev**			
Age	1724	50.8	17.5			
Conditioned	1724	49.8%				
Female	1724	54.0%				
First Degree, or higher	1714	22.1%				
School degree	1714	32.8%				
Other degree	1714	27.6%				
No degree	1714	17.5%				
Recently weighed	1648	42.8%				
Rounded weight response	1386	58.4%				
Weight non-response	1416	2.1%				
Men	N	Mean / Pct	St. Dev	25^{th}-	50^{th}-%	75^{th}-%
Weight (in pounds)	639	182.2	31.2	161	180	199
Height (in inches)	725	69.7	2.9	68	70	72
Calculated BMI	632	26.4	4.1	23.7	25.9	28.8
Underweight	632	1.0%				
Normal weight	632	37.3%				
Overweight	632	44.9%				
Obese	632	16.7%				
Employed	793	58.4%				
Women	N	Mean / Pct	St. Dev	25^{th}-	50^{th}-%	75^{th}-%
Weight (in pounds)	747	151.3	30.7	131	147	168
Height (in inches)	862	63.9	2.7	62	64	66
Calculated BMI	739	26.1	5.1	22.6	25.5	28.5
Underweight	739	2.7%				
Normal weight	739	44.4%				
Overweight	739	34.8%				
Obese	739	18.1%				
Employed	931	51.2%				
Responsible for a child <	931	21.3%				

All models also control for respondent age and education. Age and education can be assumed to be proxies for cognitive abilities, which in turn have consequences for measurement error (Alwin 2007). Education was measured in terms of highest qualifications obtained, categorised into four groups: University degree or higher, or an equivalent, which I label "First Degree or higher"; completion of compulsory schooling or its equivalent, including those staying on until age 18, which I call "School Degree"; all other qualifications not elsewhere classified, including foreign degrees, which I call "Other qualifications"; and no reported qualifications at all.

Two other variables of interest include whether the reported bodyweight was rounded and when the respondent most recently weighed her/himself. Rounding was measured using "digit preference" which was indicated if the report was of a whole or half-stone, e.g. 9½ stone rather than 9 stone 8 ounces. Respondents were asked when they most recently weighed themselves, in order to provide some sense of how accurate the response might actually be. Whether the respondent "Recently weighed" was indicated by whether the respondent reported weighing themselves within 4 weeks of the interview.

Finally, employment is measured as whether the respondent did any work for pay in the seven days ending the Sunday prior to interview. If the respondent did no work, but had a job from which they were temporarily away, they were classified as being employed. Motherhood is one limiting factor in determining whether women participate in the labour market. The models for female employment, therefore, also includes a variable for whether she is the responsible adult for a child under age 10 in the household.

8. Results

Table 2 contains results of quantile-regressions of self-reported bodyweight on conditioning treatment predicting the 25th, 50th and 75th percentiles. Hypothesis 1 implies that the 75th percentile for conditioned women would be higher than for unconditioned women. The results in column IV indicate that there is very little effect of conditioning on the 25th and 50th percentile, but a coefficient of 5.27 ($p < 0.10$) suggests that the 75th percentile for conditioned women is about 5¼ pounds higher than for unconditioned women. This effect strengthens, once rounding and recent weighing are controlled in the models. The 75th percentile for conditioned women is about half a stone higher than for unconditioned women. Note that rounding tends to increase the reported bodyweight – that is, rounding tends to increase the distributional points by about 5 pounds. Hypothesis 2 suggests that the 25th percentile of bodyweight for conditioned men should be lower than for unconditioned men. The findings shown in columns I, II and III are consistent with this hypothesis but are not significant. It should be noted that conditioning seems to yield lower median and 75th percentiles for men's bodyweight as well, though the effects are not significant.

Table 2. Results from simultaneous quantile-regressions of conditioning, rounding and recent weighing on 25th, 50th, and 75th percentiles of self-reported bodyweight

		Men			*Women*		
		I	**II**	**III**	**IV**	**V**	**VI**
25th %	Conditioning	-1.33	-1.42	-1.33	-1.23	-1.18	-1.51
		(3.11)	(3.21)	(3.04)	(3.09)	(3.09)	(3.04)
	Rounding		0.09	3.04		4.66*	3.61
			(2.69)	(2.95)		(2.97)	(2.97)
	Recent weighing			7.33**			0.82
				(2.03)			(2.59)
50th %	Conditioning	-3.29	-2.66	-3.11	0.27	-0.32	-0.63
		(2.77)	(2.88)	(2.90)	(2.45)	(2.13)	(2.28)
	Rounding		-1.76	0.51		5.44**	5.53**
			(3.17)	(3.52)		(2.26)	(2.41)
	Recent weighing			4.31			-0.29
				(3.40)			(2.27)
75th %	Conditioning	-3.80	-3.71	-4.48	5.27*	7.07**	7.04**
		(3.56)	(3.52)	(3.42)	(2.97)	(3.04)	(3.17)
	Rounding		-0.98	0.40		5.35	5.26
			(3.44)	(3.20)		(3.29)	(3.24)
	Recent weighing			5.43*			-0.78
				(3.18)			(2.59)
	N	635	635	629	744	744	741

* p < 0.10, ** p < 0.05

Notes. Shown are coefficients. Standard errors, shown in parentheses, are obtained by bootstrap methods (500 replications) and adjusted for clustering in sample design. Respondent age and education are included in the models but not shown.

Results in Table 3 evaluate Hypotheses 3, 4 and 5. Hypothesis 3 implies that the conditioning effect on the 75th percentile of the height distribution for women should be positive. The results in Table 3 for women show that across the percentiles estimated, conditioning seems to increase the point in the distribution estimated, though at greater amounts in the lower end of the distribution than at the upper end of the distribution. However, the conditioning effect for women is not significant across all percentiles. Hypothesis 4 implies a negative effect of conditioning on the 25th percentile estimate of conditioned men's height. Instead, the results show a positive effect for conditioning. In fact, the 75th percentile for conditioned men is about 2/3 of an inch higher than for unconditioned men and this effect is statistically significant (p < 0.05), though the conditioning effects on the 25th and 50th percentiles are not. Hypothesis 5 implies that conditioning should positively affect the body-mass distribution at all points for both men and women. For men, the effects of conditioning are negative across the estimated quartile points and all are generally of the same effect size. However, none of these effects are statistically significant. For women, the coefficients for conditioning are negative on the 25th and 50th percentiles while the effect is positive on the 75th percentile. The coefficient for conditioning on the 75th percentile of .93, means that conditioned women are almost one full point higher on the body-mass index scale compared to unconditioned women. This would be expected if conditioning induced women to report less biased amounts of bodyweight and height. However, all coefficients in these quantile regressions of women's BMI percentiles are not significant.

Table 3. Results from simultaneous quantile-regressions of conditioning, rounding and recent weighing on 25th, 50th, and 75th percentiles of self-reported height, and calculated body-mass index (BMI) for men and women

	Men		*Women*	
	Height	**BMI**	**Height**	**BMI**
25th %	0.16	-0.41	0.16	-0.11
	(0.27)	(0.40)	(0.23)	(0.39)
50th %	0.38	-0.54	0.13	-0.37
	(0.28)	(0.36)	(0.26)	(0.49)
75th %	0.62***	-0.42	0.10	0.93
	(0.24)	(0.43)	(0.23)	(0.66)
N	721	628	859	736

*** p < 0.01

Notes. Shown are coefficients for conditioning only. Standard errors, shown in parentheses, are obtained by bootstrap methods (500 replications) and are adjusted for clustering in the sample design. Respondent age and education are included in the model, but not shown in the table.

Table 4 presents results from a multinomial logistic regression of conditioning on categorisation of body-mass. Hypothesis 6 implies that the conditioned sample should be classified into heavier categories of body-mass than the unconditioned sample. The results in Table 4 show that this is not the case. Note that the values of relative bodyweight, used to categorise people into underweight, normal weight, overweight and obese, do not conform to the 25th, 50th and 75th percentile of the body-mass index distribution. This classification pattern is meant to reflect the health effects of bodyweight given height. Thus, the nearly 1 point increase observed in body-mass at the 75th percentile for conditioned women shown in Table 3 does not necessarily translate into a re-categorisation. For men, conditioning seems to increase the likelihood of being classified as underweight relative to normal bodyweight, with small negative effects for conditioning on being overweight or obese relative to normal. However, none of these effects are statistically significant. For women, conditioning seems to reduce the odds of being classified as underweight or overweight relative to normal, with a small positive effect on the odds of classification as obese, though none of these effects are statistically significant.

Table 4. Results from multinomial logistic regression of conditioning on categorisation of body-mass

	Men	*Women*
Underweight	1.25	-0.32
	(0.95)	(0.54)
Normal weight (omitted)	--	--
Overweight	-0.08	-0.16
	(0.22)	(0.21)
Obese	-0.09	0.03
	(0.28)	(0.23)
N	672	761

Notes. Shown are coefficients for conditioning only, age and education are also included in these models but are not shown. Standard errors, which are adjusted for clustering in sample design, are shown in parentheses. Normal weight is the omitted category.

Table 5. Results from logistic regression of conditioning and recent weighing on various indicators of survey response quality

Men	**Rounding**		**Weight Non-response**		**Recent Weighing**
Conditioning	0.02	0.00	0.05	-0.02	-0.19
	(0.20)	(0.21)	(0.61)	(0.62)	(0.16)
Recent weighing		-1.13***		-1.41*	---
		(0.19)		(0.76)	---
N	678	672	685	679	781

Women	**Rounding**		**Weight Non-response**		**Recent Weighing**
Conditioning	-0.08	-0.05	-0.78	-0.65	0.21
	(0.17)	(0.17)	(0.60)	(0.61)	(0.14)
Recent weighing		-0.57***		-1.10**	---
		(0.17)		(0.52)	---
N	769	766	792	787	918

* p < 0.10, ** p < 0.05, *** p < 0.01

Notes. Shown are coefficients. Age and education are controlled in the models but are not shown in the table. Standard errors, which are adjusted for clustering in sample design, are shown in parentheses.

Hypotheses 7 and 8 focus on the extent to which conditioning reduces the propensity to provide a round number for bodyweight and non-response at self-reported bodyweight questions. Table 5 contains coefficients from a set of logistic regressions of conditioning on rounding, bodyweight non-response and recent weighing. Hypothesis 7 suggests that the coefficient for conditioning when predicting item non-response at the bodyweight question should be negative. For women, this is in fact the case though the effects are not statistically significant. The conditioning effect for men, though also non-significant, changes from positive to negative once recent weighing is controlled. Hypothesis 8 suggests that conditioning should reduced the probability of providing a rounded number as a response strategy to avoid socially undesirable disclosure of weight. Here we would expect to find a negative effect for conditioning. The coefficient for men is positive, though very close to zero and not statistically significant. The coefficient for women is in fact negative, though not statistically significant. Although there is no clear hypothesis about recent weighing, conditioning seems to have a negative effect on recent weighing for men and positive effect for women, though the coefficients are not significant.

Table 6. Estimates from logistic regression of employment on categorisation of overweight or obese, and body-mass index

Men	***Unconditioned***		***Conditioned***	
	I	**II**	**III**	**IV**
Overweight	0.35		0.43	
	(0.45)		(0.38)	
Obese	-0.13		-0.21	
	(0.46)		(0.50)	
BMI		0.01		-0.02
		(0.05)		(0.04)
F	1.13	1.18	1.59	1.56
p-value	0.35	0.32	0.15	0.17
N	239	239	247	247

Women	***Unconditioned***		***Conditioned***	
	I	**II**	**III**	**IV**
Overweight	-0.44		0.15	
	(0.35)		(0.40)	
Obese	-0.75		-0.15	
	(0.49)		(0.49)	
BMI		-0.04		0.01
		(0.03)		(0.04)
F	3.02	3.83	4.46	4.57
p-value	0.00	0.00	0.00	0.00
N	237	237	240	240

Notes: Shown are coefficients. Respondent age, education and motherhood (women only), are included in all models but not shown in these tables. Standard errors, which are corrected for clustering in the sample design, are shown in parentheses.

Table 6 presents results from logistic regression of being obese and overweight, and BMI, on the probability of being employed for both conditioned and unconditioned men and women. Hypothesis 9 suggests that the effect sizes for the conditioned sample should be greater than for the unconditioned sample, particularly for women. The literature on obesity and employment generally finds that men do not typically experience a penalty for being overweight or obese and the results in Table 6 conform to this general finding, regardless of conditioning treatment. Note that the coefficients for being overweight and obese are of a similar sign for both conditioned and unconditioned men, and that the size of the coefficients is generally larger for conditioned as compared to unconditioned men, as is hypothesised. However, none of these coefficients are statistically significant, so it would be inappropriate to test for significant differences between them.

The results in Table 6 for women are exactly opposite to hypothesised. Amongst unconditioned women, the coefficients for being overweight and obese are negative – as one might expect from the literature – with the effect for obesity being larger than the effect for being overweight. The results also show a negative association between BMI and the odds of employment for unconditioned women. The results for conditioned women suggest a lessening of the association rather than a strengthening. The coefficient for being overweight is positive, whilst the coefficient for being obese is negative. Moreover, there is a slight positive effect of BMI for conditioned women on employment. However, none of these coefficients for women are statistically significant in either the conditioned or unconditioned samples.

9. Discussion

The theoretical approach outlined in Section 3 implies that more extremely sensitive questions might be less affected by panel conditioning than more moderate questions. Self-reported height and bodyweight may cause embarrassment when posed, motivating respondents to mis-report in cross-sectional studies, but this motivation dissipates at a subsequent administration. The test of this approach controlled for survey context and all other conditions of the interview, varying only whether the questions were asked or not to respondents in the "conditioned" group. In this way, the design should evaluate the extent to which the questions themselves, as distinct from the survey experience, fosters more accurate reporting. Admittedly, validation data would be beneficial in evaluating the extent to which accurate reporting is obtained. Nevertheless, the nature of bias is established in the literature so one can surmise that, were conditioning to be ameliorative, then reporting in ways opposite to those biases would be observed for the conditioned treatment.

The results presented here are somewhat disappointing as very few findings reach statistical significance. Nevertheless, many of the findings – particularly for women – are in the directions hypothesised. Conditioned women tend to report being heavier and taller than unconditioned women – both of which are in directions contrary to the expected direction of bias. This suggests that conditioning does induce some degree of more accurate reporting, particularly for weight, amongst women. Consequently, heavier conditioned women tend to have a calculated body-mass that is about one point higher than unconditioned women. In terms of data quality, conditioned women are less likely to provide rounded bodyweights, (i.e. to the whole or half stone), they are less likely to non-respond when asked for their body weight, and they are more likely to have weighed themselves recently. Taken together, this all suggests that conditioning enhances the reporting of accurate data as compared to data reported by unconditioned women. Although all but the findings for self-reported bodyweight fail to reach statistical significance at normal levels, the findings align with the proffered theory. Therefore, the theory may have some relevance for women.

The set of effects for men are less easily interpreted than for women. While the results indicate that conditioned lightweight men tend to report lower weights than unconditioned men, conditioning seems to induce men across the distribution to report lower weights. As for height, conditioning leads to reporting of taller heights, not shorter as hypothesised. Consequently, conditioned men tend to have body-mass index values lower than unconditioned men across all points in the distribution of body-mass. If we consider that the nature of validation bias in self-

reported height and bodyweight for men is against being small or slight, the results for calculated body-mass would conform to the theory. That is, conditioned men report being more slight at all points in the distribution of body-mass than unconditioned men. Yet given that all but the results for tall men's height are not statistically significant and the results for height and bodyweight do not otherwise conform to prediction, the theory proffered in Section 3 would not seem to hold much salience for men.

The effects of obesity on employment should be affected by biases in self-reported height and bodyweight. If reports are biased towards cultural ideals, we might expect that effects would be attenuated as compared to those based on anthropometric measures of height and bodyweight. If conditioning reduces these biases, the effects should strengthen. The results presented here do not clearly support this idea. The results for men, though non-significant, do seem to align in the expected ways however. The coefficients for conditioned men are generally larger than for unconditioned men, though non-significant for either group. Even though panel conditioning does not seem to ameliorate the reporting bias we might expect for men given validation, the results for the effects on the relationship between obesity and employment seem to support the approach proffered in Section 3. On the other hand, the results for women's employment do not support these ideas. The coefficients for being overweight are of different sign across conditioning treatments, and the coefficient for being obese, though of the same sign, is of a lower magnitude amongst the conditioned sample as compared to the unconditioned sample. The fact that these results are not statistically significant does not help with interpretation. It would seem that, although there is some evidence that women's reporting of height and bodyweight may be more accurate, this increased accuracy does not lead to a strengthening of the association between obesity and employment as observed using anthropometric measures.

10. Conclusion

This paper examines whether panel conditioning ameliorates the effects of social desirable responding in panel surveys. The approach rests on the degree of threat posed by survey questions rather than the context in which they are asked. Sensitive questions can be more or less sensitive or sensitive in qualitatively different ways. Self-reported height and bodyweight are argued to be less threatening than most topics covered in the literature on social desirability. Panel conditioning is argued to lessen the threat of these questions and therefore reduce social desirability bias irrespective of continued participation and familiarity with the survey as others have argued. One strength of this research over previous examinations of panel conditioning is that it uses an experimental design to test these ideas. Though coefficients were generally found to not reach statistical significance, the theory seems to account for conditioning effects on women's self-reports better than men's.

This research is limited in that it does not address the full range of potentially sensitive questions. One extension would be to look at the effects of conditioning on a set of questions that vary in degree of sensitivity. If the theory holds, then highly sensitive questions should be more resilient to ameliorative panel conditioning.

Finally, researchers may interpret these data to mean that conditioning does not influence self-reported height and bodyweight at all. Moreover, one might conclude that the effects of conditioning on social desirable reporting do not influence the association between obesity and employment. Were this analysis replicated on the full *Understanding Society* sample, we may discover that these types of measurement problems are reassuringly small.

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Single-sex and co-educational secondary schooling: what are the social and family outcomes, in the short and longer term?

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Abstract

This paper considers the question of whether attending a single-sex or co-educational secondary school made any difference to a range of social outcomes for girls and boys at school, and for men and women as they progressed through the life course. We examine these questions using data from a large and nationally representative sample of British respondents born in 1958. The outcomes examined include whether or not the participants liked school; their histories of partnership formation and dissolution; childbearing; attitudes to gender roles; and well-being. Among the minority of outcomes showing a significant link to attending a single sex school were lower truancy, and for males, dislike of school, divorce, and malaise at 42 (if they had been to private or grammar schools).

Introduction

The vast majority of research papers which have been published on the question of the respective merits of single-sex and co-educational schooling have focussed primarily on aspects of academic attainment. This paper seeks to redress the imbalance by asking whether single-sex and co-educational secondary schooling were linked to a range of social outcomes, both during adolescence, and later in the life course.

The UK has a long history of single-sex education, and of debates around the issue of whether mixed or single-sex schooling is better. Traditionally, British secondary schools were single-sex. However, the progressive school movement in the early 20th century and Dale's later influential work (Dale 1969, Dale 1971, Dale 1974) both stressed the advantages of boys being educated with girls. Dale argued that boys did better academically in mixed schools, because girls' greater industriousness was communicated to them, and boys were spurred on by competition with the girls. However, academic attainment was not Dale's only, or perhaps even his central, concern. He was interested in relationships between the sexes, and in promoting what he saw as 'healthy' relationships. In Dale's view, mixed-sex schooling was more 'natural' and provided protection against homosexuality. He presented evidence suggesting that boys and girls in mixed schools had more positive and friendly attitudes towards one another, and that as adults they were more likely to believe in the equality of the sexes and to have happier marriages than graduates of single-sex schools. Much of this evidence was based on selected open-ended responses and there was no claim that the survey was representative. A study by Atherton (1973), using retrospective data, also suggested that men and women who had attended co-educational schools had happier marriages.

While we do not share Dale's 'normalising' of heterosexuality and denigration of singlehood and child-free living, his work does suggest interesting areas to explore regarding the effects of co-education in encouraging more friendly and egalitarian attitudes between the sexes and in terms of 'successful family formation', as does other work on the history of concern with single-sex schooling and homosexuality (see Faraday 1989). Dale's focus on happiness and relationships within the school is also something that could usefully be revived by researchers.

In the current policy context, both in the UK and in other Anglophone countries, there has been a revival of interest in single-sex groupings within mixed schools, largely driven by the moral panic about boys' 'underperformance' compared to girls in terms of academic attainment (Warrington and Younger 2003, Younger and Warrington 2006). There is an interesting tension between the perception that girls and girl-friendly pedagogy are holding boys back, and therefore boys would be better off being taught separately, and the familiar view that girls are a 'civilising influence' to be exploited for the benefit of the boys (Ivinson and Murphy 2007). At the same time, girls' schools continue to be relatively popular with parents, while boys' schools are struggling to survive in the quasi-market within the state system, and many boys' schools within the private sector are going mixed. Parents who choose single-sex schooling for their daughters invoke a range of discourses, and raise diverse issues including equal opportunities and anxieties regarding female sexuality, while the parents of boys often perceive co-educational schooling as a positive socialising force (Ball and Gewirtz, 1997). The social, rather than purely academic, aims of schooling are often invoked both by the supporters and by the opponents of single-sex schooling, yet this is an area where strong opinions thrive in the absence of much evidence.

Literature

A few studies have examined students' attitudes towards school and delinquency at school (Brutsaert 2006, Caspi 1995, Caspi et al 1993, Lee and Bryk 1986, Marsh 1989, Marsh 1991). However, no clear consensus emerges from this literature, partly because of the diverse range of outcome variables considered. As far as we are aware, no previous studies have examined the general well-being or mental health of children at single-sex or co-educational schools, or of adults, according to whether they attended single-sex or co-educational schools.

Family formation is another area that has been neglected by researchers. This is surprising in that family formation is often central to the arguments used by both sides in the single-sex debate. In particular, religious adherents of single-sex schooling, whether Catholic, Muslim, or from other traditions, are often concerned with (female) purity, and link the danger of promiscuity and teenage pregnancy to co-educational schooling. Feminists have also been troubled by the toleration of sexual harassment within co-educational schools. Conversely, proponents of co-educational schooling have hinted darkly that single-sex schooling promotes homosexuality; though this is linked particularly to the elite boarding schools (Lambert and Millham 1968). Yet reviews of studies of single-sex and co-educational schooling have found an absence of studies addressing the issues of teenage pregnancy or childbearing at any age, sexuality, partnerships and marriage (Mael et al 2005, Mael 1998).

It has been suggested that attitudes to gender equality may be affected by single-sex schooling. This can be argued either way. Co-educational schooling may lead to more egalitarian relationships, as argued by Dale. Alternatively, boys may assert their dominance in co-educational settings, perhaps with lasting consequences for the confidence of the girls (Spender and Sarah 1980). Feminists have also argued that girls in single-sex schools are exposed to more women in positions of leadership, which may affect their attitudes to gender roles. Yet we are not aware of any studies which examine adult attitudes to gender roles, or the quality of relationships between the sexes, although one past study in the US examines the incidence of divorce, and found no difference in the likelihood of remaining married to the first spouse for either men or women according to whether they had attended single-sex high schools (Riordan 1990).

This article reports on a wide-ranging study into the lifecourse consequences of single-sex schooling. Elsewhere, we have reported on the educational and

economic consequences of single-sex schooling (Sullivan 2009, Sullivan, Joshi and Leonard 2010, Sullivan, Joshi and Leonard 2011). In the current paper, we seek to make a substantial contribution to the neglected question of whether there are social consequences for individuals of attending single-sex or co-educational schools. As such, we cover a large amount of ground, summarising results regarding a range of outcomes, rather than restricting our focus to a particular area or age-range.

The dataset used in the current study has important advantages in addressing these questions. First of all, it allows us to address the issue of comparing like with like. Single-sex schooling was quite common for the British cohort born in 1958, rather than being the preserve of a particular social or religious group. In addition, our rich longitudinal data allows us to control for a wide range of characteristics of the children prior to their entry to secondary school. Furthermore, we are able to examine the responses of this cohort, not only during their school years, but also into their middle-age.

Research Questions

We examine whether single-sex or co-educational schooling is linked to a wide range of outcomes both during adolescence and later in life.

1. **Liking for school, behaviour and well-being during adolescence**
   a. Students' responses on whether or not they liked school: Dale's work (1969, 1971, 1974) suggests the hypothesis that boys and girls should prefer co-educational schooling.
   b. Self-reported truancy rates: traditional pro-single-sex arguments suggest that single-sex schools have an advantage in terms of discipline, which suggests the hypothesis that truanting should be less common at single-sex schools.
   c. Psycho-social adjustment at 16: advocates of co-educational schooling suggest that single-sex schooling can cause psychological damage, which suggests the hypothesis that behaviour problems should be worse at single-sex schools.
2. **Mental health in adulthood**
   Respondents' scores on Rutter's malaise inventory (Rutter et al 1970): advocates of co-educational schooling suggest that single-sex schooling can cause psychological damage, which suggests the hypothesis that people who have attended single-sex schools should have higher malaise scores. We look at the self-reported measure taken at age 42.
3. **Family formation and relationships**
   a. Having a child at all (by age 42): if co-educational schooling facilitates relationships between the sexes, this suggests the hypothesis that childbearing should be less likely for people who attended single-sex schools.
   b. Teenage childbearing: some advocates of single-sex schooling argue that co-educational schooling encourages early sexual activity. This suggests the hypothesis that the risk of teenage childbearing should be lower at single-sex schools.
   c. Age at first birth: as per 3a, this suggests the hypothesis that childbearing should be delayed for people who have attended single-sex schools.
   d. Marriage: opponents of single-sex schooling have suggested that it makes it more difficult for people to form relationships with the opposite sex. This suggests the hypothesis that marriage should be less likely for people who attended single-sex schools.
   e. Self-reported rating of quality of partnerships: following from the hypothesis above regarding marriage, this suggests that partnership quality should be lower for graduates of single-sex schools, which would be reflected in self-reported partnership quality.
   f. Responses regarding whether the respondent would choose the same partner again: as above, we hypothesize that respondents from single-sex schools should be less likely to say they would choose the same partner if they had their time again.

g. Divorce: following from the hypotheses above, we hypothesize that graduates of single-sex schools should be more likely to divorce.

4. Gender role attitudes and behaviour

a. Attitudes to women's employment: competing hypotheses have been put forward in this area. Advocates of co-educational schooling have suggested that it leads to more egalitarian attitudes, whereas advocates of single-sex schooling for girls have suggested that single-sex schooling gives girls more confidence in their equality with men.
b. Domestic division of labour: competing hypotheses apply here as above.

Data and Methods

The National Child Development Study (NCDS) is a longitudinal study of a single cohort born in Britain in a week of March 1958. The cohort members have been followed-up throughout their lives, most recently in 2008 when they were 50 years old.

The initial sample was designed to be nationally representative of all children in Britain, and achieved a sample size of 17,414 (Shepherd 1995). By the third follow up (sweep 3), when the children were aged sixteen, 14,761 respondents remained in the study. Hawkes and Plewis' (2006) examination of attrition and non-response in the NCDS finds few significant predictors of attrition, wave non-response, and missing education data, thus supporting the assumption of ignorable non-response. Neither parental education nor social class were significant predictors of non-response. The distribution of educational qualifications gained by the cohort members by age 33 was closely in line with other data sources (Dale and Egerton 1997).

Schools attended by the NCDS cohort

The NCDS cohort experienced a state secondary education system that was in transition from the tripartite system to the comprehensive system. Under the tripartite system, children sat an exam at age 11 (called the eleven-plus) which determined whether they would attend an academically selective Grammar or Technical school, or a Secondary Modern school, designed for the majority of students. Comprehensive schools, which were being introduced during the 1960s and 1970s, were intended to replace this selective system with all-ability schools. 58% of the NCDS respondents attended Comprehensive schools, but 11% still attended Grammar and Technical schools, 22% attended Secondary Modern schools, and 6% attended Private and Direct Grant schools. Private schools are fee-paying schools. Direct Grant schools were fee-paying, but had a proportion of state-funded places. Henceforth, we refer to Grammar and Technical schools as 'Grammar schools', and Private and Direct Grant schools as 'Private schools'. We exclude from our analyses the 26 students who attended schools classified as special or 'other'[i]. We also exclude respondents lacking in information on the sex composition or sector of school at age 16, leaving us with a sample of 12,320. Single-sex schooling was far more common than it is today. The proportion of students at single-sex schools ranged from 78% at Private schools to 13% at Comprehensives. Taken as a whole, a quarter of the cohort attended single-sex schools at age 16. This provides an advantage for our analysis, as, in school systems where single-sex schooling has become the preserve of a small minority, this makes it very difficult to compare like with like (Baker, Riordan and Schaub 1995).

It should be noted that, although we have both individual-level and school-level data, we are not able to identify whether students attended the same school as other members of the sample. The sample is not clustered, with students being sampled within schools. Instead, the sample consists of all children born in Britain in the relevant week. It is very likely therefore that many schools would be represented by a single sample member. It is therefore neither possible nor necessary to apply a multi-level statistical model to these data. A further limitation is that, due to the small numbers of ethnic minority individuals included in the NCDS, it is not possible to conduct analyses according to ethnic group.

Outcome Variables

Our analyses address the following outcome variables.

1. Liking school (age 16): cohort members were asked to respond to the statement 'I do not like

school' on a 5-point scale ranging from 'Not true at all' to 'Very true'.

2. Truancy (age 16): cohort members were asked whether they had stayed away from school at all that year when they should have been there (Yes/No).
3. Psycho-social adjustment (age 16): as an indicator of socio-emotional adjustment at age 16, we take the mother-reported version of the Rutter Child Scale (Rutter, Tizard and Whitmore 1970), summarised into externalising/aggression and internalising/anxiety scales after exploratory factor analysis (Joshi and Verropoulou 2000, McCulloch et al 2000).
4. Malaise (age 42): the Malaise Inventory is a 24-item scale designed to assess the tendency to depression or low mood (Rutter, Tizard and Whitmore 1970). The items in this scale range from relatively minor symptoms, e.g. 'Do you often have bad headaches?' to severe problems, e.g. 'Have you ever had a nervous breakdown?'
5. Childbearing: a. Child by 42; b. Child by 18; c. Age at first birth.
6. Marriage (by age 42)
7. Relationship quality 1 (age 42): cohort members who were married or cohabiting at 42 were asked to rate the quality of their relationship from 1 (extremely happy) to 7 (extremely unhappy).
8. Relationship quality 2 (age 42): cohort members who had a partner at 42 were also asked whether they ever regretted marrying/cohabiting with their partner, and whether they would marry/cohabit with the same person if they could have their time again. Response categories included: marry (or live with) current partner/ marry (or live with) a different partner/ not marry (or live as a couple) at all/ don't know.
9. Divorce (or separation) by age 42
10. Household division of labour (age 33). Cohort members who were married or cohabiting at age 33 were asked whether they or their partner most often carried out a range of household tasks including:
    - Preparing and cooking the main meal
    - Doing the shopping
    - Cleaning the home
    - Laundry and ironing

    Response categories included: I do most of it/ my partner does most of it/ we share more or less equally/ someone else does it.

11. Attitudes to women's employment (age 33). Cohort members responded to the following Likert scale items:

    I. There should be more women bosses in important jobs in business and industry.
    II. If a child is ill and both parents are working, it should usually be the mother who takes time off to look after the child.
    III. Being a housewife is just as fulfilling as working for pay.
    IV. Women should have the same chance as men to get some training or have a career.
    V. Men and women should do the same jobs around the house.
    VI. When both partners work full-time, the man should take an equal share of the domestic chores.
    VII. I would not want a woman to be my boss.
    VIII. It is less important for a woman to go out to work than it is for a man.
    IX. Wives who don't have to work should not do so.

A scale was constructed from these items (Cronbach's alpha=0.741), with higher scores corresponding to a more egalitarian attitude.

Control Variables

Previous studies of the effects of single-sex schooling have been criticised for inadequate controls for prior attainment and family background. Given the concentration of single-sex schools in the private and selective sectors, it is important to control for such sources of selectivity. The NCDS gives exceptionally rich information on various aspects of the respondents, their schools and their parents, allowing crucial confounding variables to be controlled. The parents were interviewed at the first three data collection exercises of the study, providing information on social background, age when parents left full-time education, and other characteristics.

Data were also collected directly from the children through tests and questionnaires administered at school at the ages of 7, 11 and 16. Extensive information on examination results was collected directly from the schools. From the age of 16 onwards, the respondents themselves were interviewed.

Our regression analyses include the following variables. The distribution of the control variables across single-sex and co-educational schools is shown in the appendix.

- Sex composition of school at age 16 (single-sex or co-educational).
- School sector at 16: (private, and selective and non-selective state schools). This is crucial, as it is linked to co-education.
- Region – data collected at age 16. This is included as a control variable, as it is a predictor of attending a single-sex school. This region variable is based on the Registrar General's Standard Region prior to 1965 (Elliott, Johnson and Shepherd 2009).
- Father's social class – age 11. Seven category version of the Hope-Goldthorpe scale. In the case of missing values on this variable (2,278 cases) we imputed the value from information on the father's social class at the two previous sweeps of the study, which left us with 355 cases with missing information on this variable. Missingness on this variable often predicts equally negative or even more negative outcomes than even the lowest social class category, therefore it is likely that data is missing 'Not at Random' (Rothon 2007). These cases are treated as a separate category.
- Parental educational level – age at which parent left full-time education, mothers' or fathers' age, whichever is highest. 2,657 missing values are treated as a separate category.
- Family structure (from 0-16), number of siblings (at 16) and position in the birth order.
- Test scores at age 7 and 11 (combined giving each component equal weight and transformed into Z scores). The NCDS cohort took a range of tests at ages 7 and 11 (Steedman 1980, 1983a, 1983b), listed below.

Age 7:

- Southgate Reading Test (Southgate, 1962) - a test of word recognition and comprehension.
- Copying Designs Test - an assessment of perceptuo-motor ability.
- Drawing-A-Man Test (Goodenough 1926) – designed to test general mental and perceptual ability.
- Problem Arithmetic Test (Pringle, Butler and Davie 1966).

Age 11:

- General Ability Test (Douglas 1964) - containing verbal and non-verbal sub-scales.
- Reading Comprehension Test - constructed by the National Foundation for Educational Research in England and Wales (NFER).
- Arithmetic/Mathematics Test - constructed by NFER.
- Teacher Assessments at 7 and 11 (combined giving each component equal weight and transformed into Z scores). The cohort members' primary school teachers were asked to give their assessment of the children at ages 7 and 11. Teachers' assessments may provide a source of information on aspects of students' abilities which are not measured by the survey test scores. Abilities were rated on a five point scale from 'exceptional' to 'very limited'. At age 7, children were rated on: reading, oral ability, creativity and number. At 11 they were rated on: number, book use and general knowledge.

Analysis Strategy

All regression analyses were run separately for men and women, and, due to the large number of regressions, null findings regarding the single-sex schooling variable are reported in the overall summary of results (Table 1) but not in full detail.

Table 1. Summary of single-sex coefficients from regression analyses

	Men				Women			
	B	**S.E.**	**sig**	**N**	**B**	**S.E.**	**sig**	**N**
Liking school	-0.188	0.078	**0.016**	5,794	-0.079	0.077	0.302	5, 590
Truancy	-0.154	0.078	**0.048**	5,888	-0.195	0.077	**0.011**	5, 665
Aggression (Rutter) age 16	0.087	0.095	0.358	4,952	0.079	0.101	0.437	4,811
Anxiety (Rutter) age 16	0.125	0.092	0.174	4,952	0.119	0.083	0.150	4,810
Malaise at 42	-0.391	0.23	0.089	4,227	0.091	0.152	0.55	4, 477
Child by 42	-0.026	0.098	0.792	4,843	-0.063	0.103	0.539	5,077
Child by 18	0.381	0.294	0.194	3,733	-0.043	0.155	0.782	4,208
Age of first birth	0.09	0.244	0.712	3,732	0.076	0.211	0.72	4,207
Marriage by age 42	-0.152	0.091	0.095	4,273	0.062	0.085	0.468	4,503
Ever wish never married	-0.028	0.101	0.779	3,430	-0.092	0.093	0.325	3,614
Relationship extremely happy	-0.025	0.11	0.82	2,851	-0.194	0.099	**0.050**	3,204
Divorce by 42	0.232	0.106	**0.028**	3,702	-0.514	0.241	0.033	4,036
Attitudes to gender equity age 33	0.011	0.245	0.965	4,031	0.059	0.204	0.772	4,372
Housework (I do most)	-0.089	0.716	0.902	3,279	0.069	0.093	0.46	3,629
Housework (partner does most)	0.001	0.104	0.994	3,279	1.101	1.622	0.497	3,629

Note. All regressions reported in Table 1 are binary logistic regressions, with the exception of the regressions on malaise at 42, age at first birth and attitudes to gender equity, which are linear regressions (OLS). B: Unstandardized B coefficient. S.E.: Standard Error

We tested for interactions between single-sex schooling and other variables in all models, and these interactions are reported where significant.

While regression analysis is a powerful tool, we would nevertheless caution the reader that, given a large enough number of independent significance tests carried out at the 0.05 level, some spurious 'significant' results are always possible. This paper reports on a large number of analyses, and we have reported (albeit in summary form) on a large number of null results, where we found no statistically significant impact of single-sex schooling on the outcome. We take the view that the null results are equally as important as the positive findings in their own right, and also that the presence of the null results puts the positive findings in context, given that we report here on analyses examining fifteen separate outcomes.

Results

In preliminary analyses, the predictors of attendance at a single-sex school have been modelled, and little difference was found in the prior characteristics of students at single-sex and co-educational schools within each school sector (Comprehensive, Grammar, Secondary Modern and Private). The only other important predictor of single-sex schooling is region. This suggests that the danger of spurious results due to differences between the pupil populations of single-sex and co-educational schools is minimal, provided that school sector and region are controlled. This finding may seem surprising, but makes sense in the context of schooling at the time, long before the 'parental choice', school diversity and accountability agendas arrived in Britain. Catchment area rules were strong during this period, and there was therefore relatively little scope for parents to choose schools within the

state sector. In principle, they could have movedhome in order to be near the school of their choice.Although this is a recognized practice now (Gewirtz, Ball and Bowe 1995, Gibbons and Machin 2006), the N

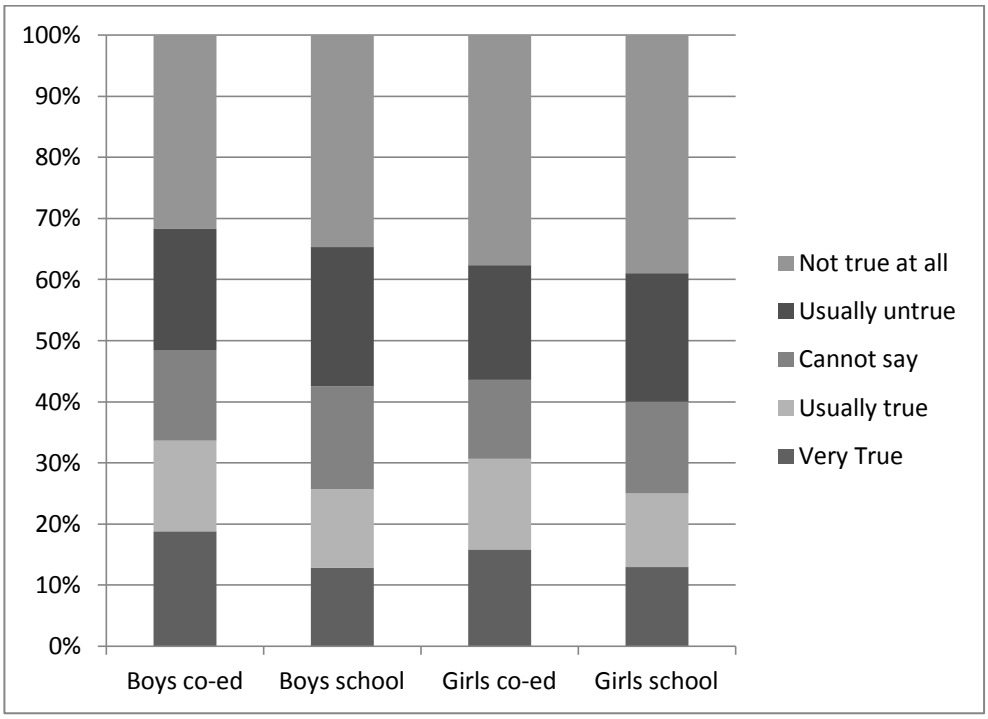
CDS children started secondary school in 1969, in a very different context. There were no 'league tables'of school examination results at this time, and school quality was not perceived to be very variable within each school sector. In addition, only 46% of the cohort members were living in owner-occupied properties in 1969, and 42% were in council housing, and therefore would not have been able to move easily.

1. Liking for school and behaviour during adolescence

Whether pupils liked school

Figure 1 shows a breakdown of cohort members' reported liking for school at age 16 according to the student's sex and whether they attended a single-sex or co-educational school.

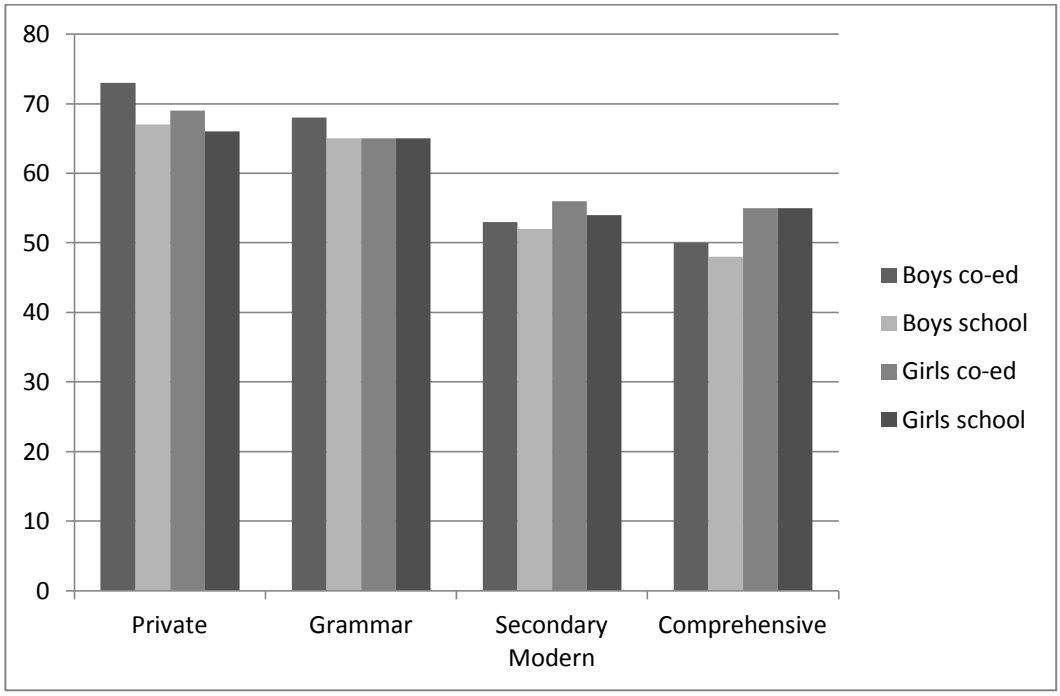
Figure 1. Students' responses to 'I do not like school', at age 16 (1974)



N = 11,688

Figure 1 appears to show that students were happier in single-sex schools. However, this is misleading because students in private and grammar schools were more likely to say that they liked school. Figure 2 below shows the proportions of students responding 'usually untrue' or 'not true at all' to the statement 'I do not like school' (i.e. those who generally liked school) by type of school.

Figure 2. Percentage liking school at age 16 by type of school (1974)



N = 11, 688

Students at private and grammar schools were most likely to say that they liked school, and students at comprehensives were slightly less likely to like school than students at secondary moderns. Girls liked school more than boys at comprehensives, but this was not true at private and grammar schools.

Within each school sector, there was therefore a slight tendency for students at co-ed schools to be more positive about school. This is in line with Dale's findings from his various surveys of grammar and former grammar school pupils. However, we found the differences to be slight in each sector and we did not find that girls were 'decidedly happier' in mixed schools (cf. Dale 1971).

Binary logistic regression analysis (Table 2) shows that, conditioning on background controls, the link between liking school and being at a single-sex school was statistically significant for boys, but not for girls. Boys who attended single-sex schools had 0.8 the odds of liking school of those who attended co-educational schools (an odds ratio of 1 represents parity). In addition, there were statistically significant school sector differences for boys but not for girls. Boys were more likely to like school within the private and grammar schools, and also within the secondary modern schools, as compared to comprehensives. This is an aspect of comprehensivisation which has not been uncovered by previous researchers, and it is certainly an intriguing finding. However, we can only speculate as to the reasons for boys' relative unhappiness within the comprehensive schools – the reasons may include such diverse factors as pedagogy and school size. Among the other variables for which we control in our model, being the first-born child was positively linked to liking school for both sexes, as were higher social class status, test scores and teachers' assessments. For boys, there was also regional variation, but this was not apparent for girls. Note that, in all the regressions reported here, missing values due to item non-response on regressors are included as dummy variables, but not shown unless the coefficient is statistically significant.

Table 2. Liking school, binary logistic regression

	Boys				Girls			
	B	**S.E.**	**Sig.**	**Exp(B)**	**B**	**S.E.**	**Sig.**	**Exp(B)**
Single-sex school	-0.188	0.078	**0.016**	0.828	-0.079	0.077	0.302	0.924
School sector			**0.003**				0.339	
Private	0.386	0.135	**0.004**	1.472	0.086	0.14	0.537	1.09
Grammar/Tech	0.22	0.109	**0.044**	1.247	-0.041	0.104	0.695	0.96
Secondary Modern	0.198	0.071	**0.005**	1.219	0.114	0.073	0.119	1.121
Region			0.126				0.771	
North Western	0.329	0.118	**0.005**	1.39	0.031	0.116	0.787	1.032
North	0.139	0.132	0.294	1.149	-0.125	0.134	0.35	0.882
Ridings	0.217	0.122	0.076	1.242	0.028	0.129	0.827	1.029
North Midlands	0.313	0.13	**0.016**	1.367	0.169	0.132	0.203	1.184
East	0.255	0.126	**0.043**	1.291	-0.114	0.128	0.371	0.892
London and South East	0.335	0.113	**0.003**	1.398	-0.05	0.115	0.661	0.951
South	0.341	0.141	**0.016**	1.406	0.022	0.141	0.876	1.022
South West	0.337	0.136	**0.013**	1.401	0.037	0.137	0.785	1.038
Midlands	0.128	0.122	0.297	1.136	-0.015	0.121	0.902	0.985
Wales	0.187	0.139	0.179	1.206	-0.034	0.143	0.812	0.966
Father's class			**0.002**				0.039	
Emp, manag 1	0.442	0.173	**0.011**	1.556	0.527	0.175	**0.003**	1.693
Emp, manag 2	0.229	0.115	**0.045**	1.258	0.154	0.117	0.19	1.166
Professional	0.374	0.156	**0.016**	1.453	0.275	0.163	0.092	1.317
Own account	-0.217	0.158	0.171	0.805	0.285	0.168	0.089	1.33
Non-manual	0.355	0.108	**0.001**	1.426	0.131	0.109	0.226	1.141
Skilled manual	0.148	0.083	0.076	1.159	0.018	0.083	0.83	1.018
Parents' age left FT education			0.121				0.028	
19+	0.249	0.12	0.038	1.283	0.26	0.12	0.03	1.297
17-18	0.096	0.088	0.276	1.1	0.178	0.091	0.051	1.195
16	-0.017	0.077	0.831	0.984	-0.034	0.077	0.655	0.966
Family structure			0.325				0.01	
Not 2 original parents	-0.149	0.1	0.134	0.861	-0.255	0.097	0.009	0.775
Siblings			0.293				0.061	
Only child	0.278	0.152	0.067	1.321	0.314	0.149	0.035	1.369
1 sib	0.019	0.101	0.849	1.02	0.141	0.1	0.159	1.152
2 sibs	-0.05	0.1	0.615	0.951	0.086	0.1	0.39	1.089
3 sibs	-0.053	0.105	0.609	0.948	-0.057	0.104	0.58	0.944
Position in birth order			**0.000**				**0.021**	
first born	0.469	0.131	**0.000**	1.598	0.329	0.125	**0.009**	1.39
2	0.28	0.129	**0.030**	1.323	0.141	0.124	0.258	1.151
3	0.117	0.138	0.396	1.124	0.111	0.133	0.406	1.117
Test score 7 (z score)	-0.035	0.037	0.349	0.966	-0.019	0.038	0.617	0.981
Teacher assessment 7 (z score)	0.11	0.039	**0.005**	1.117	0.054	0.041	0.182	1.056
Test score 11 (z score)	0.198	0.046	**0.000**	1.218	0.126	0.049	**0.010**	1.135
Teacher assessment 11 (z score)	0.077	0.044	0.081	1.08	0.149	0.047	**0.001**	1.161
Constant	-0.287	0.187	0.126	0.751	0.146	0.191	0.445	1.157
Chi-square	416.1				267.9			
N	5794				5590			

Truancy

16 year-olds were asked whether they had truanted at all during the last year. Both boys and girls were less likely to report truanting from private and grammar schools, and single-sex schooling too was significantly associated with a lower likelihood of reported truanting, conditioning on school sector and other background controls (Table 3). There was regional variability in the level of truanting for both sexes. Both boys and girls were less likely to truant in London and the South-East (compared to Scotland), and for girls, several other regions also had lower relative levels of truanting. Both girls and boys from professional social class backgrounds and with parents who had stayed in education beyond the age of 16 were less likely to truant. Girls from single parent or divorced families were more likely to truant, but this was not significant for boys. Smaller numbers of siblings and a higher position in the birth order were protective for both sexes. Surprisingly, girls with high test scores at age seven had an increased risk of truancy, while those with high test scores at age eleven had a reduced risk of truancy. For boys, a positive teacher assessment at age seven was linked to a lower risk of truancy.

Table 3. Truancy, binary logistic regression

	Boys				Girls			
	B	**S.E.**	**Sig.**	**Exp(B)**	**B**	**S.E.**	**Sig.**	**Exp(B)**
Single-sex	-0.154	0.078	**0.048**	0.857	-0.195	0.077	**0.011**	0.823
School			**0.000**				**0.000**	
Private	-1.005	0.142	**0.000**	0.366	-0.922	0.146	**0.000**	0.398
Grammar/Tech	-0.463	0.108	**0.000**	0.630	-0.477	0.103	**0.000**	0.621
Secondary Modern	-0.095	0.071	0.181	0.910	-0.095	0.073	0.194	0.910
Region			**0.010**				**0.000**	
North Western	0.111	0.118	0.348	1.117	0.460	0.117	**0.000**	1.585
North	-0.119	0.132	0.364	0.888	0.144	0.134	0.282	1.155
Ridings	-0.162	0.122	0.183	0.850	0.098	0.128	0.444	1.103
North Midlands	-0.053	0.129	0.685	0.949	0.085	0.131	0.518	1.088
East	-0.025	0.126	0.843	0.975	0.515	0.128	**0.000**	1.674
London and South East	0.302	0.113	**0.007**	1.353	0.584	0.115	**0.000**	1.794
South	-0.020	0.140	0.885	0.980	0.451	0.141	**0.001**	1.570
South West	-0.045	0.135	0.741	0.956	0.502	0.137	**0.000**	1.653
Midlands	0.052	0.122	0.672	1.053	0.415	0.122	**0.001**	1.514
Wales	0.067	0.139	0.631	1.069	0.535	0.144	**0.000**	1.707
Father's class			**0.000**				**0.004**	
Missing	0.342	0.174	**0.050**	1.407	-0.024	0.182	0.894	0.976
Emp, manag 1	-0.353	0.172	0.040	0.702	-0.335	0.168	0.046	0.715
Emp, manag 2	-0.217	0.114	0.057	0.805	-0.226	0.117	0.053	0.797
Professional	-0.544	0.157	**0.001**	0.580	-0.418	0.164	**0.011**	0.658
Own account	0.217	0.161	0.177	1.243	-0.280	0.166	0.092	0.756
Non-manual	-0.365	0.107	**0.001**	0.694	-0.177	0.109	0.103	0.838
Skilled manual	-0.142	0.083	0.088	0.868	0.064	0.084	0.449	1.066
Parents' age left FT education			**0.031**				**0.000**	
19+	-0.287	0.119	**0.016**	0.750	-0.377	0.118	**0.001**	0.686
17-18	-0.202	0.087	**0.021**	0.817	-0.329	0.090	**0.000**	0.719
16	0.007	0.077	0.929	1.007	-0.022	0.077	0.778	0.978

(Table 3 cont'd)

Family structure			0.066				**0.000**	
Missing	0.105	0.107	0.328	1.111	0.359	0.116	**0.002**	1.432
Not 2 original parents	0.226	0.100	**0.024**	1.254	0.329	0.098	**0.001**	1.390
Siblings			**0.007**				**0.000**	
Only child	-0.274	0.148	0.064	0.761	-0.448	0.146	**0.002**	0.639
1 sib	-0.239	0.100	**0.018**	0.788	-0.425	0.101	**0.000**	0.654
2 sibs	-0.068	0.100	0.493	0.934	-0.235	0.100	**0.019**	0.791
3 sibs	0.092	0.105	0.379	1.097	-0.017	0.106	0.875	0.984
Position in birth order			**0.001**				**0.041**	
missing	-0.811	0.217	**0.000**	0.445	-0.304	0.223	0.172	0.738
first born	-0.478	0.133	**0.000**	0.620	-0.344	0.129	**0.008**	0.709
2	-0.403	0.131	**0.002**	0.668	-0.207	0.128	0.107	0.813
3	-0.254	0.140	0.069	0.775	-0.132	0.137	0.338	0.877
Test score 7 (z score)	0.069	0.037	0.063	1.071	0.173	0.038	**0.000**	1.189
Teacher assessment 7 (z score)	-0.111	0.039	**0.004**	0.895	-0.036	0.041	0.372	0.964
Test score 11 (z score)	-0.088	0.046	0.055	0.916	-0.141	0.049	**0.004**	0.869
Teacher assessment 11 (z score)	-0.062	0.044	0.160	0.940	-0.034	0.047	0.471	0.967
Constant	0.391	0.188	0.038	1.478	0.306	0.194	0.115	1.357
Chi-square	513.839		0.000		475.685		0.000	
N	5, 888				5, 665			

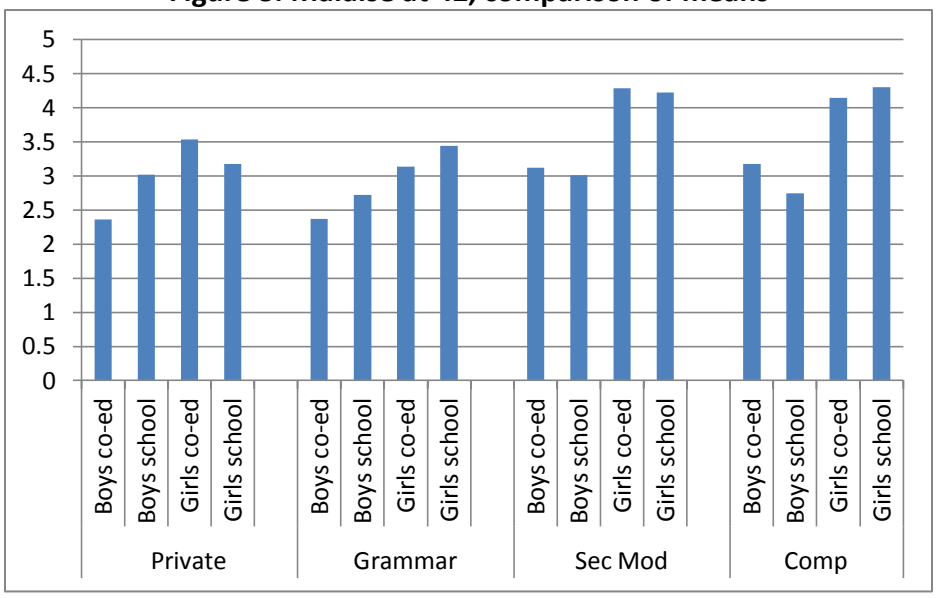
Psycho-social adjustment

As Table 1 shows, we found no impact of single-sex schooling on parent ratings of cohort members' anxiety or aggression at age 16.

2. Mental health in adulthood

Figure 3 shows that mean scores on the Malaise Inventory (range 0-24) at age 42 were higher for women than for men. Women from comprehensive and secondary modern schools had higher scores than those from private and grammar schools, but there was little variability according to whether the school attended had been single-sex or co-educational. However, for men from the private and grammar sectors, Malaise scores were higher if they had been to the single-sex schools.

Figure 3. Malaise at 42, comparison of means



Linear regression analysis (Table 4) of the Malaise scores at 42 showed that, conditioning on background controls, there was a significant interaction between school sector and single-sex schooling, ie men who had attended single-sex boys' schools in the private and grammar sectors suffered from slight (1.2 points and 0.8 points for private and grammar school boys respectively on a 19 point scale) but statistically significantly higher levels of low mood than their peers from comprehensive schools. It should be noted that there was no main effect of single-sex schooling for either sex – i.e. single-sex schooling did not predict either higher or lower levels of Malaise scores overall. The interaction between school sector and school sex for men is intriguing, and suggests that different **school** cultures and practices within the boys' private and grammar schools must be implicated in this small effect, rather than just single-sex schooling per se.

For women, father's social class status was highly significant, as fathers with higher social class occupations were predictive of a lower risk of Malaise at age 42 for daughters. In contrast, father's social class had no significant effect on this outcome for men. For women, but not for men, higher test scores at age eleven were a significantly protective factor. For men living with the same two parents to age 16, and being an only child were protective, but these factors were not significant for women.

Table 4. Malaise at age 42, linear regression, ordinary least squares (OLS)

	Men			**Women**		
Parameter	**B**	**Std. Error**	**Sig.**	**B**	**Std. Error**	**Sig.**
Single-sex	-0.391	0.23	0.089	0.091	0.152	0.55
Private	-0.548	0.41	0.182	-0.432	0.269	0.108
Grammar/tech	-0.325	0.277	0.24	-0.168	0.203	0.407
Secondary Modern	-0.132	0.149	0.376	-0.002	0.146	0.991
Private SS	1.243	0.507	**0.014**			
Private co-ed	0					
Grammar SS	0.777	0.387	**0.045**			
Grammar co-ed	0		.			
Sec mod. SS	0.317	0.349	0.364			
Sec mod co-ed	0					
Comp boys	0					
Comp co-ed	0					
Region						
North Western	-0.198	0.223	0.374	0.085	0.235	0.717
North	-0.007	0.246	0.977	-0.084	0.269	0.756
Ridings	-0.035	0.23	0.88	0.165	0.26	0.525
North Midlands	-0.027	0.238	0.911	0.021	0.265	0.936
East	-0.158	0.23	0.493	-0.06	0.257	0.816
London and South East	-0.129	0.211	0.541	0.138	0.23	0.547
South	-0.283	0.257	0.272	-0.144	0.282	0.611
South West	-0.138	0.249	0.581	-0.198	0.271	0.463
Midlands	0.031	0.231	0.892	-0.124	0.248	0.616
Wales	0.103	0.254	0.684	0.139	0.283	0.623
Father's class						
Emp, manag 1	-0.366	0.302	0.225	-0.484	0.321	0.132
Emp, manag 2	-0.042	0.211	0.844	-0.909	0.231	**0.000**

(Table 4 cont'd)

Professional	0.141	0.272	0.603	-0.869	0.312	**0.005**
Own account	-0.032	0.301	0.916	-0.706	0.325	**0.030**
Non-manual	-0.116	0.199	0.56	-0.655	0.214	**0.002**
Skilled manual	-0.041	0.155	0.789	-0.447	0.167	**0.007**
Parents' age left FT education						
19+	-0.128	0.215	0.552	-0.038	0.23	0.869
17-18	0.016	0.163	0.922	-0.213	0.179	0.234
16	0.167	0.146	0.25	-0.061	0.154	0.691
Family structure						
Not 2 original parents	0.61	0.188	**0.001**	0.249	0.191	0.192
Siblings						
Only child	-0.611	0.27	**0.024**	0.248	0.287	0.387
1 sib	-0.234	0.19	0.219	-0.2	0.201	0.322
2 sibs	-0.13	0.189	0.49	-0.099	0.2	0.619
3 sibs	-0.002	0.196	0.991	0.034	0.21	0.873
Position in birth order						
first born	-0.247	0.249	0.32	-0.135	0.249	0.589
2	-0.137	0.244	0.573	0.188	0.248	0.449
3	0.402	0.261	0.123	0.133	0.266	0.617
Teacher assessment 11 (z score)	-0.141	0.081	0.081	-0.065	0.092	0.479
Test score 11 (z score)	-0.098	0.086	0.251	-0.382	0.097	**0.000**
Test score 7 (z score)	-0.029	0.069	0.672	0.003	0.076	0.966
Teacher assessment 7 (z score)	-0.064	0.072	0.380	-0.032	0.081	0.692
Constant	3.774	0.366	0.000	5.2	0.392	0
R2	0.029			0.039		
N	4, 227			4, 477		

3. Family formation and relationships

Childbearing

Regression analyses (summarised in Table 1) on outcomes for men and women show no link between single-sex schooling and either the chance of having a child by age 42, or age of first childbearing (for details of these variables see Kneale 2010. Despite the views of religious opponents of mixed schooling for adolescents, we found no significant deterrent effect of single-sex schooling on teenage parenthood for either girls or boys.

Marriage

In the 1958 cohort, the vast majority of those who formed any partnership eventually married. We found no link between single-sex schooling and the chances of marriage by the ages of 33 or 42 (see Table 1).

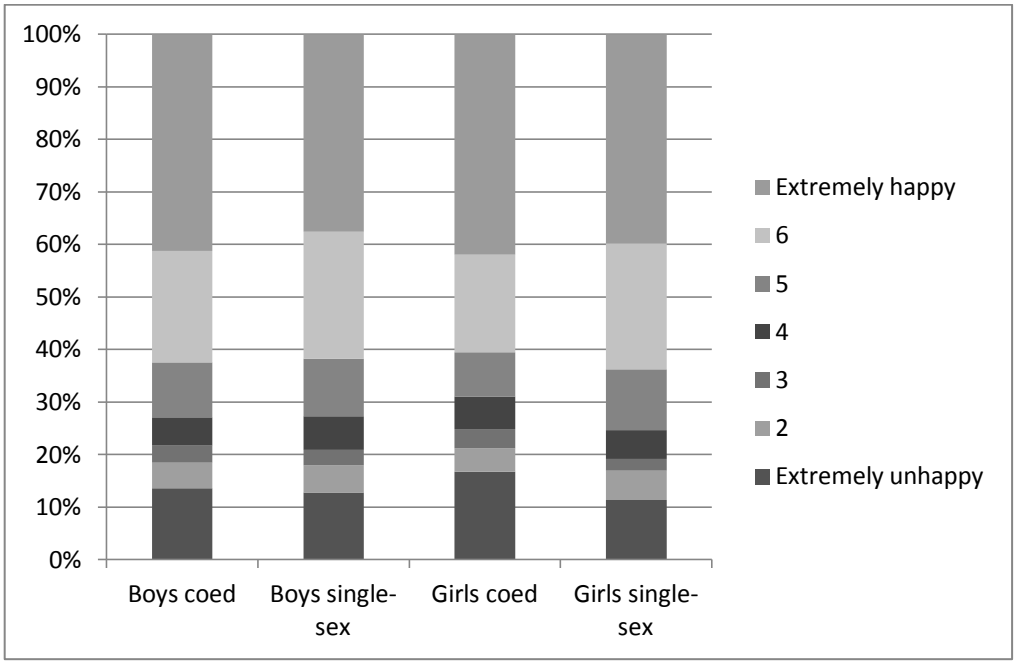
We looked for evidence of same-sex relationships in household composition, but such cases were far too rare - only 21 men and 22 women reported living with same-sex partners at age 42 - to be a reliable indicator of sexual orientation, let alone a basis for analysis. We are therefore unable to comment on whether co-education did provide the 'clean, healthy natural atmosphere' so commended by its early advocates (see (Dyhouse 1985) on the Progressive Education Movement).

Relationship quality

Cohort members who were married or cohabiting at 42 were asked to rate the quality of their current relationship. 47% of both men and women reported that their relationship was extremely happy. Figure 4 shows these responses according to whether the

respondent had attended a single-sex school. Men and women who had attended single-sex schools were fractionally more likely to say that they were extremely happy in their relationship. However, we modelled this outcome using binary logistic regression (modelling 'extremely happy' in contrast to any other response) and found that the coefficient for single sex schooling was negative for both sexes, but not statistically significant for men. For women, it just achieved statistical significance at the 0.05 level (see Table 1).

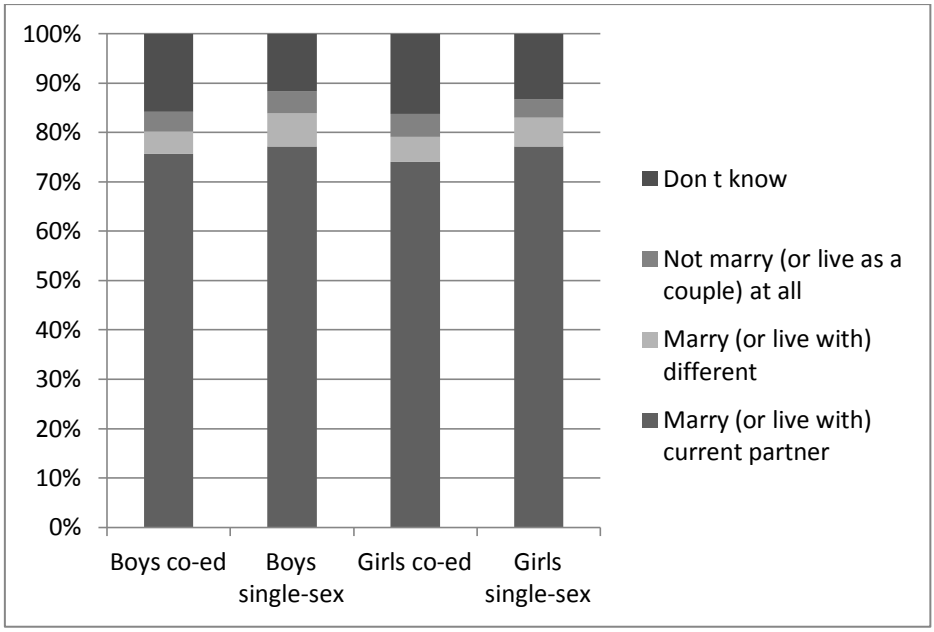
Figure 4. How happy is your relationship? Age 42 (2000).



N = 7,165

Respondents who had a partner at 42 were also asked whether they ever regretted marrying/cohabiting with their partner, and whether they would marry/cohabit with the same person if they could have their time again. The responses to this question are shown in figure 5. Around three quarters of the respondents said that, if they had their time again, they would marry or cohabit with their current partner. Positive responses were slightly higher for men and women who had attended single-sex schools. However, when we modelled the outcome using binary logistic regression, we found that there was no statistically significant link in the responses between single-sex schooling and the quality of partnerships as measured in this way - hence no support on this measure for co-education improving the relationship between spouses (see Table 1).

Figure 5: 'If you could live your life again, which would you do…?' Age 42 (2000)



N = 7,166.

Divorce

When we examined the risk of divorce or separation by age 42 for those who had ever been married, men who had been to single-sex schools appeared to be somewhat more likely to have divorced or separated, except in the private sector (Figure 6).

Figure 6. Divorce by 42 (of those ever married)

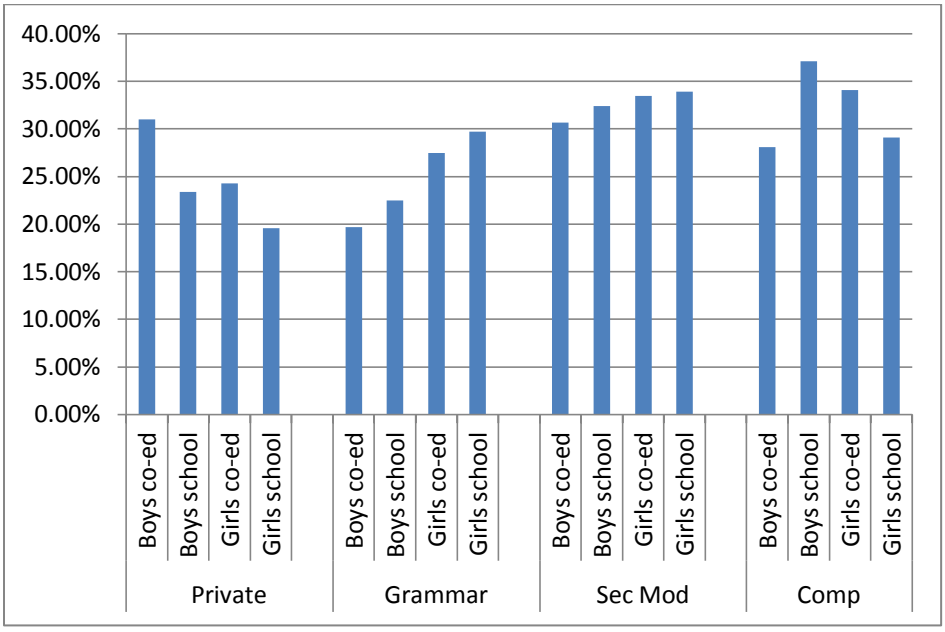


Table 5. Divorce by age 42, Binary logistic regression.

	Men				Women			
	B	**S.E.**	**Sig.**	**Exp(B)**	**B**	**S.E.**	**Sig.**	**Exp(B)**
Single-sex	0.232	0.106	**0.028**	1.261	-0.09	0.095	0.346	0.914
School sector			0.654				**0.045**	
Private	-0.135	0.184	0.463	0.873	-0.512	0.189	**0.007**	0.6
Grammar/tech	-0.182	0.15	0.226	0.834	0.005	0.129	0.971	1.005
Secondary Modern	-0.044	0.096	0.651	0.957	-0.021	0.088	0.808	0.979
Region			**0.000**				0.290	
North Western	0.442	0.165	**0.008**	1.555	0.056	0.148	0.707	1.057
North	0.072	0.188	0.702	1.074	-0.13	0.17	0.444	0.878
Ridings	0.314	0.172	0.068	1.369	0.248	0.159	0.119	1.282
North Midlands	0.738	0.171	**0.000**	2.092	0.177	0.165	0.282	1.194
East	0.357	0.173	**0.039**	1.429	0.327	0.158	**0.039**	1.387
London and South East	0.252	0.16	0.115	1.287	0.073	0.145	0.617	1.076
South	0.272	0.195	0.162	1.312	0.098	0.177	0.580	1.103
South West	0.686	0.181	**0.000**	1.986	0.268	0.167	0.109	1.307
Midlands	0.338	0.171	**0.048**	1.402	0.051	0.155	0.744	1.052
Wales	0.578	0.183	**0.002**	1.783	0.063	0.177	0.721	1.065
Father's class			0.149				0.059	
Emp, manag 1	0.031	0.215	0.886	1.031	0.002	0.199	0.990	1.002
Emp, manag 2	-0.434	0.158	0.006	0.648	-0.288	0.145	**0.047**	0.749
Professional	-0.26	0.208	0.211	0.771	-0.525	0.217	**0.015**	0.592
Own account	0.001	0.214	0.998	1.001	-0.34	0.205	0.098	0.712
Non-manual	-0.247	0.145	0.088	0.781	-0.043	0.129	0.739	0.958
Skilled manual	-0.083	0.108	0.442	0.92	-0.125	0.1	0.213	0.883
Parents' age left FT education			0.624				0.530	
19+	-0.083	0.165	0.616	0.92	-0.112	0.151	0.460	0.894
17-18	-0.01	0.120	0.935	0.99	0.026	0.111	0.816	1.026
16	0.093	0.104	0.367	1.098	-0.106	0.095	0.264	0.90
Family structure			0.517				0.025	
Not 2 original parents	0.153	0.134	0.253	1.166	0.307	0.114	**0.007**	1.359
Siblings			0.799				0.670	
Only child	-0.099	0.195	0.613	0.906	-0.001	0.177	0.995	0.999
1 sib	-0.158	0.137	0.248	0.854	0.078	0.125	0.534	1.081
2 sibs	-0.053	0.135	0.696	0.949	-0.014	0.125	0.909	0.986
3 sibs	-0.03	0.139	0.83	0.971	0.157	0.129	0.226	1.169
Position in birth order			0.272				0.459	
first born	0.104	0.177	0.554	1.11	0.113	0.154	0.464	1.119
2	-0.043	0.173	0.802	0.957	-0.018	0.154	0.906	0.982
3	-0.086	0.185	0.643	0.918	0.028	0.164	0.864	1.029
Test score 7 (z score)	0.09	0.051	0.077	1.094	0.037	0.047	0.427	1.038
Teacher assessment 7 (z score)	-0.063	0.054	0.24	0.939	-0.026	0.05	0.607	0.974
Test score 11 (z score)	-0.092	0.063	0.142	0.912	-0.059	0.06	0.327	0.943
Teacher assessment 11 (z score)	-0.086	0.06	0.151	0.917	-0.049	0.058	0.399	0.953
Constant	-0.888	0.262	0.001	0.411	-0.514	0.241	0.033	0.598
Chi-square	104.3		0.000		74.972		0.002	
N	3,702				4,036			

Regression analyses (Table 5) conditioning on background controls show that there was a statistically significant increased risk of divorce or separation for men from single-sex schools, but no interaction with school sector. Men who had been to boys' schools at age 16 had odds of divorce 1.26 time those of other men, all else equal. For women, however, there was no significant link. In this model, women who had attended private schools appeared less likely to get divorced (60% of the odds for those attending comprehensive schools). Higher paternal social class status was somewhat protective for both women and men. Being from a single-parent or divorced family was linked to a higher risk of divorce for women (Odds ratio =1.36), but, surprisingly, not for men.

4. Gender role attitudes and behaviour

Division of labour in the home and attitudes to women's employment

At age 33, cohort members who were married or cohabiting were asked about division of labour in the home. 45% of women reported that they did most of the work in all four key areas of household tasks (cooking the main meal, laundry, cleaning and shopping). 39% of men reported that their partner did most of the work in all of these tasks. 86% of men said that they did most of none of these tasks, and 88% of women said their partners did not do most of these tasks. We modelled the likelihood both of respondents reporting that they did most of the work on the majority of these tasks, and of the partner doing most of the work, and found no link between single-sex schooling and the domestic division of labour (Table 1).

At this age the survey members also responded to a series of nine items on gender and work, such as 'there should be more women bosses', 'men and women should do the same jobs', 'where both partners work full-time, housework should be shared equally', etc. We again found no link between single-sex schooling and attitudes to gender roles on these measures (Table 1).

Conclusions

For boys, single-sex schooling was linked to a dislike of school. The fact that school sector was linked to the likelihood of liking school for boys but not for girls, with boys less happy at comprehensive schools, is intriguing. Although we can only offer tentative explanations for this finding, it does point to the possibility that ostensibly the same school structures and practices can be experienced differently by boys and girls. Research which fails to analyse outcomes for girls and boys separately will not pick up on the intersection of gender and school structures in producing outcomes, whether these are purely academic outcomes or the wider outcomes we have considered here. It is also notable that a great deal of research was carried out on the question of the effects of comprehensivisation on academic outcomes, but, as far as we are aware, little consideration has been given by researchers to the question of pupils' liking for school within the different school sectors.

We found that both sexes were less likely to truant from single-sex schools. It seems implausible that pupils truanted from school as a direct consequence of the presence of the opposite sex. Rather, this may reflect the different cultural and disciplinary regimes prevailing within single-sex and co-educational schools at the time. It is possible that this also in turn accounts for boys' greater dislike of single-sex schools.

There was no main effect of single-sex schooling on the experience of malaise in adulthood, although, for men, there was an interaction between single-sex schooling and school sector. The higher risk of malaise was limited to boys' private and grammar schools, and suggests that different school cultures and practices within the boys' private and grammar schools must be implicated, rather than just single-sex schooling per se.

There were a large number of outcomes for which we could show no effect of attending a single-sex school. Perhaps surprisingly, teenage pregnancy was no more or less likely for respondents from single-sex schools. There was no difference in the likelihood of having children, or in the age of first childbirth, according to whether the respondent had been to a single-sex or a co educational school. Neither

attitudes to working women, nor the domestic division of labour, were linked to attendance at a single-sex school, for either men or women.

There was little link between single-sex schooling and reported relationship quality for either sex (there was a marginally significant one for women). However, for men, there was a statistically significant link between single-sex schooling and divorce. This lends some support to those who have expressed concerns about the impact of single-sex schooling on later relationships between the sexes, though it is unclear why this impact on divorce should be limited to men.

It is usually positive research findings which generate the most interest. However, it is important not to lose sight of the fact that most of our results showed no significant difference between people who had attended single-sex and co-educational schools. Overall, then, we can conclude that single-sex schooling had less impact on many of the outcomes considered here than might have been expected by either the proponents or the opponents of single-sex schooling.

Of course, our results relate to schooling in a particular historical period in Britain, and clearly both co-educational and single-sex schools have changed since the 1970s. Equally, both co-educational and single-sex schools differ in different national contexts. One major change is that many single-sex schools now have mixed 'Sixth forms' (the non-compulsory final two years of schooling, from 16 to 18). This allows students to mix with the opposite sex before leaving school, and may make future relationship difficulties less likely.

From a policy perspective, social impacts on children need to be considered alongside the academic and economic outcomes. Our previous work (Sullivan, 2009, Sullivan, Joshi and Leonard, 2010, Sullivan, Joshi and Leonard, 2011) has suggested that girls who had attended single-sex schools fared well in examinations at age 16, compared to girls who had attended co-educational schools, and that girls who had attended single-sex schools also went on to earn higher wages later in life. Also, both self-concept and participation in maths and science, English and modern languages, were more starkly gendered for boys and girls in the co-educational schools. Clearly, single-sex schooling had advantages for this cohort, especially for the girls. The difficulty is to weigh these advantages against the relatively moderate social disadvantages which are more apparent for boys than for girls, including a dislike of school and a higher risk of divorce. For a previous generation of 'progressive' educationalists, the answer to this dilemma was clear – boys' well-being trumped girls' academic attainment. However, these social disadvantages may not be an inevitable consequence of single-sex schooling. No doubt social outcomes varied on an individual school level, and it is unfortunate that our data do not allow us to investigate this variability. We are also conscious that our findings raise many questions regarding the daily lived experiences underpinning the aggregate differences that we observe here. We hope that future research will be able to take up the issues raised by our findings, and develop them using both quantitative and qualitative school-level data.

Acknowledgements

This paper is dedicated to the memory of our colleague Diana Leonard who worked with us on this project before her death in 2010. Professor of Sociology of Education and Gender at the Institute of Education, University of London, Diana Leonard, 1941-2010, was a leading international figure in feminist sociology, whose other work spanned theoretical, qualitative and practical fields. Her published books include *Sex and generation: a study of courtship and weddings* (1980), *Familiar Exploitation:* a new analysis of marriage in contemporary *western societies* (with Christine Delphy) (1992); and *A Women's Guide to Doctoral Studies* (2001). She was on the publishing collective of the radical feminist magazine *Trouble and Strife,* and an adviser on women's education in Pakistan. Her participation in the research reported here was her first venture into quantitative longitudinal studies to which she brought enthusiasm and cross-disciplinary insight.

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Endnote

[i] A third of boys attending special schools in 1974 were in single-sex establishments, compared to 11% of girls in special schools. These schools catered for children with particular disabilities, abilities or problems

Changing times, life course shifts: response to the Review Consortium on 'A Companion to Life Course Studies: the Historical Context of the British Birth Cohort Studies'

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Compiling a book with the title "A Companion to Life Course Studies" as applied to the 'British Birth Cohort Studies' was a challenging enterprise. The British birth cohort studies chart, effectively, the lives of a series of generations born since the Second World War, each in their own way reflecting the different sets of economic and political circumstances, and scientific and technological innovations to which these generations were exposed. At the same time, all the members of the cohorts were subject to the same sets of 'period' effects but at different ages. And each starting off at a different time experienced different circumstances at the same ages as they got older – 'age and cohort effects'. The challenge is in distinguishing one effect from another as exemplified by uncertainties about where the line was to be drawn between generations. The book identifies four: 'Adversity to Affluence', ('never had it so good') or 'Baby Boomers' (1946-1960), 'Permissive Society' (1960-1970), 'Individualised Society' (1975-1990), 'Digital World' (1990 to present day). Determining what in the external environment was bringing about the change depends on the age and life course stage at which we observe them.

John Welshman's (2011) review of our book expresses disappointment with the broad backcloth approach adopted. But it is difficult to see how the objective of framing or contextualising cohort members' lives could have been achieved without it. Welshman argues that the book should have focused much more on what amounts to the interaction between individual lives in the different cohorts and their historical context, shifting attention throughout much more to the cohort members themselves and their life histories, and away from the context itself. But that would have required our authors to have had access to two sets of expertise, historical and scientific, making the point that these are usually to be found on parallel rather than intersecting tracks. It is also exactly what the book argues for: namely much more inter-cohort comparative analysis which not only takes into account, but also makes use of, the cohort differences in exposures. Our purpose was to inform those who analyse birth cohort data about the contextual effects on life course development and to encourage new analyses that would make more effective use of them.

The three contributors to the Book Review Symposium *A Companion to Life Course Studies: the social and historical context of the British birth cohort studies,* John Goldthorpe (2011), Emily Murray, (2011)and Barbara Maughan (2011), by and large, accept the book as presented. Its seven chapters set out in the domains of politics, family, economy, education, employment and skills, health, and leisure, an historical overview of what was happening over the period 1946 to 2010, as the different birth cohorts experienced them. Information about the cohorts' progression over the whole period is supplied in a potted history of the studies (1946, 1958, 1970, Avon, and Millennium cohort studies) in the initial overview chapter of the book and returned to in the final chapter. That chapter brings together the main cross-cutting themes of the preceding chapters and offers, beyond that, a more speculative appraisal of next research steps. The themes start with 'life course and generation', then range through 'shifting boundaries', 'collectivism' versus 'individualism', 'science and technology revolution', 'disadvantage, social mobility and inequality', 'individualisation and risk' and 'cultural and recreational continuity and change'. The research ideas are organised under the seven life domains that structure the historical accounts.

The authors were invited to contribute to the book as experts on the history of the period encompassed by their specialist topic areas - hence their relatively limited knowledge, for the most part, of the detailed findings of each cohort study. This is other than the few words addressed to them, with our help, at the end of each chapter - re-enforcing the point that although separated, how vitally connected the two aspects, history and individual experience as captured by the changing life course, really are.

Different life courses, begun at different times, will have been shaped differently by the external context starting from conception or, in some respects, the context of their parents' generation.

In their reviews, both Goldthorpe and Maughan helpfully differentiate historical change that is step-like, sudden or acute, from that which is continuous or more gradual. They each identify the step-change historical period effect as offering opportunities for 'before and after' studies of the impact of change. That kind of research can, of course, be undertaken in a study of a single population. The British cohort studies together offer, across a series of cohorts spanning 50 years, the opportunity for comparison of life courses and capital acquired (human, educational, social, psychological, economic and health) pre-change circumstances, with those whose experience was entirely post-change. For example, the cohort at secondary schools when the selective secondary system was predominant, can be compared with cohorts educated in the comprehensive system and those whose experience was only partial, as Local Education Authorities took different amounts of time to implement the change and some never did.

In other words comparative inter-cohort studies provide the opportunity to ask, in the sense of a 'natural experiment', how policy influenced the lives of individuals in the long-term. Murray's review suggests the value, for policy impact studies, of knowing the developmental and health histories of those growing up in areas that later became prime targets of de-industrialisation. Such histories could then be compared with those of others in the same cohort, who had grown up in more stable areas.

Equally there is unique research value in the opportunity to compare the effects of what Goldthorpe in his review calls continuous, directional historical change. For example, mental and physical health across the life course of those who grew up in the immediate post-war period of predominantly traditional single earner nuclear families and food rationing, can be compared with the health of people growing up in times of very different family and health behaviour norms. Such comparative research can take the form of studies of opportunities for classes and sub-groups as well as for individuals, and can examine how the processes of mental and physical resilience and vulnerability develop at the individual level. Taking account of historical change will also provide opportunities for insight into policy effects at the national level. For instance, comparative research using the British birth cohorts is well-placed to investigate pro-social behaviour and its determinants at a time of widening inequality. This will be of particular relevance for Government policy initiatives such as the 'Big Society' that look towards new roles for charities and the expansion of volunteering.

The oldest British birth cohort sample population is now aged 65 years, and it seems likely that at least the two subsequent cohorts will also be followed-up into later life. Essential questions about the health and intellectual processes of later life will thus be open to study in the context of experience across the whole of their lives. The differences between these cohorts' whole life experiences will be great, and will provide an invaluable opportunity for inter-cohort comparative research to study how step-change, salient events have their impact, and how long that impact affects the lives of those who experience it. For example the period of high risk of unemployment during the 1980s hit the 1946 cohort members in mid-working life, and affected their subsequent prospects of returning to employment. In contrast, the high risk of unemployment impacted early on the working life of the 1958 cohort, when in due course such opportunities were still likely to be open.

However, as Maughan notes, these same kinds of period effects which confer research value, also bring methodological challenges in the form of cohort differences in questions asked, and scales and measures used. The research and policy questions that the studies addressed were themselves influenced by their historical context, as continuous change in the social and life sciences demanded new and improved measures. For instance, new developments in and demands for the measurement of wellbeing, are now being addressed in the British cohorts, but mostly only indirect methods can be used to assess wellbeing prevalence in earlier periods. And although, in general, attrition in the older studies is remarkably similar, its components (death, refusal, living overseas, lost contact) vary between cohorts, and require compensatory statistical weighting (Martin et al 2006). Response of more recent times has been considerably reduced in all kinds of survey research, and it is evident that future data collections, especially in newly established cohort studies, will require new approaches to data collection and to sample maintenance.

The series of British birth cohort studies is, as Goldthorpe reminds us, what C. Wright Mills described as the 'intersection of biography and

history'. They are also the intersection of biography, history and biology. They can facilitate study not only of the impact of socio-economic circumstances on lifetime health and survival, but also the impact of changing chances of lifetime health and survival on the structure and functioning of society. In addition, at least three of these life course studies have sources of DNA. That and their information on the lives of their parents' generation, and in some instances also on the offspring generation, provides the potential to study the impact of history on the health of individuals, not least through the search for cross-generational environmental and health behavioural influences on genetic effects, or epigenetics (Schooling and Leung 2010). Goldthorpe raises the question of alternative hypotheses to account for health inequalities in mortality, rather than the 'psycho-social environment' hypothesis given in the Health chapter. The psychosocial hypothesis postulates that prolonged exposure to mental stress (e.g. associated with perceived socioeconomic inequality or other adversity) is manifested in adverse change in neuroendocrine, autonomic metabolic, and immune response to chronic stress. The neo-material hypothesis is concerned with the direct physical effect of poor conditions. The Health chapter concentrated on the psychosocial hypothesis because it goes beyond the scope of the neo-material hypothesis, suggesting a biologically plausible account of how environmental exposures 'get under the skin' of the individual and interact with genetic inheritance, to become illness and processes of health change with age. And it can only be tested in long-term studies of individual lives.

In preparing *The Companion to Life Course Studies* we felt keenly the need for a history of the British national birth cohort studies, and the influences that affected their early development and continuation. Some historical work is already published or in progress (Bynner and Joshi 2007; Wadsworth 2010; Welshman 2011) but a systematic review of the archives of the studies and their funders would address the important questions raised by Goldthorpe about the differences between the studies in concerns and focus, the reasons for their spacing in time, and the apparent omission of two in the series. The 30 year gap in the national series between the 1970 and 2000 studies is problematic for analysts because, as Goldthorpe notes, it closed off the possibility of monitoring the effects on the life course of the massive socio-industrial and economic transformation that took place, especially in the early part of the period (1982 onwards) when, if the series had been maintained, a new birth cohort study would have been due. It is notable that David Willetts, Minister of State for Universities and Science in the current UK Government, whose 2011 book *The Pinch* focuses on the way the current adult generation *Took Their Children's Future – And Why They Should Give it Back*, apologised publicly in September 2010 for the decision of the Conservative Government in 1984 not to support the proposed new birth cohort study. Only the release of Government archives in 2014 will reveal the nature of the expert advice that lay behind that decision.

It is not surprising in the light of the above, but encouraging nevertheless, that all three reviewers recognise the merits of the book's aim, believing that much cohort analysis and interpretation in the past has suffered from inadequate recognition of the period and cohort effects which interact with cohort lives. Goldthorpe's focus on life course continuities, discontinuities, and turning points, draws attention to the key periods when context (period) effects matter most. These are powerfully revealed, in his view, by four examples including the rapid rise in inequality from the 1990s onwards, and the collapse of heavy industry and with it traditional patterns for entering the labour market at age 16 years. Other, perhaps more pervasive societal shifts, include those driven by changes in (moral) norms relating to premarital sex and the breakdown of marriage, and its increasingly common replacement by cohabitation. The fourth example resides in the paradox that while lives are getting longer, in successive cohorts, inequality increases, as graphically brought home by Murray in her account of the effects of de-industrialisation on mental and physical health. It is clear that our authors picked up in their specialist areas the key historical drivers of generational 'turning points', while also noting that the other periods showing relative stability and consolidation over a period of time are inevitably less sharply drawn.

The key point to observe is that the birth cohorts have tended to be studied independently rather than together, each being seen as demonstrating the growth of individuals in different environments. This is within a scientific framework for investigating the life course that assesses the outcomes, as Murray puts it, of 'exposure' to, 'treatments', reflected by different environments for which outcomes will vary or not in accordance with the postulated bio-physiological and

genetic mechanisms in play. Maughan's approach, in the tradition of Elder's (1974) *Children of the Great Depression*, concentrates more on conceptualising the life course as a continuous process of development interacting with, and consequently shaped by, changing circumstances in the context of linked lives, social and institutional structures, the timing of events and the power of human agency. She stresses that the *timing* of events as key drivers of trajectory and life course shifts is where the developmental science interest in historical change principally lies.

Goldthorpe also argues, with respect to research designs and commitments, that the picture needs to be further enhanced to map fully the historical context of the cohort studies. The essential complement to the cohort study of individual lives will always be continuous repeated (cross-sectional) surveys based on nationally representative samples to monitor changes in the population parameters through which period effects are described. As Maughan notes in her review, the absence from the book of comment on the effect of migration is a reflection of the design that fixes in time the population that a new birth cohort represents - the cohort effect. In her terms 'the social, political and economic landscapes are constantly changing, creating unique constellations of opportunities, expectations and constraints that form the backdrop to the lives of each new generation'. These constellations need to be understood to bring context fully into the cohort study framework - a very challenging task. She also notes the significance of social attitudes as potential instigators and moderators of the changes observed, and suggests the need for more coverage of these for the purposes of cohort comparison.

We are grateful to our reviewers for giving qualified approval for what the book set out to do. We appreciate their working within our framework to draw out from the book the importance of the historical backcloth in which the cohort members live their lives, but also pointing up the challenges in exploiting to the maximum extent the scientific benefit of the historical data available. It can be argued that the British birth cohort studies are currently experiencing a step change in perceptions of their usefulness, as their comparative value begins to be appreciated for policy purposes and for social and life sciences research. New funding for the 2012 birth cohort study and the establishment of the Cohort Research Facility to support the birth cohort series as a whole, clearly reflect that change and the new perception of the value of life course research. The new phase of cohort study should include the systematic recording of qualitative and quantitative context information from official sources and from the cohort members themselves. In the meantime we hope that cohort study analysts will make much more in their interpretations of the changing historical context of personal time.

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