



STRATEGIC REVIEW OF PANEL AND COHORT STUDIES

**REPORT TO THE RESEARCH RESOURCES BOARD OF THE
ECONOMIC AND SOCIAL RESEARCH COUNCIL**

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EXECUTIVE SUMMARY

1 Background and Method

Longitudinal studies are a flagship component of ESRC's social science data resources that have proved their worth in addressing key scientific questions of central importance to individual and societal well-being and have been major aids to policy makers. They are the only means for studying processes of individual life course development and dynamics, and for studying the effects of earlier characteristics on later outcomes. The capability of the UK longitudinal studies to address future societal challenges requires a long term strategy and constant review to ensure that the data collected will meet scientific and policy needs.

Longitudinal studies are very expensive to develop, establish, and maintain. They require long-term investment to ensure that they can be conducted efficiently and that they will provide the data needed to address the longitudinal research questions of concern.

The success of a longitudinal study depends on stable leadership from a committed principal investigator (PI) and a team of highly skilled researchers.

Until relatively recently funding for longitudinal studies was largely *ad hoc* and dependent on PI advocacy. There is a need for substantial stable funding for longitudinal data resources in the future. This funding should be geared to a comprehensive strategic plan that has scope for continuation funding as well as support for new studies.

As a basis for establishing a long-term strategic plan for ESRC-funded longitudinal studies, a review team comprising six members knowledgeable about longitudinal studies - including two from the US - was established. The team collected evidence by:

- correspondence, telephone and personal interviews with over 70 experts and stakeholders in England, Scotland and six other countries
- a two-day consultative conference attended by 42 UK and overseas experts
- searches of websites and other sources for documentation from which the features of 91 longitudinal studies mainly from the UK, USA, Canada, Germany, Sweden, Australia and New Zealand, were analysed and recorded

2 Case for Investment

The need for increased investment in longitudinal studies is driven by the identification of critically important research questions that require maintenance and enhancement of the existing studies and the development of new studies. There is a broad consensus among a number of sources,

including the ESRC's Strategic Plan and the emerging National Data Strategy, about the key issues that longitudinal data are needed to address:

- a. Ageing population
- b. Long term effects of childhood experience
- c. Timing of transitions
- d. Demographic shifts and mobilities
- e. Biotechnology revolution
- f. Immigration
- g. Cultural diversity and inequality
- h. Globalisation

Recommendations

1. *It is essential that the ESRC through the National Data Forum ensures that new research challenges demanding longitudinal data are recognised in the National Data Strategy and that resources are sufficient to support the longitudinal data that are needed.*

3 Longitudinal Research Design

The key issues generate research questions that demand different kinds of longitudinal research design for optimum answers. The main designs, which vary in use from one country to the next and supply the basis for longitudinal research programmes, are:

- Household/ family panels
- Birth cohorts
- Repeated (age) cohorts
- Age cohorts
- Special population studies (e.g. ethnic minorities, immigrants)
- Area studies (involving data collection from individuals/families and the local institutions and services to which they relate
- Economic short-term panels
- Record linkage studies

A number of key decisions need to be made to implement the designs:

- sample design details including whether there should be refreshment to include immigrants and/or over-sampling to improve analysis capability for special population sub-groups like ethnic minorities;
- data collection frequency and mode;
- topic coverage;
- enhancement through the addition of administrative, environmental, institutional, biomedical and qualitative data

Topic coverage varies depending on whether the study is general purpose, topic-based (e.g. health, crime, education) or discipline-based (e.g. demography, economics, sociology, political science, psychology). New data

and measurement approaches that extend the scope of longitudinal data have to be considered, including physical environmental measures (e.g. air quality) and biomarkers such as obesity measures. Administrative data can be a valuable addition supplying additional information that reduces respondent burden or filling gaps in the longitudinal record.

Linking administrative data to sample members provides a valuable means of enhancing longitudinal data. However, the quality of such data needs careful appraisal. The issues of protecting respondent confidentiality and the legal and other restrictions on access to other sources of data will need to be addressed. These protections may result in significantly limiting access to the combined survey and administrative data, but the value of the administrative data makes this limitation an acceptable price to pay.

Longitudinal studies gain through comparison with other studies both in the UK and internationally. Consideration should therefore be given to coordinating U.K. longitudinal studies with those conducted in other countries and in the different territories of the UK. Comparison is facilitated by harmonising key variables across studies.

Recommendations

2. *Longitudinal research designs should be matched to the research questions they are best equipped to answer. In ongoing studies samples should be refreshed and expanded and data enhanced as appropriate to supply the data needed to answer new questions and to meet new methodological challenges.*
3. *ESRC should ensure that new designs are appraised and tested to meet new research needs, including hybrids involving qualitative and quantitative data, and experimental combined with (survey) approaches, as well as the tried and tested designs.*
4. *ESRC should work through the UK Data Forum to secure greater access to relevant administrative data for longitudinal studies in the UK.*
5. *New measurements and measurement approaches should be piloted to extend the scope of longitudinal data including physical environmental measures and biomarkers such as obesity measures and DNA.*
6. *The potential for cross-national comparisons and comparisons within the territories of the UK should be taken into account in designing studies, by harmonising key variables and other relevant design features between studies.*

4 British Household Panel Survey (BHPS)

The British Household Panel Study (BHPS), established in 1991 with a sample of 5,500 households and 12,000 individuals has proved its worth in answering many important research questions. It has several hundred active users. The longer it continues, the wider the range of questions it can address; hence interest in analysing the data it produces is likely to expand further. However, its current sample size is inadequate to support a number of important analyses in some key areas. The main limitations are:

- a. Sub-groups with relatively low prevalence in the general population – such as people with disabilities, lone parents, absent fathers, different minority ethnic groups and specific age cohorts – are too small for robust inference.
- b. Although wave-to-wave response rates are currently high, attrition over the life of the panel has reduced numbers in the main panel and is a potential source of bias.
- c. Immigrants into the UK since the panel began in 1992 are not covered in general.
- d. Age cohorts within the panels, including those formed from panel members' children, have to be too broadly defined for the effective assessment of 'cohort effects'. If they are focused on single ages the data have to be aggregated over many years confounding the cohort effects with period effects
- e. Aggregating infrequent events that occur across years of the study (such as divorces) until adequate numbers are obtained similarly requires many years of data.
- f. Geographical variation can only be captured to a limited extent. The sizes of the augmented samples in Scotland, Wales and the new panel in Northern Ireland numbers are insufficient for within-country fine-grained analysis.

Recommendations

7. *The BHPS would benefit greatly from a very substantial expansion in its sample size. We consider the proposed expansion to 40,000 households to be fully justified. The expansion should be achieved by augmenting the existing BHPS in such a way that the data can be integrated.*
8. *The current BHPS panel should be continued alongside the new sample unless bias due to attrition becomes too serious a problem.*
9. *Annual data collection should be retained but as an expanded BHPS moves increasingly towards becoming a multipurpose framework for a*

number of matrix/module-based studies the implications of a longer time interval between rounds of data collection should be investigated.

10. *Where feasible and appropriate, the new larger panel should use a modular and matrix approach, rotating topics at less frequent intervals either for the whole sample or for particular sub-groups. Different modes of data collection to replace personal interviews for some waves, topics, and respondents should be considered and evaluated.*

5 Birth Cohort Studies: (NCDS, BCS70, MCS)

The birth cohort studies starting with a whole week's births in 1946 (National Health and Development Study), 1958 (National Child Development Study), 1970 (BCS70) respectively and a whole year's (sampled) births in 2000/2001 (Millennium Cohort Study) are an effective vehicle for studying the effects on the human life course of exposure to different biological and environmental (social and physical) influences. From what was initially mainly a biomedical developmental perspective, interest in them has expanded to embrace a much wider range of scientific programmes such as the economic and social returns to education and, through using the studies in combination, the impact on the life course of social change.

The main limitations of the studies are:

- a. Inability to deal with short-term life course dynamics because of the relative infrequency of data collection, particularly in the early years of the 1958 and 1970 studies.
- b. Absence of area-level data because of the spread of the one week's births throughout the country on which the first three were based.
- c. Lack of data collected from other members of the family to tease out the relational aspect of life course development ('shared lives').
- d. Increasing problem with attrition and non-response reducing numbers for longitudinal analysis and potentially biasing the sample.
- e. The 30 year gap between the 1970 cohort and the Millennium cohort meaning that life-course processes in cohorts born across the period 1970 to 2000 cannot be observed.
- f. No inclusion of immigrants after the cohort members pass the end of their compulsory schooling at age 16.

Recommendations

11. *The current birth cohort studies should be continued and sufficient resources made available to support data collection across the lifespan at an average interval of four years and to continue the*

intergenerational components. Cross cohort collaboration should be facilitated and harmonisation of the data collected between them encouraged in support of cross-cohort comparison.

12. *A new cohort study should be started in around 2012 to restore the twelve year interval series. It should be preceded by scoping new designs to determine whether to concentrate data collection in one year or spread it over several years and also whether to start all cohorts at birth or some at later ages.*
13. *To partly fill the thirty year gap in the series between BCS70 and the MCS, there should be support for data enhancement and potentially data collection after 16 years of age in the Avon Longitudinal Study of Parents and Children (ALSPAC). The potential role of the Longitudinal Study of Young People in England (LSYPE) through addition of relevant administrative data back to birth also needs to be investigated. The feasibility of using the Scottish School Leavers Survey in this way should also be investigated.*

6 Strategy

Longitudinal studies in which ESRC is a major stakeholder constitute a portfolio for investment and development within the National Data Strategy. The portfolio includes national, area-based, population sub-group-specific and intergenerational studies covering a range of scientific disciplines and study areas: sociology, psychology, economics, political, science, demography, environment, education and bio-medical studies. It ensures coverage of the key research issues without unnecessary duplication and establishes harmonisation of data between the longitudinal studies as appropriate.

The prime purpose of the ESRC-supported studies should be recognised as scientific and their integrity should not be compromised to meet policy evaluation requirements. While the studies should not be policy driven, they should be policy relevant, supplying the evidence base on which policy can draw.

The BHPS and the cohort studies cannot address all major longitudinal research questions, in part because of sample size limitations and in part because of the range of data they can collect. To address these limitations, larger samples and also other, more specialised, longitudinal studies are needed in the ESRC portfolio.

Recommendations

14. *A national framework should be established under the auspices of the UK National Data Forum to provide an integrated portfolio of longitudinal studies for a range of research purposes in which ESRC is a major stakeholder. Widespread input to the framework from scientific interests across the social science disciplines should be facilitated.*
15. *ESRC should establish task forces to undertake detailed work on the design of an enhanced BHPS and a new birth cohort study with coordination between them to ensure that the two types of study complement one another in terms of a coherent scientific programme. They should draw on the widest possible range of subject-matter expertise and methodological advice, both in the UK and internationally.*
16. *The potential for adding or linking additional data to existing and new studies should be fully explored, including administrative, biomedical (including DNA), environmental and other data subject to constraints of feasibility and quality.*
17. *New studies should seek to harmonise key data within the UK longitudinal and cross-sectional studies, and internationally where possible, to aid national and international comparison and replication.*

7 Data Quality, Methodology and Analysis

Methodological development is crucial to data quality and therefore to maximising the returns to investment in longitudinal data. Longitudinal data are subject to errors and biases that accumulate over time and need to be taken into account by data producers, analysts and methodologists. Attention needs to be directed particularly at the major methodological challenges of attrition, missing data and measurement error and optimum ways for meeting them.

Recommendations

18. *Sufficient funding should be provided to enable longitudinal study teams to employ survey methods that will generate the high level of data quality needed for longitudinal analysis and also to conduct methodological studies to assess data quality and to improve their methods.*
19. *Acknowledging the substantial past and present ESRC methodological initiatives such as ALCD and the current Research Methods Programme and National Research Methods Centre, more should be done to ensure that the knowledge gained is transferred directly into improved practice.*

20. *As well as funding for data collection, the study teams should be provided with sufficient funding for post-field data preparation, statistical adjustment, documentation and its dissemination, and preliminary data analysis.*

8 Building New Capacity

Capacity in the UK to design longitudinal research and analyse longitudinal data is inadequate and needs to be developed at a number of levels. Because of the specialised nature of longitudinal research, capacity building needs cannot be met fully through general purpose methods training programmes. A variety of provision is needed within a coordinated national programme.

Recommendations

21. *To ensure that longitudinal studies use state of the art methods and that the full analytic potential of longitudinal data is realised, ESRC should provide substantial funding to expand and enhance capacity to undertake longitudinal research, building on its current programmes.*
22. *Advanced training in longitudinal methods should be targeted at analysts, data producers, methodologists, and other constituencies with a potential interest in longitudinal research. An appreciation of the potential of longitudinal data and basic analytic techniques is needed from undergraduate level upwards.*
23. *Funding for the main studies should allow for the development of high level statistical and survey expertise to help in training and the provision of advice.*

9 Data Access and Disclosure Control

Detailed consideration of the complex topic of data access and disclosure control is beyond the scope of this review so the report stops largely at the endorsement of key principles concerning confidentiality issues and data sensitivity and the options for addressing them while maximising data access.

Recommendations

24. *To capitalise on the investment in each longitudinal study ESRC should seek arrangements that allow for the widest exploitation of longitudinal data by social scientists while safeguarding the data provided by individual respondents. Licensing arrangements and safe settings appear likely to provide the best means of protecting the interests of respondents in relation to disclosive and/or sensitive data while supporting maximum research use.*

25. *The feasibility of establishing a small network of centres that provide support and a safe setting for the analysis of a range of longitudinal data should be investigated. Such centres could also provide facilities for cross-sectional studies.*
26. *To facilitate international collaboration, the feasibility should be investigated of:*
 - a. *extending licenses to overseas collaborators through 'visiting' status*
 - b. *licensing safe settings for using UK longitudinal data overseas e.g. in the secure enclaves established for analysing data collected by national statistical agencies*

10 Governance and Funding

Governance is concerned with protecting the scientific integrity of studies while ensuring accountability. Funding concerns the infrastructure that will ensure the studies' continuation. Mechanisms are needed that will provide the most effective support. To maintain the integrity of the scientific programme that longitudinal data serves, the independence of the research team from funders in making decisions about design and coverage must be preserved.

Recommendations

27. *ESRC should ensure that the major longitudinal studies are funded on a longer-term basis than one or two waves at a time in order to provide stability and enable long term planning. It should negotiate and manage any co-funding arrangements, which should be welcomed provided that there are no consequences for the integrity of the study.*
28. *ESRC should ensure that all research funders and research constituencies with a current or potential stake in longitudinal data have their interests represented in the development of both a long term strategy and funding arrangements for longitudinal studies.*
29. *ESRC should examine the case for a Longitudinal Studies Foundation as a channel for funding.*
30. *ESRC should ensure that each study obtains continuing outside input through such mechanisms as a steering committee on which sponsors are represented and a scientific oversight committee to represent the wider research community that the study serves.*

11 Collaboration

A framework for the development of the national portfolio of longitudinal resources is valuable in stressing the interconnectedness of all the studies in answering complementary scientific questions. For such a framework to

operate effectively commitment to collaboration across all programme components and facilitation of collaborative opportunities is crucial.

Such opportunities exist at a number of a number of levels:

- research funding
- across studies
- across scientific disciplines
- policy research and academic research
- international programmes

Recommendations

- 31 ESRC should seek means of strengthening collaboration with MRC and the other research councils through the UK Data Forum over longitudinal research strategy and, especially with MRC, through the establishment of joint working groups of medical and social science researchers with joint interests.*
- 32 To achieve maximum return from investment ESRC should encourage and facilitate collaboration over the design and use of longitudinal data in every way possible at all levels: between longitudinal study teams, scientific disciplines; analysts; academic and policy researcher; UK and overseas researchers.*
- 33 A standing conference on longitudinal studies should be established with an annual meeting and specialist panel meetings in between and with periodic extension to an international meeting.*

1 Background and Method

- 1.1 Britain has internationally renowned longitudinal studies that provide a wealth of information on the life histories of people as they move from birth to old age. Longest established are the birth cohort studies, starting respectively in 1946, 1958 and 1970, and most recently, 2000. They produce a picture of growing up in Britain and the subsequent routes through adult life that is unparalleled. In 1991 ESRC initiated the British Household Panel Survey (BHPS) to map household dynamics over an extended period. Together these studies have transformed our understanding of life in a changing Britain. Complementary projects, ranging from the Avon Longitudinal Study of Parents and Children (ALSPAC) to the census-based Longitudinal Study (LS), enrich the seam of longitudinal data available for research.
- 1.2 From the risk of smoking in pregnancy to the timing and duration of family poverty spells, longitudinal studies have made a vital contribution to understanding what influences well-being, with growing emphasis on the effects of environmental and societal change. They serve as living histories capturing the ways that lives unfold. They are the only means of unravelling the long-term effects of childhood experiences and the dynamics of inequality, ageing and health in the human life course. When extended across the generations, longitudinal studies give unmatched insights into cycles of deprivation and achievement, and the intergenerational transfer of resources.
- 1.3 The strengths of longitudinal studies are recognised by the numerous government enquiries and policy developments to which the British studies have been a major source of evidence. For example, the Plowden Committee on Primary Education (1967), the Warnock Committee on Special Educational Needs (1978), the Finer Committee on One Parent Families (1966-1974), the Acheson Independent Enquiry on Health Inequalities (1998) and the Moser Committee on Adult Basic Skills (1997-1999) all drew heavily on longitudinal data. Similarly numerous policy initiatives from Sure Start to the Child Poverty initiative and Pensions Reform have relied heavily on cohort and panel study data to aid policy development and to help to assess its effects. Government departments, such as the Department of Work and Pensions (DWP), use such data as major policy monitoring tools.
- 1.4 Overseas, recognition of the worth of longitudinal data is exemplified by the US government's \$14 million dollars investment in the first five years of the Health and Retirement Study (HRS) and the extension by the US sponsor, the National Institute of Ageing (NIA), of substantial financial support in this country for the English Longitudinal Study of Ageing (ELSA) and the Survey of Health, Ageing and Retirement in Europe (SHARE) cross-national network. The support for such collaboration reflects the added value of cross-national comparisons of

the findings from longitudinal studies.¹ Such ‘big’ social science is an increasing feature of international scientific cooperation in longitudinal social research on ageing, offering scope for programmes of investigation on a much wider scale and at relatively lower cost than is possible for any one country acting alone. At the other end of the age scale the US National Institute for Child Health and Development (NICHD) and a consortium of US government agencies is in the process of launching the National Children’s Study (NCS) comprising 100,000 babies, with the tracking beginning at conception. The total cost over 28 years is estimated to be \$2.3 billion including \$29 million for planning and development work.

- 1.5 Longitudinal studies are very expensive to develop, establish, and maintain. They require long-term investment to ensure that they will provide the data needed over the right period to address the longitudinal research questions of concern. Their success depends on stable leadership from a committed principal investigator (PI) and a team of highly skilled researchers.
- 1.6 Until relatively recently the development of the longitudinal resources has been largely *ad hoc*, relying on the efforts of individual PIs to raise the necessary funding to keep their own particular longitudinal project going or to launch a new one. The founders of the early studies, James Douglas, Neville Butler and Mia Kellmer Pringle, had particular difficulties in making the case for investment in longitudinal data. Without their persistence in persuading people of the studies’ scientific potential, it is doubtful whether the whole British longitudinal enterprise would have ever happened.² Due to their efforts and those of their successors and the commitment of ESRC to significant expansion through the establishment of BHPS, the UK has a range of high quality longitudinal resources for research that are highly valued throughout the world.
- 1.7 Following a series of reviews and initiatives to give the key studies a more secure base,³ ESRC, in conjunction with other major funders including MRC and government departments in the newly established *UK Data Forum*, wishes to establish a sound scientific case for its own investment in an integrated portfolio of longitudinal studies. A comprehensive review of longitudinal resources was consequently commissioned by ESRC to inform the evolving National Data Strategy. This report is the result of that review.

¹ Burkhauser, R.V. and Lillard, D.R. (2006) *The Contribution and Potential of Data Harmonization for Cross-National Comparative Research*, *Journal of Comparative Policy Analysis*, 7, 313-330.

² Williams, S.(1997) *Women and Childbirth in the Twentieth Century*, Stroud, Sutton.; Bynner, J and Goldstein, H. (1998) –Three Generations of Children – an edited transcript of a video recording made in March 1982 of the then directors of the three major British cohort studies, *Paediatric and Perinatal Epidemiology*, 12 Supplement 1, 15-30.

³ e.g. Falkingham, J. (1993) *Report of the Findings of the Consultative Exercise to the Working Group*, ESRC Strategic Review of Birth Cohort Studies. Swindon: ESRC; ESRC (2003), *UK Longitudinal Studies Centre (ULSC, Report of the Review Panel of the Research Resources Board* (mimeo).

- 1.8 The review addressed a number of critical issues bearing on the future of the existing studies. The review also identified gaps in the programme and the need for new data collection and new studies. Methodological challenges, capacity building and confidentiality and disclosure issues, which are the subject of other ESRC initiatives, were also briefly examined, together with the funding mechanisms for longitudinal research resources and ways of promoting collaboration in the design and use of longitudinal data.
- 1.9 The broad scope of the review required the collection of evidence from experts and stakeholders both in Britain and in other countries with longitudinal research traditions. We focused, however, on the major longitudinal studies including family and household panel studies in Britain, the USA, Germany, Sweden, New Zealand and Australia and a wide range of cohort studies, involving short-term and long-term follow-up of individuals over time. Information was compiled on 91 studies from Britain and six overseas countries and contact was made by letter, telephone calls and meetings with over 70 experts and stakeholders.
- 1.10 This first stage of the review also included a consultative workshop held at St Anne's College Oxford at which 42 experts discussed the issues of concern to the review. An interim report on the findings was considered by ESRC's Research Resources Board in October 2005 and in the light of the Board's response the conclusions were developed further for the final report submitted in January 2006. The experts and stakeholders, who contributed to the review through interview or in writing, and conference participants, are listed in Appendix 1. The longitudinal studies examined are listed in Appendix 2 followed by summaries of the main studies drawn on for the report⁴. Appendix 3 lists other government longitudinal surveys.
- 1.11 The report is structured to address all the questions to which the ESCR brief required answers with the major issues discussed first. The following section (2) identifies the major challenges confronting the UK in the next 15-20 years that demand longitudinal data to build the evidence base. Section 3 links longitudinal research designs to the research questions that they can be used to answer. The report then moves in the two following sections (4 and 5) to the future of the core portfolio studies – BHPS and the 1958, 1970 and Millennium birth cohort studies – in which ESRC is the major stakeholder. Section 6 maps out long term strategy and assesses the need for new investment in existing studies and new studies. The next three sections deal respectively with methodological issues arising in the conduct of longitudinal research (7), capacity building (8) and data access and disclosure (9). Section 10 considers governance and funding and 11 collaboration.

⁴ Summaries of all the studies reviewed are available on request

2 Case for Investment

2.1 The case for major public investment in social science longitudinal research resources rests on their indispensability in supplying the answers to questions of major importance to individual and societal well-being in Britain. The first session of the Oxford consultative workshop was devoted to questions of this kind that are likely to arise over the next 15 to 20 years. Big questions require big money to answer them, which as Wolfson (2006) argues, is how governments should approach them⁵. The acceptance for the first time this year of a social science bid to the UK Science Large Science Facilities Capital Fund is a major step forward in this direction.

2.2 The big questions help define the priorities to which social science research funding is directed and the type and scale of resources that are needed. As recognised through US investment in ageing research, not only in the US but internationally, the counterpart to natural science facilities like the European particle physics laboratory, CERN, is the large scale longitudinal enquiry. International programmes based on the collection of longitudinal data within agreed frameworks offer the best means of finding solutions to key social, economic and health problems from which all participating countries will benefit. The House of Lords Science and Technology Committee, in reviewing British research on ageing across the science funding spectrum, supported strongly longitudinal studies of ageing and was generally complimentary about the English Study of Ageing (ELSA) and the MRC-funded Cognitive Functions and Ageing Study (CFAS). However the committee was highly critical of the absence of multidisciplinary approaches and lack of coordination in the programme as a whole, concluding that:

‘The picture we have received from the evidence falls so far short of the ideal that we believe that radical measures must be taken to improve current arrangements.’⁶

2.3 The committee was particularly critical of ESRC’s allocation of scarcely 1% of its research budget to ageing topics and argued that this should be increased alongside making available additional funding to implement ‘joined up programmes of longitudinal research’. They point to the US National Institute for Ageing (NIA) as exemplifying the kind of level of investment and approach to the subject that is needed.

2.4 The Council’s 2005 Strategic Plan does in fact put ageing high on its list of strategic priorities, but also identifies others for research funding. In common with those of the UK Data Forum, the government’s

⁵ Wolfson, M.C. (2006) *Thoughts on the Nature of Big Science*, Paper presented to the StatCan – Conference, Longitudinal Social Surveys in an International Perspective, Montreal, January 2006

⁶ *Ageing Scientific Aspects*, Volume 1 Report, 2005, p 83 para 8.7.

Coordination of Research and Analysis Group (CRAG) and other bodies such as the Futures Foundation, our Oxford conference identified as key priorities:

- a. Ageing population
- b. Long term effects of childhood experience
- c. Timing of transitions
- d. Demographic shifts and mobilities
- e. Biotechnology revolution
- f. Immigration
- g. Cultural diversity and inequality
- h. Globalisation

All these prioritised topics raise questions to do with the dynamics of *change* of various kinds which is what defines longitudinal research. The priorities therefore present challenges for longitudinal data strategy to ensure that research demands can be met. Investment in continuing and new studies should therefore be driven by the strategic priorities with regular updates to ensure that investment matches need.

Ageing population

- 2.5 Both the number and proportion of people aged 60 years and older are increasing although at different rates. The 2001 Census showed that for the first time the number of people age 60 and over was greater than the number aged under 16. In 1951 there were 0.2 million people aged 85 and over; by 2001 this had grown to over 1.1 million. By 2050 it is estimated that the proportion of the population aged over 65 will have risen to 20% compared with 7% in 2000. Such massive demographic changes raise questions about how long such men and women will work, how long they will live and what their resources and their needs will be. The phenomenon of an ever-increasing proportion of life spent in retirement or quasi-retirement has ramifications extending from the labour market to the health and social services and the family. The risk of illness and disability are also little understood. Only longitudinal data collected by following people through the later period of their lives can supply the evidence that is needed about the likely level of need and what can be done to meet it.

Long-term effects of childhood experience

- 2.6 There is increasing recognition that exposure to different kinds of physical and social environmental factors from conception onwards in interaction with individual biology contributes to the shaping of a person's development from then on. The effects of these factors are manifested in the aetiology of illnesses with rising prevalence, such as asthma, childhood obesity and mental health problems. They may also underpin maladaptive behaviour in adulthood such as alcohol and drug addiction, crime and suicide. Longitudinal data are needed to model the processes of psycho-social and biological risk that lead to such

outcomes and to find the means of reversing them at different stages of life. Such data when collected across the whole of the life course also supply the basis for determining the long term effects of early experience in the acquisition of skills and the response to later cognitive decline.

Timing of transitions

2.7 With each successive generation the timing and duration of transitions at key life- course stages – home-to-school, school-to-college or work, leaving the family home, pregnancy and parenthood, work-to-retirement – have been changing. The extension of education for a growing section of the population and the increasing postponement of child bearing reflect dramatic reconstruction of the life course with consequent costs as well as benefits. For example, in 2004 for the first time the fertility rate of women aged 30-34 overtook that of women aged 25-29; in the 1970 cohort study only 27% of men were fathers by the age of 30 compared with 49% in the 1958 cohort study and over 80% of the 1946 cohort study. Some transitions arise as the result of the legislative system, such as school entry and the transition from school to work, while others such as getting married, having children, moving house and changing job are the product of human agency combined with opportunity. Longitudinal data collected to coincide with these transitions are needed to chart their timing and duration and to reveal their antecedents and consequences.

Demographic shifts and mobilities

2.8 Mobility in this context concerns continuities and discontinuities between the generations in social, economic and political statuses in a changing demographic landscape. Jobs for life passed down the generations in one locality give way to multiple jobs, multiple careers and occupational portfolios operating in different places. Political orientation and voting intentions similarly change in response to socio-economic transformation with weakening of the link between parents and children's party affiliations. Family structure is also changing with over 42% of children born outside marriage in 2004 (15% to single parents and 20% to mothers born outside the UK) compared with 32% in 1994.⁷ At the same time, there is evidence to suggest that while gender differences have reduced in areas such as university entrance and earnings, social mobility continues to stall. Longitudinal data supplies the evidence base to understand the drivers of socio-economic and political stability and change.

⁷ *Birth Statistics 2004* Series FM1 no.33 www.statistics.gov.uk/statbase/Product.asp?vlnk=5768.

Biotechnology revolution

- 2.9 The consequence of gene splicing, stem cell research, and cloning and their combination with ICT advances have huge social and economic as well as medical consequences that we are yet barely aware of. Challenges for what Rifkin (1998) describes as the 'Biotech century' range from genetic modification to the patenting of new life forms. The human genome project opens up vast new opportunities for the treatment of illness and the prolonging of life, while technological advance transforms the way in which life is lived and how it is supported. The impact of these developments on social and economic life requires close monitoring of the kind that only longitudinal data can provide.

Cultural diversity, inequality and identity

- 2.10 While opportunities for advancement are increasing for some sections of the population, they are decreasing for others resulting in increasing polarisation and marginalisation, identified with class, ethnicity, religious identity and geographical location. Effects may be manifested in health inequalities and social exclusion, leading to mental illness, drug and alcohol abuse and propensity to crime. There may also be a political response in terms of radicalised protest and distrust of institutions of the state and established forms of political practice. A series of new and complex questions are emerging surrounding social difference and the basis of social cohesion and identity in the modern multicultural, multi-lingual, multi-faith society. The short-term and long-term processes of differentiation need to be examined in longitudinal studies with detailed investigations of the population sub-groups where their effects are most evident to recognise both their enriching and their polarising aspect.

Immigration

- 2.11 The opening of borders since the fall of the Berlin Wall and the expansion of supra-national entities like the EU stimulate movement of populations across the globe in the quest for improved life chances. First generation immigrants are characterised not only by transience of statuses, but by the effects of their presence on others in the indigenous population. The direction of flows is also changing as conditions change in the country or region of origin resulting in reverse migration. Apart from immigration into the British Isles and emigration overseas, the effects of movement between the territories of the UK are also important to understand. We need intensive longitudinal investigation of immigrants, at least over the early period after immigration, to understand the processes of immigration and the consequences of immigration for immigrant families and the host society.

Globalisation

- 2.12 The ICT revolution in employment and the growth of the 'knowledge economy' set in motion a process of globalisation that has removed boundaries from companies now operating on a world scale in a largely unregulated market. Coupled with the effects of world media and massive world population growth, globalisation is shifting not only the nature of jobs but also the basis of socialisation into adult roles and identities. Past certainties about life course destination rooted in family and work place are giving way to reliance on the deployment of personal resources and the exercise of personal choice thus laying the foundations for what is described as the Risk Society⁸. But globalisation processes operate differently in different places with each country's institutions mediating their effects. To understand their impact requires cross national comparison drawing on longitudinal data. The 'Globalife' project involving comparisons of longitudinal analyses of transition to first job, job mobility for women and transition to retirement across 21 countries exemplifies the kind of work that is needed⁹.
- 2.13 These research issues all concern in varying degrees adaptation of human populations to the changing contexts that modern societies are experiencing and the consequences of this adaptation for health and well-being more generally in social and economic spheres. These contexts comprise:
- the immediate physical, social and economic environment with which individuals, with distinct biological make-ups and developmental histories, interact continually throughout their lives;
 - the communities in which people live and the institutions of the state with which they engage;
 - the family – the main means of transfer of assets, norms and values from one generation to the next
- 2.14 To understand the processes involved requires study of their short-term and long-term dynamics and the longer-term consequences of early life experience. How are individuals' lives both shaped by, and how do they shape, the contexts through which they pass? Longitudinal data are the means of finding out through the tracking of individuals and the other individuals to whom they relate over the whole or shorter periods of their lives.

Recommendations

1. *It is essential that the ESRC through the UK Data Forum ensures that new research challenges demanding longitudinal data are recognised in the National Data Strategy and that resources are sufficient to support the longitudinal data that are needed.*

⁸ Beck, U. (1992) *Risk Society*. London: Sage.

⁹ Blossfeld, P. (2006) *Globalife: Life Course in the Globalization Process*, Final Report, 1 September, 1999 - 28 February 2005, University of Bamberg (mimeo).

3 Longitudinal Research Design

- 3.1 The key research topics identified in the previous section all concern in one form or another unravelling life course processes through which statuses change, thus potentially embracing cause and effect. Prospective longitudinal investigations that follow individuals forward in time are particularly valuable in this respect because they capture the temporal ordering of events and influences in people's lives observed under natural conditions. Data collected to reflect the age and stage of life reached and what has happened in the interim - including genetic, environmental, physical, psychological and socio-economic data - can be supplemented by specially collected data from institutions with which people have had contact such as schools, hospitals and work places. Depending on the topic under investigation and the research questions requiring answers, the relevant data can be assembled within an appropriate longitudinal research design. The analytic approach for identifying determinants of a given outcome is then to develop statistical models of the postulated causal process.
- 3.2 Like longitudinal studies, repeated cross-sectional surveys can be used to examine social trends over time but say nothing about the movement of individuals between occasions on which explanatory models of their behaviour are based. However, cross-sectional data collected within a longitudinal survey do have utility in their own terms; they can be used descriptively to portray an age-group or a generation, e.g. 33 year-olds or the population as whole.¹⁰ Also many cross-sectional surveys, through the use of retrospective recall, generate longitudinal data from which valuable insights into possible life course processes can be gained. In fact longitudinal studies can be based entirely on recall, as in the suite of German studies based on samples born at different times taken from the German micro census.¹¹ However such longitudinal enquiries are restricted in the sense that they cannot encompass transient attributes such as attitudes and if extended over long time periods suffer from potential bias due to memory unreliability. The core British longitudinal studies contain recall as well as contemporaneous data since there is frequently the need to collect information about what has happened since the previous wave of data collection.
- 3.3 The range of possible longitudinal research designs that needs to be considered includes household panels, birth cohorts, other age and age-related cohorts (e.g. school leavers), cohorts defined by certain

¹⁰ Ferri, E. (1993) (ed.) *Life at 33 London*: National Children's Bureau; Bynner, J., Ferri, E. and Shepherd, P. (eds.) (1977) *Twenty-something in the 1990s*, Aldershot: Ashgate; Berthoud, R. and Gershuny, J (eds) (2000). *Seven Years in the Lives of British Families*, Bristol: The Policy Press; Buck.N., Gershuny J., Rose D., and Scott J. (1990) *Changing Households*, Colchester, University of Essex .

¹¹ Mayer, K.U. (1987), 'German Survivors of World War II: The Impact of the life course of the collective experience of birth cohorts', in Riley, M.W. (ed.) *Social Change and the Life Course. Vol I Social Standards and Human Lives*. Newbury Park: Sage.

characteristics (e.g. immigrants), and panels of institutions or other organizations (e.g. schools or firms). Each of these designs may be limited in duration or continue indefinitely; it may be a one-off study or repeated periodically; the sample may be refreshed to represent new entrants to the population or not refreshed; it may be national or regional in scope; and it may over-represent (over-sample) certain population subgroups (e.g. geographic areas or minority populations) or not. The data collected may be quantitative or qualitative in form. Data collection may be by face-to-face interview, telephone or postal questionnaire or rely entirely on administrative records. There are thus many decisions to be made in fashioning a longitudinal research design to meet a study's analytic objectives. The main designs are briefly discussed below. Table 3.1 lists exemplar studies under each of the main types of design. (Full details are supplied in Appendix 2).

Table 3.1 Types Longitudinal Survey Design

Type of design	Exemplar Studies
Household/ family panels	<ul style="list-style-type: none"> • British Household Panel Survey (BHPS), including Northern Ireland (NIHPS) • Consortium of Household Panels for European Socio-economic Research (CHER) • European Community Household Panel Survey (ECHP) • German Socio-Economic Panel (GSOEP) • Survey of Labour and Income Dynamics (SLID) • Household, Income and Labour Dynamics in Australia (HILDA) • Panel Study of Income Dynamics (PSID) • Luxembourg Household Panel (PSELL) I & II • Sweden Level of Living Survey
Birth cohorts	<ul style="list-style-type: none"> • 1970 British Cohort Study (BCS70) • Millennium Cohort Study (MCS) • National Child Development Study (NCDS) • National Survey of Health and Development (NSHD) • National Longitudinal Survey of Children and Youth (NLSCY) • Growing up in Australia – Longitudinal Study of Australian Children (LSAC) • US National Children's Study
Age cohorts	<ul style="list-style-type: none"> • English Longitudinal Study of Ageing (ELSA) • European Longitudinal Study of Ageing Health and Competence (EXCELSA) • Longitudinal Study of Young People in England (LSYPE) • NLSY79 Children and Young Adults (NLSY79 Children) • National Longitudinal Survey of Youth 1997 (NLSY97) • West of Scotland Studies • Growing Up in Scotland Study • MRC Cognitive Function and Ageing study • Sweden Individual Development and Adaptation (IDA) • USA Early Childhood Longitudinal Studies • USA Health and Retirement study
Repeated age cohorts	<ul style="list-style-type: none"> • Youth Cohort Study - England and Wales • Scottish School Leavers Survey
Special population studies (e.g. ethnic minorities, immigrants)	<ul style="list-style-type: none"> • Longitudinal Survey of Immigrants to Canada (LSIC)
Area studies (involving data collection from individuals/families and the local institutions and services to which they relate	<ul style="list-style-type: none"> • Avon Longitudinal Study of Parents and Children (ALSPAC), also called 'Children of the 90s' • Aberdeen Child Development Study • Newham Household Panel Study - Living in Newham (NHPS) • Christchurch Health and Development Study (CHDS) • Dunedin Multidisciplinary Health and Development Study (DMHDS)
Economic short-term panels	<ul style="list-style-type: none"> • Labour Force Survey - UK • US Survey of Income and Program Participation (SIPP)
Record linkage studies	<ul style="list-style-type: none"> • Longitudinal Study – England & Wales • Longitudinal Study – Scotland • Administrative Longitudinal Data Set (LDS) -Australia • Longitudinal Study – France

Types of design

Household/family panels

3.4 Household panels such as BHPS chart family life and household change. They also provide information on the transitions and resource

transfers of adults living in the same households and show how these change over time. Family dynamics involving interactions between family members in relation to status changes such as partnership formation and breakdown, parenthood and job changes are particularly well-served by them. With annual data collections the timing and duration of such events can be observed close to the time at which they occur. As the panel matures, longer-term processes can be observed such as the transfer of resources from parents to children and the later outcomes for both. Such child extensions to the traditional adult-focused household panel are becoming increasingly common: the US Panel Study of Income Dynamics (PSID) and the German Socio-Economic Panel (SOEP) follow children from birth; BHPS has a youth panel (aged 11-15) that started in the fourth wave. Thus changing economic and family circumstances, economic and social mobility, diversity and inequality and globalisation effects may all be addressed in the household panel study.

Birth cohorts

- 3.5 Birth cohort studies are particularly useful for answering questions concerning the social, economic and health outcomes of earlier life experiences especially those studies of the British kind starting with the National Survey of Health and Development (NSHD) in 1946 and followed by the 1958, 1970 and Millennium cohort studies. These studies offer the opportunity to observe the passage through life of a large sample of individuals all born at the same time. With gaps filled in the longitudinal record from retrospective recall the data set comprises large numbers of life histories on which such developmental analysis can be based. When used in combination in a repeated series they also offer powerful indications of variation in the impact of different external factors on the life course over a 50 year time span of social and environmental change.

Age cohorts

- 3.6 Birth cohorts take a long time to mature, delaying the time when data will be available on key transitions such as from school to work and retirement. For this reason cohort studies are often launched at later ages to capture key transitions such as school entry, school leaving or retirement when they are occurring. The DfES-funded Youth Cohort Study and ELSA are good examples of such age cohort studies. A variant common in the USA and Canada is to define a cohort by an age range e.g. 14-21 in the 1979 version of the US National Longitudinal Study of Youth (NLSY) and 0-11 in the 1994-5 Canadian National Longitudinal Survey of Children and Youth (NLSCY). Such designs effectively comprise multiple cohorts and in the case of NLSCY, one followed up from birth. The NLSY contains cohorts that are much the same age as the NCDS cohort, which has led to the compilation of a joint dataset for US/UK analysis on mothers and

children.

- 3.7 The need for contemporary data extends to other cohorts defined by the transitions they have gone through or about to go through. School entry and school leaving are examples where the timing of the transition is fixed by legislation; therefore the timing of the first contact can be chosen accordingly. Others like becoming a parent or leaving a partnership are based on personal life course events. Entry to the cohort occurs when the transition happens. Often the sample has to be constructed by identifying the relevant individuals from another survey or from an administrative source.

Special population studies

- 3.8 Although the BHPS and the cohort studies can between them address many of the topics in our priorities list, the data they generate are insufficient to provide answers to all the important research questions, especially in the immediate and short term. In particular, some of the questions relate to small population groups of which general population longitudinal studies will not contain adequate numbers in the sample for analysis. Moreover, the data that need to be collected from these groups are likely to be markedly different from those collected in the general population studies. Thus such topics as diversity and inequality (with a focus on minority ethnic groups) and immigration require special longitudinal studies, where samples of sufficient size are constructed to represent the population of interest. The duration of the study may be short-term or long-term, depending on the research objectives and the feasibility of retaining the sample over time.

Area studies

- 3.9 A variation applying to all the forgoing designs relates to geographic scope of data collection. Longitudinal studies based on national samples appeal because of the population estimates they provide. However, the large-scale longitudinal study of this kind typically does not have the resources to collect data directly from all related local institutions such as schools and hospitals. Linking administrative data from such local institutions is one way of filling the gap, the ramifications of which we consider in more detail later. Another is the local area study, like the Avon Longitudinal Study of Parents and Children (ALSPAC) where close connections with local institutions and geographical convenience can lead to the construction of much richer multi-level data sets than is usual in the large-scale national survey at relatively low cost. Such studies can be based on the birth cohort study model as in ALSPAC or the household panel model. An extension to BHPS starting in 2003 was the Newham Household Panel Study based similarly in a single Local Authority.

Record linkage studies

3.10 Data collection typically involves a field work operation to collect information by home interview, telephone or post. But one form of study, with mainly a demographic focus, relies entirely on the use of administrative records. The ONS Longitudinal Survey (LS) and the equivalent Scottish LS use linkage of vital registration and medical information, such as cancer information, to census records for a selected sample of the population. In the case of the ONS LS, which started with the 1971 Census, everybody whose birth fell on one of four days in the year was selected. The individual data are linked via the birth dates and other characteristics across censuses, producing an ongoing panel of 700,000 people. A number of other countries such as Finland, Sweden and France operate similar record linkage surveys which have supported large-scale cross-national demographic investigations. Because of the sensitivity of census information and the restrictions surrounding its use, LS data can generally be accessed only in aggregate form or via special arrangements. This raises general issues concerning data access that we consider later.

Short-term economic panels

3.11 A variant of the household panel is the short-term economic panel. Such panels are used to monitor changes in the population's economic behaviour in the areas of income and expenditure and labour market participation and are longitudinal through sub-sample panels over short periods e.g. a year, with data collection every 2-3 months. Examples are the UK Labour Force Survey (LFS) survey and the US Survey of Income and Programme Participation (SIPP). Although ESRC funds research using such data, the longitudinal aspect is not a major feature, so this type of design is not central to the report.

Studies of institutions

3.12 Longitudinal investigations need not be restricted to individuals or households. Another design variant focuses on institutions, such as schools, hospitals, community organisations or businesses as the unit of analysis, providing insights into the factors affecting their development. In such cases information about the members comprising the institutions is used only in aggregate as one of the data sources, e.g. school registers or customer records. Research into 'school effectiveness' has developed methodologies and highlighted problems in this area that also apply to other substantive fields of study. The 'birth', 'death', 'merger', and 'splitting' of the aggregate units raise important methodological problems, comparable to those in the household level analyses in household panel studies.

Qualitative studies

- 3.13 Quantitative longitudinal surveys provide the standardised data needed for statistical analysis and are the main focus of this report. However, they may lack the fine ethnographic detail needed to understand biographical process that may be obtained by the use of less structured qualitative approaches. Qualitative longitudinal enquiries such as 'Negotiating Transitions to Citizenship' at Loughborough University¹² build case records over a series of interviews followed by post-field thematic coding of the transcribed interview data, to establish typologies of experience across different life domains. Coordination occurs at the level of agreed interview topics and the coding scheme to employ.
- 3.14 In the right circumstances, qualitative and quantitative enquiries can be combined. For example, small samples of cases identified as having certain characteristics based on large-scale survey data can be followed up in an intensive qualitative study. Such an approach has been applied in the 1958 and 1970 birth cohort studies with recent qualitative follow-ups in the areas of savings behaviour, poor basic skills performance and political activism. These studies can also feed back usefully into the quantitative survey suggesting new topics for inclusion and better ways of asking the survey questions. Because of the resource intensive nature of data collection, typing of transcripts and coding, qualitative studies are generally small scale involving usually no more than 100 interviews and often far fewer, but following a scoping report to the Research Resources Board a much larger-scale programme of linked qualitative studies is under consideration.

Experiments

- 3.15 The vast range of small-scale experimental investigations involving assignment of subjects to treatment and control groups is outside the scope of this report but needs to be mentioned as another form of 'embedded enquiry'. These can involve, as in the case of the German SOEP, selecting sample of cases with certain characteristics from the large-scale panel for small-scale economics experiments in which subgroups are subjected to different 'treatments'. The main concern about their use is that such experimental manipulation may affect the attitudes and behaviours of those involved, thus making them unrepresentative in future rounds of the longitudinal survey. SOEP

¹² Smith, N., Lister, R., Middleton, S. and Cox, L. (2005) Young People as Real Citizens: Towards an Inclusionary Understanding of Citizenship, *Journal of Youth Studies*, 8, 425-444.

have monitored this concern closely and found no signs of its occurrence.¹³

Design decisions

3.16 Design decisions have particular significance in longitudinal surveys because their impact extends over every wave and biases in longitudinal data are potentially likely to accumulate. This is why design issues arise not only when the study begins – when the issues are much the same as in a cross-sectional survey – but through the whole of its progress. There are two broad areas of special importance: sample design and response; and topic coverage and data collection.

Sample design and response

3.17 All surveys share a concern with population representativeness but in the case of longitudinal surveys there are special challenges. The longer the study lasts the greater the problems caused by nonresponse and dropout from the survey (attrition) and missing elements of the current population, such as new immigrants. Over the course of time a longitudinal study becomes unrepresentative because some of its subjects drop out who may have different attributes from those staying in the study. For example, men are more likely to drop out than women and attrition is likely to be most common among the least educated sample members.

Refreshment

3.18 Whether new immigrants can be added to the study may depend on how follow-ups were conducted. In the case of the 1946, 1958 and 1970 cohort studies, in the school years up to the age of 16, all school registers were screened for children born in the specified week, which defined the original sample selection. This approach automatically included immigrant children but it did not continue beyond 16 when address lists were used for follow-up instead. In the case of BHPS the sample was drawn from the post-code address file and address lists were used throughout. Consequently since 1991 immigrants have not entered the BHPS panel except by joining the panel members' households through partnership or tenancy.

3.19 Sometimes a refreshment sample can be selected to provide representation for the new entrants to the population. Thus, for example, the US Panel Study of Income Dynamics (PSID) – the prototype household panel – attempted to add a sample of persons entering the US between the study's inception in 1968 and 1997, but with limited success. However, the German SOEP starting in 1984

¹³ Wagner, G.G., Frick, J.R. and Schüpp, J et al, (2006). *Enhancing the Power of Panel Studies- the case of the German Socio-Economic Panel Study (SOEP)*. Paper presented to the StatCan – Conference, Longitudinal Social Surveys in an International Perspective, Montreal, January 2006.

successfully added immigrants to the panel in 1995. based on screening 20,000 households.

Expansion and oversampling

- 3.20 A general expansion of the sample will also draw in immigrants (in the proportion that they exist in the population), but is generally directed more at the attrition problem and boosting the sample for sub-group analysis. The SOEP sample size was doubled in 2000 for these reasons, Sub-group size raises another design issue: whether to accept representation on the basis of the proportion of the subgroup existing in the population or to boost the sample size by some form of 'oversampling'. On the BHPS this was done to increase sample sizes in Scotland, Wales and Northern Ireland and similarly in the MCS. The MCS sample design also involved oversampling areas with high proportions of minority ethnic groups and high levels of deprivation. Weights need to be applied for analyses based on the whole sample which reduce precision. A question to be considered is whether the over-sampled domains will remain of key analytic interest as the study ages and new objectives emerge. A further issue is the stability of such a design over time as members of the original sample move to other areas with different characteristics.

Topic coverage and data collection

- 3.21 A number of issues arise here including topic coverage, supplementary data, data collection mode, frequency of data collection. Topic coverage will be determined by whether the study is multipurpose serving a number of scientific programmes or topic focused, e.g. health, crime and education. Studies will sometimes have a fairly narrow focus to begin with such as perinatal mortality or family poverty, and move to a wider range of subjects as the study progresses. So ALSPAC broadened from child health to education when the ALSPAC children entered primary school and most household panel studies expand coverage from economics to health issues as the studies mature. Coverage is also driven by disciplinary focus. Thus all the main disciplinary users of longitudinal data: health scientists, psychologists, demographers, economists, sociologists, political scientists will have different data demands depending on the research questions they are pursuing, although increasingly, as in multipurpose studies like BHPS and the birth cohort studies there is overlap between them. Life course theory provides a unifying framework¹⁴. Respondent burden is the ever-present constraint on coverage.

Administrative data

- 3.22 Most longitudinal studies rely on respondents' reports to supply information about their own experiences while the details are still fresh

¹⁴ Geile, J.Z. and Elder, G.H. (eds.) (1998) *Methods of Life Course Research*, London: Sage.
Phelps, E., Furstenberg, J.R., and Colby, A. (2002) *Looking at Lives*. New York: Russell Sage.

in their minds. An alternative source for certain kinds of factual data is administrative records such as school performance records and tax returns. Although data quality can never be taken for granted and always needs appraisal, when this can be assured, the advantages can be considerable. These include:

- Reducing respondent burden – many measures of respondent characteristics such as educational aptitudes or tax and benefits are time consuming to collect but may often be available in an administrative data base.
- Data extension – small area statistics about the area in which panel members live, or data relating to periods outside the time span of the study such as birth and mortality data and medical data more generally, are not available within the study but may be accessible from records.
- Data completion – missing data arising through attrition and non-response may be substituted from appropriate records or the records may be used more generally for data adjustment purposes as in BHPS.

3.23 Countries differ in the availability and accessibility of administrative data for these kinds of purposes. Scandinavian countries have extensive unified administrative record systems through registers based on unique identifiers allocated to individuals at birth. The linkage of administrative data from various sources is therefore straightforward and provides a major longitudinal dataset that involves no data collection from respondents. Thus most of the major cohort studies, such as the longstanding Malmö study¹⁵, do not collect any data directly from study members until age 10, and the Level of Living survey, also in Sweden, similarly relies heavily on administrative registers for the income, education and welfare benefits data that it needs.

3.24 The UK does not have such registers but does have other potentially useful administrative data such as the Department of Work and Employment (DWP) Longitudinal Study database on tax and benefits and the Pupil Level Annual School Census (PLASC) database on education performance, which is now available for research use. There is a strong case for ESRC to work with government through the UK Data Forum to improve our ability to exploit such administrative data for research purposes. The UK Data Forum could also play a lead role in identifying the different types administrative data that will become available over the next 15 to 20 years and for developing arrangements for research access.

¹⁵ See Jansson, C.G. (2000) *Seven Swedish Longitudinal Studies*, Stockholm: Swedish Research Council, where seven major Swedish Longitudinal Studies are described.

Biomedical measurement

- 3.25 The focus on ageing has brought to the fore physical and psychological health questions in all the major longitudinal surveys. The effect has been a desire to improve the quality of what have often been crude health questions and biomarkers such as obesity measures. The growing interest in gene-environment interaction has prompted interest in taking blood samples for the extraction of DNA, following the precedents of NSHD, ALSPAC, ELSA and the medical follow-up of NCDS. Psychological measurement to assess personality factors and propensity to psychiatric disorders are other examples. Measures of a limited kind have featured in the birth cohort studies for some time and with the growing interest on the part of economists in 'soft measures', as well as interest in genetics, are being taken up in many household panel studies as well. The big new US studies such as the US National Children's Study (NCS) are now building in this range of measurement from the start.

Physical environmental measurements

- 3.26 There is growing concern to understand the impact of the physical environment on life course processes. Measuring the exposure of individuals to environmental factors such as pollution in a longitudinal study is therefore an important issue. Such data are typically measured at the area level, which raises problems in relation to exposure of individuals to the effects. Sometimes, however, data collection takes place at the level of the family home to determine cleanliness and the presence of pollutants and toxic chemicals such as lead. As an important part of its data collection protocol, the US NCS includes such physical measurements at the neighbourhood and family level for all 100,000 sample members.

Social environment

- 3.27 The social environment can include such entities as schools and workplaces in addition to geographic neighbourhoods or communities. In some cases analysis of neighbourhood effects can be conducted by appending local area administrative and census data to a survey. Such aggregate data (small area statistics) have been periodically added to the UK longitudinal studies datasets. The importance of neighbourhood effects is illustrated by analyses of PSID data that have shown effects of poverty and racial segregation neighbourhood characteristics on various outcomes.

Measurement issues

- 3.28 All measurement enhancements raise a host of problems ranging from data access and disclosure to respondent burden and interview space. They also have potentially high costs attached. Area studies like ALSPAC in the UK and the Dunedin and Christchurch studies in New Zealand bring their cohort members into a local clinic once a year and spend some hours collecting the required biomedical and psychological data. The NSHD team is planning to adopt this approach on a national scale for the next round of data collection in 2008 and may repeat the exercise one or two years later to collect a second tranche of such data.

Modes of data collection

- 3.29 A variety of alternative modes of data collection are available including the standard methods of face-to-face interview, postal questionnaire, telephone interview, and newer modes of web-based data collection and interactive voice response (IVR) technology. In longitudinal studies different methods may be employed in different rounds of data collection, as well as different methods for different respondents within any one round (e.g. face-to-face interviewing for those who are within easy reach of a survey interviewer and telephone interviewing for those who are not). With the increased difficulty of securing high response rates in surveys, it is likely that mixed mode data collection will become more common in the future, gaining respondents' cooperation using whichever mode they prefer.
- 3.30 The drawback of mixed mode surveys is that the responses given to some items can be affected by the mode used to collect the response, with quite dramatic effects.¹⁶ This is a particular problem in longitudinal surveys because repeated measures are a major feature; hence switching modes could have potentially biasing effects. An associated issue is the use of proxy informants when it is not possible to collect the survey data from the sampled individual in person. A mixture of in-person and proxy data collection across the waves of a longitudinal study can equally give rise to inconsistency and bias.

Frequency of data collection

- 3.31 In birth cohort studies such as ALSPAC, MCS and NSHD the timing of data collection varies through the course of the study, typically using short intervals of one or two years during childhood and early adolescence and then much less frequent intervals in adulthood. In the NCDS and BCS70 where funding was more limited the rounds of data collection were timed to coincide with its availability and at significant points in the life cycle such as school entry, transfer from

¹⁶ Tourangeau, R and Smith, T. (1998) 'Collecting Sensitive Information with Different Modes of Data Collection', in Couper, M.C., Baker, R.P., Bethlehem, J., Clark, C.Z., Martin, J., Nicholls II, W.L. and O'Reilly, J.M. (eds.) *Computer Assisted Survey Information Collection*. New York: Wiley.

primary to secondary school and the transition from school to work or further education at the minimum statutory leaving age 16.¹⁷ Most household panel surveys collect data each year with respondents being asked to report events for the past calendar year. However, after many years of annual data collections, in 1997 the PSID moved to a two-year interval for budgetary reasons. The PSID has adopted a time diary approach to help respondents recall the timing of the events on which they report.

Cross-national extension

- 3.32 Longitudinal studies within a country operate within a relatively homogeneous and generally single institutional framework. A study in a single country can examine the effects of variations in different types of institution, such as different types of school or workplace, but it cannot assess the effects of the system as a whole. Cross-national research, using data from comparable longitudinal studies in more than one country, can provide important insights into the effects of different systems and their historical and cultural foundations.
- 3.33 The major challenge for cross-national research is achieving comparability in terms of data and methods, recognizing the limitations imposed by language and cultural differences. One approach is to mount a study in several countries with a standardised questionnaire, as was done with the European Community Household Panel (ECHP), which ran from 1994 to 2001. A variant is a close collaboration of researchers in different countries conducting very similar studies, as is the case with the Survey of Health, Ageing, and Retirement in Europe (SHARE) starting in 2004, which like ELSA is modelled on the U.S. Health and Retirement Survey. Another approach is to *harmonise* the data from a set of similar studies so that they can be analysed jointly. Examples of this type include the Cross-National Equivalent File (CNEF) 1980-2003 embracing four countries, USA, UK, Germany Canada, with Australia soon to be added and the Consortium of Household Panels for European Socio-Economic Research (CHER) embracing 21 countries¹⁸.
- 3.34 Because of language and cultural differences, such comparisons are more affected by some of the problems of comparability than those that arise in comparing the UK countries. The main issue to be addressed in designing comparisons within the countries of the UK is one of the required sample sizes in each country and the likely need for over-sampling to achieve these sample sizes in the countries with smaller populations. Thus the Millennium Cohort Study boost sample in Scotland was considered inadequate for Scottish purposes and the

¹⁷ NCDS would probably never have become a longitudinal survey if the UK Plowden Committee on Primary Education had not wanted to survey in 1975 a convenient sample of primary school children that the 1958 births survey provided.

¹⁸ Burkhauser, R.V. and Lillard, D.R (2005) *The potential of Data Harmonization for Cross-national Comparative Research* Department of Policy Analysis and Management, Cornell University (mimeo)

decision was taken by the Scottish Executive to launch a new 'Growing up in Scotland' study based on two cohorts starting at birth and at age 5 with the sample sizes expanding to 5,000 and 3,000 respectively.

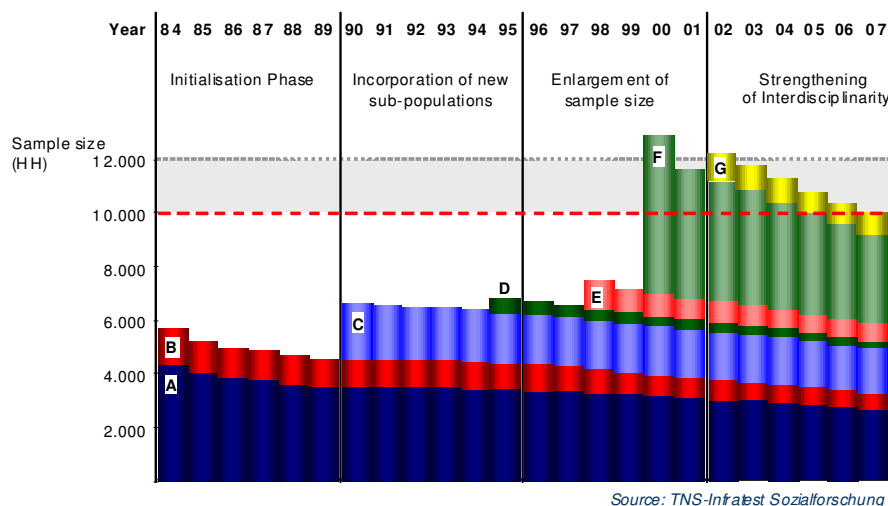
Recommendations

- 2 Longitudinal research designs should be matched to the research questions they are best equipped to answer and in ongoing studies samples should be refreshed and expanded and data enhanced as appropriate to supply the data needed to answer new questions and to meet new methodological challenges.*
- 3 ESRC should ensure that new designs are appraised and tested to meet new research needs, including hybrids involving qualitative and quantitative data, and experimental combined with (survey) approaches, as well as the tried and tested designs.*
- 4 ESRC should work through the UK Data Forum to secure greater access to relevant administrative data for longitudinal studies in the UK.*
- 5 New measurements and measurement approaches should be piloted to extend the scope of longitudinal data including physical environmental measures and biomarkers such as body mass measurement and DNA.*
- 6 The potential for cross-national comparisons and comparisons within the territories of the UK should be taken into account in designing studies, by harmonising key variables and other relevant design features between studies.*

4 **British Household Panel Survey (BHPS)**

- 4.1 The particular strengths of household panels surveys in relation to the production of longitudinal data are first, the short interval between data collections and second, through the collection of data from all adult household members, the availability of the household as a unit of analysis as well as the individuals comprising it. Such contextual data, embedding the individual in the set of relationships that form a household, are of increasing interest to analysts. Starting in 1965 with the Panel Study of Income Dynamics (PSID) in the USA, there have been numerous replications of the basic design in different countries, of which some of the most developed examples are the German Socioeconomic Panel (SOEP), the BHPS, the Canadian Survey of Labour and Income Dynamics (SLID) and the Australian Household Income and Labour Dynamics in Australia study (HILDA).
- 4.2 Through our contacts with the PIs we have been able to chart the evolution of these studies which have typically moved to substantially expanded samples and in some cases have extended to a second generation, child component. As Figure 4.1 shows, after German re-unification the SOEP sample was first expanded to include East Germany, immigrants were then added and most recently the sample size was doubled. Experimental manipulation of small sub-samples matched with panel members as controls has also been tried without apparent damage to response rates.

Figure 4.1 The SOEP sample 1984 – 2007¹⁹



8

Note: A, B=first samples, started in 1984; C=East German sample; D=immigrant sample; E=refresher and innovation samples; G= High income boost sample

- 4.3 Such development of the panels points to their increasing use as vehicles for multiple investigations rather than as single research programmes in their own right. They offer possibly the most comprehensive framework available for social science research involving individual and family follow-up.
- 4.4 The current BHPS comprises a follow-up annually since 1992 of a nationally representative panel of 5,500 households in England, Wales and Scotland, There are currently over 16,000 participating individuals living in over 9,000 households, as original panel members have moved to form new households which have been added to the study. The sample has been boosted in Scotland and Wales and a new panel had been started in Northern Ireland. There is also an associated panel study carried out for the London Borough of Newham involving 1000 households now in its fourth year. The BHPS used to run this survey as an extension of BHPS but it has now been taken over fully by the Borough Council with a different survey contractor.

¹⁹ Source: *20 years of Micro Panel Data for Germany – the SOEP between Continuity and Innovation*, Powerpoint presentation by J.R. Frick, J. Schupp and G.G. Wagner, September 2005.

- 4.5 With its annual follow-up BHPS meets the research requirement of close monitoring of household and family life and facilitates analysis of family dynamics. As the study progresses far more extended transitions are encompassed, opening up potential for a wide range of longitudinal enquiries and, with data collection extending to children, to intergenerational investigations.
- 4.6 BHPS has been an undoubted success in social science terms. Its reputation has been assured through a large body of research that has been enthusiastically received in social science and policy circles. This has been in no small part due to the presence of the panel study in the Institute of Social and Economic Research (ISER) at the University of Essex containing many staff with a major interest in exploiting the data. The fact that the study was designed as a research resource and generously funded from the beginning has ensured data management and documentation of the highest order. However the current study has features that weaken its potential for analysis. These include:
- a. Sub-groups with relatively low prevalence in the general population - such as people with disabilities, lone parents, absent fathers, different minority ethnic groups and specific age cohorts – are too small in a small probability sample for robust inference.
 - b. Although wave-to-wave response rates are currently high, attrition over the life of the panel has reduced numbers in the main panel and is a potential source of bias.
 - c. Immigrants into the UK since the panel began in 1992 are not covered except through joining the households of panel members.
 - d. Age cohorts within the panels, including those formed from panel members' children, have to be too broadly defined for the effective assessment of 'cohort effects'. If they are focused on single ages, for example, the data have to be aggregated over many years confounding the cohort effects with period effects
 - e. Aggregating infrequent events that occur across years of the study (such as divorces) until adequate numbers are obtained similarly requires many years of data.
 - f. Geographical variation can only be captured to a limited extent. The sizes of samples in the augmented samples in Scotland, Wales and the new panel in Northern Ireland numbers are insufficient for within-country fine-grained analysis.
- 4.7 All panel studies confront sample size, non-coverage of recent immigrants and attrition problems, Groups of relatively low prevalence in the population will also have within any one sweep relatively small

numbers, which means that for robust analysis their numbers have to be accumulated over a number of sweeps. In the case of the SOEP, the response in 2000 was to double the sample size (Figure 4.1), but the goal now is 40,000.

- 4.8 We accept the argument put to the Large Scale Facilities group that to build on past successes and to meet future anticipated research needs the BHPS sample size requires a substantial expansion from its original 5,500 households. The justification can be sought from the estimates of numbers in specified subgroups of importance to research that an eightfold expansion to 40,000 would bring. SOEP consider that for many analyses a sample of 500 is the minimum subgroup size that can suffice. But for regional analyses where major demographic variation is important, such as rural/urban and male/female, regional samples of at least 3000 are necessary.
- 4.9 Tables 4.1-4.4 compares numbers for many important sub-samples in the original BHPS sample with estimates based on a sample of 40,000 households.²⁰ Thus Table 4.1 shows that the groups with different levels of qualifications in the current BHPS, when accumulated across age groups spanning ten years, fail to reach the 500 criterion, even when men and women are combined, which would be unsatisfactory for most analyses e.g. only 165 have degrees. A boost to 40,000 households produces adequate numbers, or very much more quickly, in most cases. Table 4.2 shows similar figures for regions and territories of the UK. The numbers in the unexpanded sample are too small for examination of, for example, density of population or rural/urban variation in different parts of the country or between important analytic categories such as local labour market or Local Authority. A sample of 40,000 households would achieve in excess of 3000 in each standard region of England, giving sufficient numbers to compare the 47 English counties if not all 437 UK Local Authorities. Table 4.3 gives figures for minority ethnic groups where there is much more variability in group size and where for most groups even an expanded sample of 40,000 households would be insufficient. Finally Table 4.4 shows that for life course events, such as partnership separation and having children, many years of data are needed before there are sufficient numbers for analysis. Thus from a sample of 40,000 households 806 annual partnership separations could be expected compared with 111 currently but only 462 such separations with a child present. There would be 1,200 births annually to the panel, i.e. over five years 10,000 new members would become new panel members.

²⁰ Source: personal communication Nick Buck, ULSC, University of Essex.

Table 4.1 Illustration of the size of age cohort groupings

Based on BHPS Original sample size	Ten-year grouped cohort		Five-year grouped cohort		Single years	
	Men	Women	Men	Women	Men	Women
Degree	92	73	46	37	9	7
Other higher	178	153	89	76	18	15
A-level	110	79	55	39	11	8
O-level or below	227	342	113	171	23	34
No qualifications	194	260	97	130	19	26
All	799	906	400	453	80	91
Based on 40,000 Households	Ten-year grouped cohort		Five-year grouped cohort		Single years	
	Men	Women	Men	Women	Men	Women
Degree	665	533	333	266	67	53
Other higher	1291	1111	645	555	129	111
A-level	796	571	398	285	80	57
O-level or below	1647	2487	824	1244	165	249
No qualifications	1411	1889	705	945	141	189
All	5811	6591	2905	3295	581	659

Table 4.2 Expected number of eligible adults (age 16+) by Government Office Region

	Original BHPS sample size (5,500 households)	40,000 households
North East	458	3330
North West	1067	7758
Yorkshire	927	6740
East Midlands	731	5319
West Midlands	914	6651
East of England	951	6921
Greater London	1112	8087
South East	1419	10320
South West	903	6565
Wales	516	3759
Scotland	949	6908
Northern Ireland	363	2640

Table 4.3 Expected number of eligible adults (age 16+) by ethnic group

	Original BHPS sample size (5,500 households)	40,000 households
White British	8736	63533
Other white	328	2383
Indian	152	1102
Pakistani	87	633
Bangladeshi	36	258
Other Asian background	45	329
Black Caribbean	84	613
Black African	61	445
Other black background	9	69
Chinese	28	206
Mixed ethnicity	44	321
Other ethnic group	72	524

Table 4.4 Average number of events per annum

	Total up to wave 13 of BHPS	Average per year	Expected per year average with 40,000 households
Partnership formation	2263	189	1372
Partnership separation	1330	111	806
Partnership separation with child present	763	64	462
Child leaving parental home	1759	147	1066
Child born	2005	165	1196
Migration > 50km	1731	144	1049
Employment to unemployment transition	1273	106	772
Employment to retirement transition	973	81	590
Unemployment to employment transition	1481	123	898
Unemployment/inactivity to employment transition, Lone parents	269	22	163

Two studies or one?

- 4.10 In building what amounts to a new BHPS the future of the current study has to be considered. The main options for achieving the expansion are:
- a. replace the current BHPS by a new panel up to eight times its present size
 - b. augment the existing panel to achieve the required sample size
- 4.11 Starting afresh with a new panel has some significant advantages. However, the review team favours option b because of the importance it attaches to the longer-term analyses that a continuation of the existing panel can provide. Option a runs counter to the argument that the BHPS data becomes more valuable the longer the panel is maintained (provided it is not subject to too severe attrition bias). Moreover, early termination before a new panel was fully established would produce a 'data gap'. We recognise that this option is the more expensive, but the high value placed on the increasingly long-running PSID supports the case for similar BHPS continuation.
- 4.12 We note the recommendations of the BHPS Scientific Steering Committee in favour of this option and add our support for the establishment of a new BHPS with substantially enhanced sample size possibly in the order of eight times the size of the present one, i.e. based on 40,000 households encompassing potentially approximately 70-80,000 individuals. The current BHPS sample should be sustained as a component of the augmented sample with a periodic independent evaluation of representativeness to justify combined analysis and continuation. We also think that augmentation should be in accordance with the existing panel design and on balance are against further over-sampling to boost the representation of particular sub-groups (other than the existing boost samples for Scotland, Wales and Northern Ireland).

Topic coverage

- 4.13 Multipurpose studies have the problem that the data to which the potential research questions relate frequently exceed the questionnaire space available. This is particularly the case in a panel study like BHPS with annual data collection because the burden on respondents (all household members) would be considerable if questioning lasting several hours occurred every year. Accordingly, the actual interview time with any one respondent is restricted to 45 minutes. The solution to the coverage problem, as spelled out by the BHPS Scientific Advisory Committee and also pursued successfully in such studies as SOEP, is a matrix and modular survey format in which particular instruments are used (and repeated) with particular sub-samples at

varying intervals depending on the instrument involved.²¹ Varying the coverage for sub-samples such as children for example is already part of the core design. This approach extends the idea to sub-samples selected at random from the main sample. All sub-samples complete core modules such as those to do with family, occupation and income. These developments are necessary to ease the problem of respondent burden that is going to increase with the steady move of panels towards issues to do with ageing and health. Biometric data in particular, such as lung function, can be time-consuming to collect and could not possibly be accommodated within the current BHPS design.

Sub-sample study

4.14. A further variation suggested is to set up sub-panels on the basis of events as they occur in the panel members' lives such as parenthood or losing a job. Follow-up of individuals for more intensive study has been a common feature of the birth cohort studies, including medical investigations of respiratory illness and qualitative follow-up studies, but the respondents concerned have not been followed up further. BHPS establishment of the youth panel of all 11-15 year-old children in the panel households is one example in which the added sample has been followed over five years by which time all the members had reached 16 and joined the main study. PSID and SOEP go further in adding samples of panel members' children that go back to birth. With such developments it needs to be acknowledged that the longitudinal aspect in a study like BHPS needs to be catered for in a very sophisticated way. This is to ensure that over time all relevant data are collected with sufficient frequency to support a number of research programmes and to meet all analysts' needs.

Data collection frequency

4.15 The preferred frequency of data collection particularly for household income has been annual to minimise the potential bias arising from anything more than a year's retrospection. However, for funding or operational reasons a number of household panel studies have relaxed the annual requirement collecting data at two or even three year intervals. PSID moved to a two year interval for budgetary reasons but now sees merit in the gap years because of the opportunity they offer for carrying out add-on studies such as the child supplement (involving all children born to panel members) and methodological development. In the case of certain kinds of data such as attitudes, and various kinds of behaviour more extended periods may sometimes be preferred, with rotation of data collection cross different waves because of the relative lack of movement in these variables over short periods. In weighing the

²¹ *The Long Term Value of the British Household Panel Survey; the views of the BHPS Scientific Steering Committee*, University of Essex, UKLSC, 2005 (mimeo). A proposal for a *Continuous Population Survey* to replace five government continuous surveys, LFS, APS, GHS, EFS, OMN, put out for consultation through the Office of National Statistics, is based on a similar matrix approach, ONS, 2004.

options the team favours maintaining annual data collection. However, as the panel expands and data collection extends the implications of retaining the annual interval will need to be investigated further, especially with respect to the burden placed on the survey team in managing an increasingly complex design.

Recommendations

- 7 *The BHPS would benefit greatly from a very substantial expansion in its sample size. We consider the proposed expansion to 40,000 households to be fully justified. The expansion should be achieved by augmenting the existing BHPS in such a way that the data can be integrated.*
- 8 *The current BHPS panel should be continued alongside the new sample unless bias due to attrition becomes too serious a problem.*
- 9 *Annual data collection should be retained but as an expanded BHPS moves increasingly towards becoming a multipurpose framework for a number of matrix/module-based studies the implications of a longer time interval should be investigated*
- 10 *Where feasible and appropriate, the new larger panel should use a modular and matrix approach, rotating topics at less frequent intervals either for the whole sample or for different sub-groups. Different modes of data collection to replace personal interviews for some waves, topics and respondents should be considered and evaluated.*

5 British Birth Cohort Studies (NCDS, BCS70, MCS)

- 5.1 Although cohort studies are common across the world the British birth cohorts which follow nationally representative samples of individuals from birth to adulthood with direct contact with cohort members from infancy – rather than via registers – were, until relatively recently, unique. The closest to them are the New Zealand studies based in Dunedin and Christchurch that like the British ALSPAC are area-based birth cohort studies. The large suite of Swedish longitudinal studies, though based on birth cohorts, do not start typically until the age of 10, relying on administrative records held on the Swedish registers to supply the relevant data about education, health and family circumstances up to that age. In fact an attempt to establish a Swedish birth cohort study on British lines, as part of the European-wide Millennium initiative, failed to gain government funding largely for the reason that the existence of the registers made it unnecessary. A number of countries established Millennium birth cohort studies but these were typically medical in conception such as the 100,000 birth cohort study established in Norway, which has the central role in the cross-national ‘Gender and Generation study’. In the USA a much more wide ranging 100,000 birth cohort study, the National Children’s Study (NCS) starting at pregnancy is about to begin.
- 5.2 The main difference in design is the quasi-sequential feature of most of the studies undertaken in other countries in which different cohorts enter the study in the same year but at different ages, including sometimes one cohort at birth. Such studies clearly cannot collect the full range of prospective data available to the birth cohort study but make do with retrospective accounts from parents and use administrative records from health and education to fill the gaps. The advantage of such designs is delivering data on later ages, and therefore key transitions such as school entry, relatively quickly. Cohorts followed up from birth also lose representativeness through immigration and non-response. There is also the question of whether you can load onto a general purpose cohort all that you need to collect for a particular transition of interest.
- 5.3 The 1958, 1970 and 2000 (Millennium) birth cohort studies, of which ESRC is the major funder, are the successor studies in a series that began with the 1946 cohort study one year after the end of the last war.²² The motivation for the latter study was medical – a concern with perinatal mortality – and interest in observing the effects of the National Health Service established in 1948 on the new generation. The subsequent National Child Development Study (NCDS) began in 1958 and the Child Health and Education Study (CHES – now BCS70) began in 1970 similarly had primarily a medical focus to start with. All adopted the same design of following a single week’s births; though in

²² Wadsworth, M. (1991) *The Imprint of Time*, Oxford: Clarendon Press.

the case of the 1946 study rather than following the whole cohort of potentially 17000 births, a sample 5,362 births, stratified in favour of small families and the better educated, was followed. From then on the studies took different paths with data collected at different ages, largely depending on the availability of funding. In the case of the 1946 study the direction of interest became mainly medical, with the establishment of an MRC Unit to run the study in 1963. With the exception of the MRC-funded medical sweep at age 44 in NCDS, NCDS and BCS70 have been supported from government and social science sources, increasingly ESRC.

- 5.4 The Millennium Cohort Study (MCS) history is quite different, in the sense that funding came from ESRC and a consortium of government departments from the beginning. The design was also different, embracing a whole year's births rather than births in a single week and, to capture ecological effects, used a clustered sample based on all births in 400 wards. Boosts of the sample also occurred in Scotland Wales and Northern Ireland. Another boost increased the number of wards with high proportions of minority ethnic groups and high levels of social deprivation, the latter in order to aid the evaluation of the Sure Start programme directed at three to five year olds. Older siblings were also added to support another evaluation that of the Children's Fund.
- 5.5 There is a thirty year gap between BCS70 and MCS which brings to attention one more birth study. The Avon Longitudinal Study of Parents and Children (ALSPAC) started in 1992. It comprised all pregnancies across a single year in the county of Avon, 14,120 children in all for whom data have been collected annually since the birth. Although the study is not nationally representative this is compensated for by the very rich data collected not only from parents and children but from the local institutions – schools and hospitals with which they interact. For research questions in which national estimates and regional variation are not an issue, the study could hardly be equalled. In this respect it parallels the highly productive New Zealand birth cohort studies in Dunedin and Christchurch with the added value of having a much larger sample size.
- 5.6 All the ESRC funded studies involve following up the selected sample from birth to adulthood with numbers in excess of 10,000 still participating in the NCDS and BCS70. At age 33 the NCDS study was extended to data collection from one third of cohort members' children – 5,000 children – and at age 34 in BCS70 a similar child study was carried out but this time with half the cohort members' children to allow for the delayed child bearing in the latter cohort. Data collection intervals have varied through the life of the studies but in accordance with a strategic plan are currently fixed at four year intervals alternating face-to-face and telephone interviews.
- 5.7 The main limitations of the studies in their mature form (age 47 NCDS; age 35 BCS70) are:

- a. Inability to deal with short term life course dynamics because of the relative infrequency of data collection particularly in the early years of the 1958 and 1970 studies.
 - b. Area-level data are absent because of the spread of the one week's births throughout the country on which the first three were based.
 - c. There is a lack of data collected from other members of the family to investigate the relational aspect of development.
 - d. Problems with attrition and non-response are reducing numbers for longitudinal analysis potentially biasing the sample.
 - e. The 30 year gap between the 1970 cohort and the Millennium Cohort means that life-course processes in cohorts born across the period 1970 to 2000 cannot be observed.
 - f. No immigrants were included after the cohort members passed the end of their compulsory schooling at age 16.
- 5.8 There are two issues that arise in relation to future strategy raised in the brief for the review that we consider here.
- a. Should the original series, with twelve year intervals, be restored implying the need for a further cohort study starting around 2012?
 - b. Should some attempt be made to bridge the 30 year gap between the 1970 and Millennium Cohort studies?

New cohort study for 2012?

- 5.9 The extent to which there is support for the continuation of the series through a new birth cohort study to be launched in 2012 depends on research interest in the impact of socio-economic change on the life course. Those respondents to the review who were major users of the cohort study data were mainly in favour. The argument is based on the idea that 12 years is about the right interval to monitor the life course effects of significant societal changes and secular trends such as globalisation pressures on the labour market, major policy shifts and changing family structures. The alternative is to tie each new study to some major social, economic or policy shift or even historically important symbolic event. The case for the MCS was made in Parliament largely on this basis.
- 5.10 We favour on balance the fixed interval approach but, drawing on overseas models for longitudinal studies and our consultations, believe some variations in design on past models are desirable and need to be explored through a scoping study. These design options include

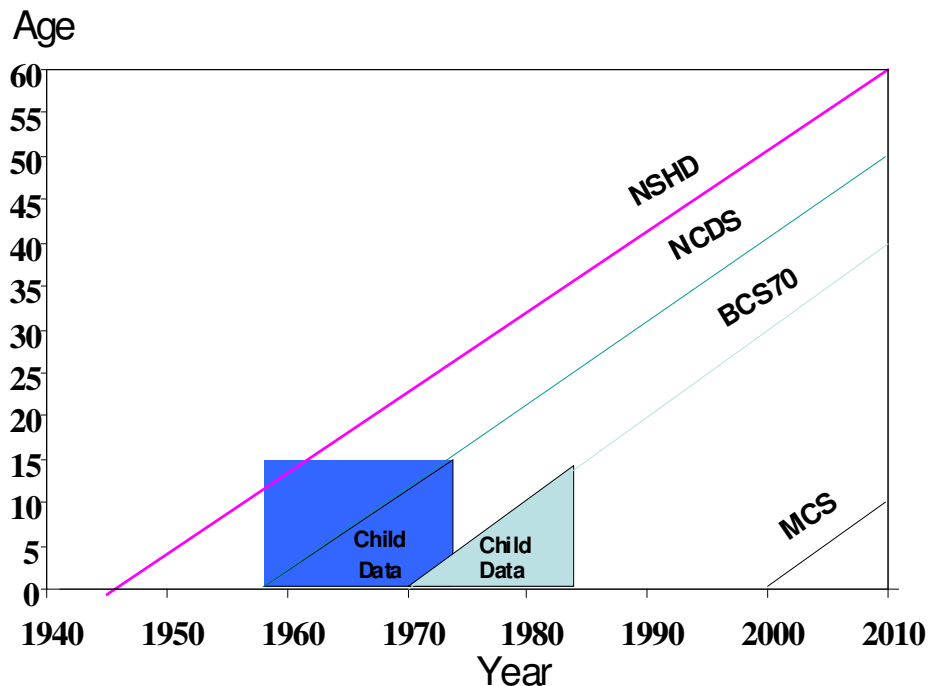
continuous data collection across an interval of some years rather than trying to compress data collection into as short a time period as possible. For example, for a target sample of around 20,000 births over four years this design would embrace, in effect, up to four birth cohorts (each with $n=5000$) starting in consecutive years. Another design option (which departs from a true birth cohort) is that rather than start all samples at birth, two or more quasi-sequential cohorts starting at ages 0, 5 or 0, 5 10, 15 could be used instead. The older samples would of course represent different birth cohorts and would therefore overlap with the Millennium Cohort, offering the opportunity for cross-study analysis. Data collection intervals would be decided on the basis of age and stage reached.

- 5.11 More detailed scoping work is required to decide whether to concentrate data collection in one year or spread it over several years and also whether to start all cohorts at birth or some at later ages
- 5.12 Spreading data collection over an extended period means that the MCS stratified and clustered sample design would probably need to be replicated (with or without the area over-sampling). These possible design enhancements have a number of advantages over the traditional birth cohort study based on one week's births and even over the MCS design spread over a year:
 - a. By collecting the data continuously or breaking each age cohort into a set of four repeated sub-cohorts – each of which would be larger in size than the Dunedin and Christchurch and the main Swedish studies – a wider range of life course experience is captured over a more extended period.
 - b. In line with the proposals for BHPS survey design could be varied across sub-cohorts including, an option which collected data from institutions with which the sample member had interacted and there could be question rotation across cohorts.
 - c. Costs are saved in a continuous field work operation conducted by a highly trained single contingent of interviewers.
 - d. Information about transition in older cohorts is available much earlier (a key factor for policy interest, e.g. in school entry).
- 5.13 Because of the extended interval for data collection it has been considered acceptable to run interviews for longer than in the BHPS: 1.5 hours average time has generally been the norm. This is still substantially less than in area studies like ALSPAC. And the pressure from users of the data for further expansion of the interview is considerable.

Bridging the 30 year gap

5.14 The UK birth cohort studies gain value by being used in combination. For example, the same age groups can be compared at different time points enabling shifts in the life course to be observed (cohort effects). Figure 5.1 shows the full range of comparative possibilities including with the 1946 cohort study. However, the 30 year gap between the 1970 birth cohort study and the MCS limits scientific investigation of the factors behind these shifts. The need for the relevant data might be met through early data enhancement and potentially new data collection in studies of cohorts born at the relevant time.

Figure 5.1 Birth cohort studies: continuities and gaps



5.15 The case for bridging the gap by piggy-backing on an existing study of such a cohort has been argued by a number of our informants largely in terms of the comparative value of the cohort studies in revealing the way the life course has changed over the second half of the twentieth century. Such comparative data enables theories about the origins and consequences of the changes for later life to be tested. The major upheavals in the transition to work that had occurred by the early 1980s are captured by the 1970 cohort study. Since then rising staying

on rates and the postponement of child bearing occurred which cannot be observed when they first occurred in an existing study. Similarly, changing family structures, the rise in obesity, asthma, drug abuse and antisocial behaviour also merit data collection from a cohort currently in their mid-teens.

Figure 5.2 Age at birth of first child: women

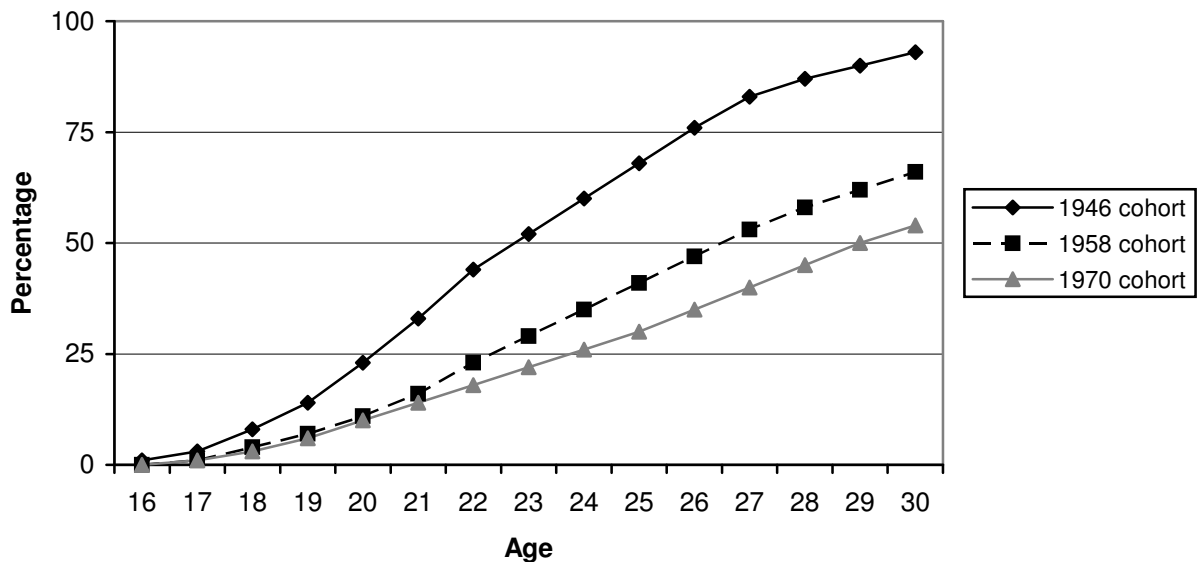
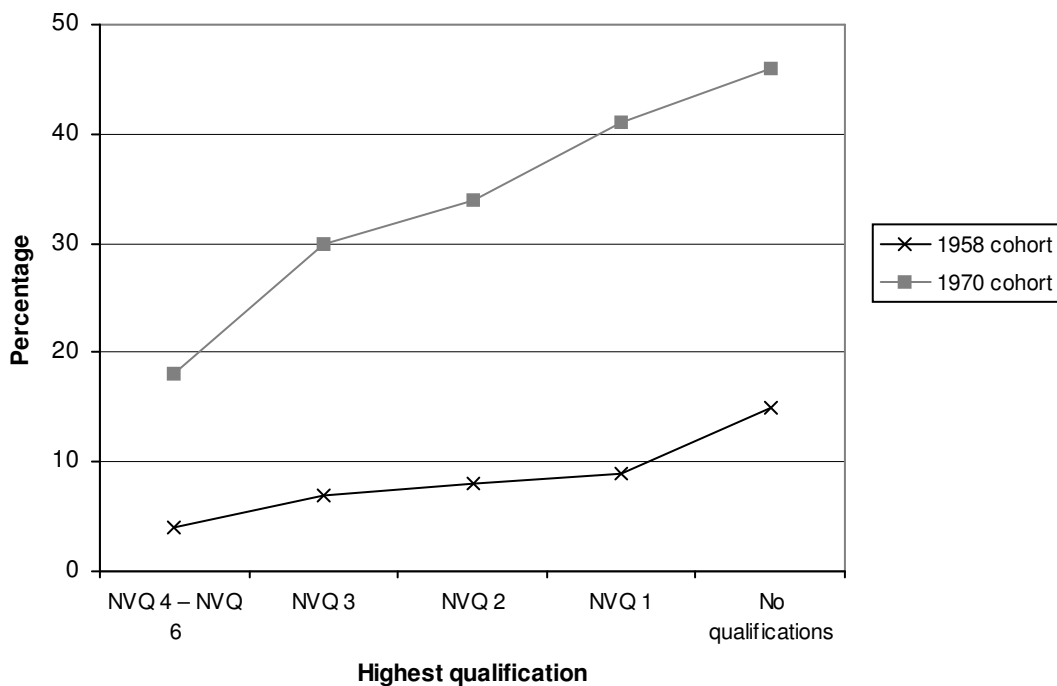


Figure 5.3 Experience of ever been arrested by highest qualification: men



- 5.16 Figures 5.2 and 5.3 illustrate the kinds of social trends that can only be effectively pursued in life course terms through the missing cohort.²³ Figure 5.2 shows the increasing delay in child bearing across the three cohorts and Figure 5.3 the shift upwards not only in the prevalence of offending between the 1958 and 1970 cohorts but the strengthening association of offending with low levels of qualifications. Increasing education and class-based polarisation of this kind is evident from cross cohort comparison in many areas such as health-related behaviour, e.g. Smoking, and the life course trends producing it, need to be understood. Unless there is evidence from the most contemporary cohorts we have no means of knowing whether the trends are continuing and what their predicted outcomes for these cohorts will be. This is a key issue for policy analysts in judging the worth of birth cohort study data
- 5.17 The study that comes closest to meeting the missing cohort requirement is ALSPAC. Clearly it has limitations in being restricted to the Avon area rather than being a nationally representative study but its members were born in 1992 and are currently in their mid teens so its timing is ideal. The cohort has been followed annually since conception with a wealth of data collected, particularly on health and education. Another study which has some potential value in filling the gap is the LSYPE whose members are also now in their mid teens. However, this study (restricted to England) did not start at birth and it would be impossible to collect all the data about earlier years that a cohort study starting at birth would have accumulated by this stage. It began in year nine in secondary school (age13/14) in 2004 with a school-based sample of 20,000 pupils, 5000 of which were from ethnic minorities. Subsequently by 2005 there has been one follow-up in the currently funded three wave programme, with the intention of repeat surveys every year at least until age 25. The study also serves as one of the cohorts in the DfES funded Youth Cohort Studies series, which since the early 1980s has been charting the educational pathways of large samples of children past the last year of compulsory schooling (aged 16/17). The Scottish School Leavers study supplies comparable data on educational pathways post 16, and could conceivably also provide some information to compensate for the 'missing cohort'
- 5.18 We see both ALSPAC and LSYPE as potentially playing an important part in the portfolio in their own terms, but also because of their added value in relation to the missing cohort problem they merit ESRC investment in their own right. This could be used to assist the ALSPAC team with coding and documenting the early data. In the case of LSYPE, which is fully funded until age 16 under an education policy agenda, discussion could begin about possible ESRC support for augmenting the study with relevant administrative data on early life such as health records. In the longer term, neither study has assured

²³ Source: Ferri, E., Bynner, J. and Wadsworth M. (2003) *Changing Britain, Changing Lives*. London: Institute of Education Press.

funding and for surveys beyond age 16 both studies are likely to be actively seeking co-funding opportunities.

Future directions

- 5.19 More generally there is a case for developing the cohort studies along the lines argued for BHPS i.e. as supplying large sampling frames for use in more specialised investigations of particular sub-populations and particular features of their life course. The design options for the 2012 survey offer these opportunities for such a development enabling, for example, small sub-samples of the main sample defined at random or by age or some other attribute, to be studied in depth by quantitative or qualitative methods. Experimental designs could also be embedded in the new study in this way.
- 5.20 Finally the case has been frequently put for extending the studies to the next generation. This happened on a one-off basis for the 1946 cohort study (firstborns) and in the 1958 and 1970 birth cohort studies the children of one third and one half of the cohort members' respectively had their children assessed. The intergenerational data are particularly valuable additions to the NCDS and BCS70 datasets because the data collected on the cohort members' early childhood is relatively limited with wide intervals between surveys during which development is very rapid. The all-age feature of the child data is therefore useful in making good the gaps. Intergenerational data are also central to research on the transfer of resources from one generation to the next, and on 'cycles of deprivation' and 'escape' from them. In the case of the birth cohort studies the data extend back to the cohort members' parents and for some variables back to grandparents enabling unique four generational data sets to be constructed with much potential analytic value. When used comparatively as in the case of NCDS their value extends further.
- 5.21 Developments along these lines for the birth cohort studies would lead naturally to closer collaboration between the largely ESRC-funded cohort studies and the MRC-funded cohorts of which the 1946 study and ALSPAC are the most obvious examples. But others, such as the West of Scotland Longitudinal Study and the Cognitive Functions and Ageing study, are also relevant (Appendix 2). Bringing the birth cohort studies more closely together physically, or virtually, within some kind of 'observatory' needs to be considered. Such a development, which would be jointly funded by ESRC and MRC, could give Britain a lead position in developing the cohort study models for developmental science internationally.

Recommendations

- 11 *The current birth cohort studies should be continued and sufficient resources made available to support data collection across the lifespan at an average interval of four years and to continue the*

intergenerational components. Cross cohort collaboration should be facilitated and harmonisation of the data collected between them encouraged as support cross-cohort comparison.

- 12 *A new cohort study should be started in around 2012 to restore the twelve year interval series. It should be preceded by scoping new designs to determine whether to concentrate data collection in one year or spread it over several years and also whether to start all cohorts at birth or some at later ages.*
- 13 *To partly fill the thirty year gap in the series between BCS70 and the MCS, there should be support for data enhancement and potentially data collection after 16 years of age the Avon Longitudinal Study of Parents and Children (ALSPAC).The potential role of the Longitudinal Study of Young People in England (LSYPE), through addition of relevant administrative data back to birth also needs to be investigated. The feasibility of using the Scottish School Leavers Survey in this way should also be investigated.*

6 Strategy

ESRC portfolio

- 6.1 Enhancements to the BHPS and the cohort studies would go a long way towards meeting social scientists' needs for longitudinal data but still leave some gaps. These studies need to be viewed in the context of the other major UK longitudinal data sources which are available for secondary analysis, including government studies, and in which ESRC investment may be desirable. They also need to be set against key overseas longitudinal studies, which apart from offering potential collaborative opportunities, supply some of the models that we consider valuable to fill the identified gaps. The whole adds up to an ideal integrated portfolio of longitudinal resources, the effectiveness of which is judged by how well the portfolio meets the research requirements set for it by the UK social science research community. The portfolio, while requiring stability, therefore also needs to be kept continually under review.
- 6.2 A national framework is needed to establish the integrated portfolio of longitudinal studies in which ESRC is a major stakeholder. This framework could be developed under the auspices of the UK Data Forum. It should cover national, area-based, population specific and intergenerational studies for a range of scientific disciplines and study areas: sociology, psychology, economics, political science, demography, environment, education and bio-medical studies. The framework should ensure coverage of the key research issues without unnecessary duplication and should support harmonisation between the longitudinal studies and cross-sectional studies as appropriate. Harmonisation is of great importance in establishing a cross-over between studies, thus facilitating the application of data from several studies in addressing a specific research issue.
- 6.3 Although the value of the portfolio data for policy makers is an important consideration, the prime purpose of the ESRC supported studies should be recognised as scientific research, supporting academic and other scientific research programmes. The integrity of the studies should therefore not be compromised to meet transitory policy evaluation requirements. While the studies should not be *policy driven*, they should be *policy relevant*, supplying the evidence base on which policy can draw.
- 6.4 Within the portfolio we have made a strong case for continuation and enhancement of the current ESRC core longitudinal studies, BHPS and the cohort studies, based on their increasing value the longer data collection continues. However, the BHPS and the cohort studies cannot address all major longitudinal research questions, primarily because of the practical restrictions on the range of data they can collect and also because their sample sizes are not large enough for

the rare population subgroups that are involved. To address these limitations, larger samples and more specialized, longitudinal studies are needed in the ESRC portfolio.

6.5 The portfolio of longitudinal studies should be viewed in a broad context of other data collections. They have common features with other related kinds of research design with longitudinal elements including:

- Government evaluation studies involving the follow up of treatment and control groups to assess the impact of particular government policy or programme.
- Major government surveys with longitudinal components (For example, the Labour Force Survey, which is widely used in academic research, is a 5 wave panel carried out over a year. Data for individuals can be joined over the year and used to study very short-term labour market transitions. From 2005 the General Household Survey has a 4-year longitudinal panel design as it is being used to meet the requirements of the European Statistics on Income and Living Conditions (EUSILC).
- National continuous or repeated cross-sectional surveys, such as the Expenditure and Food Survey, the Family Resources Survey, the British Crime Survey, the Health Survey for England, the Programme for International Student Assessment, and many others are longitudinal only at the macro level, but can be used to contextualise micro (individually-based) longitudinal data and assess period effects.

Response and measurement problems of a comparable kind occur in all these surveys, which require harmonisation of approaches and collaborative analyses.

New investment

Ageing population

6.6 As a response to the dramatic demographic shifts towards an ageing population one of the major developments in longitudinal studies have been research programmes on ageing. The standard was set by the US Health and Retirement Study (HRS) funded by the National Institute of Ageing (NIA), which began in 1992 with a panel of 12,654 50-61 year-olds followed one year later by a sample of 8,222 aged 75 or more. Subsequently the two panels merged. The study was strongly interdisciplinary from the beginning with economists, health scientists, geneticists and survey statisticians working together with the help of

expert panels to decide topic coverage.²⁴ The model stimulated replication in other counties of which ELSA, funded by UK government departments and NIA, was the first and most notable example. This is based on an initial sample of 12,100 people aged 50 and over, identified through the annual Health Survey for England.

- 6.7 The centrality of ageing to current societal concerns and the need to know how each country's institutions are adapting to the challenges it represents have stimulated this huge amount of activity and again Britain is a world leader in the field. Although to date ESRC has had no direct involvement in funding data collection in ELSA (only some secondary analysis), in combination with MRC and other research councils through the UK Data Forum, it would appear to have a strong case for getting involved in the funding at some stage. In the meantime there is an anomaly, resolution of which should be considered by ESRC. Despite the existence of the Health in Scotland survey ELSA does not currently operate 'north of the border'. There is a case for ESRC to take the lead in enabling it to do so. In addition there is a facilitating role to be pursued, supporting collaboration and data harmonisation between ELSA, BHPS and the cohort studies to ensure that the ageing data they collect are compatible and that maximum research potential is gained through sharing of results across all the studies.

Ethnic minorities

- 6.8. Another largely missing population from the current panel and cohort studies, of much policy and scientific importance, is minority ethnic groups, where identity issues and the experience of various forms of discrimination and disadvantage merit longitudinal investigation. The range of designs to encompass relevant diversity and choice of appropriate sampling frames are complex and currently under consideration by ESRC. For example, when is it essential to have sufficient numbers of a particular ethnic group in the sample for worthwhile analysis and when can groups be legitimately combined? The final column of Table 4.4 giving estimated numbers for an enhanced BHPS illustrates the problem of small numbers in many groups. Such issues and many others will need to be resolved and there will be a need for substantial methodological investment in the survey's development.²⁵

Other minority groups

- 6.9. In the course of the review the point was made that other minority groups are also of special policy interest not least because they are sometime subject to various forms of discrimination. Travellers and

²⁴ Juster, F.T. and Suzman, R. (1995) An Overview of the Health and Retirement Study, *Journal of Human Resources*, 30 Supplement 1995, S7-S56.

²⁵ Nazroo, J (2005) *A Longitudinal Study of Ethnic Minorities: Focus and Design*, UCL, Department of Epidemiology and Public Health (mimeo).

asylum seekers are two such examples; the Roman Catholic population in South West Scotland is another. The list is potentially a long one and no convincing argument has been put to the panel that one group should take precedence over another. Again accommodation of such research populations will be contingent on the decisions made about an enhanced BHPS. Whether numbers are sufficient to answer the research questions – if necessary with over-sampling – or whether separate studies are needed will depend on the size of the enhanced BHPS.

Immigrants

- 6.10 One of the significant manifestations of globalisation is greater mobility of populations raising the issue for host countries of the impact of immigration and immigrants. Although it might be possible to study people who arrive in the country at a particular point in time and follow them up to see how they adapt to their new country, immigrants arriving some years later might be quite different in terms of their backgrounds and subsequent experiences. Thus ideally one would need a continually updated sampling frame. This would be a major challenge in most European countries. Some countries with long histories of substantial immigrant flows such as New Zealand and Canada have underway short-term longitudinal surveys of immigrants. In the Longitudinal Immigration Survey of New Zealand (LISNZ), data are collected at six months, two years and four years, and in the Longitudinal Survey of Immigrants to Canada, annually for up to six years. The reason such studies tend to be short term is that critical adjustment issues arise for new immigrants which are of particular concern to policy; however, a longer duration study would have value for the observation of immigration's longer-term effects.
- 6.11. Such studies are based on a sampling frame derived from immigrant registration records that are continually being updated as new immigrants arrive not necessarily from the same countries of origin. Within the European Union, with free movement of populations and, at least currently in Britain, no mandatory identity cards, such information is not available on any single database. For this reason other sampling frames derived from surveys have to be used for screening purposes or questions added to an ongoing survey instrument. The Home Office is currently working on the design of a longitudinal survey of immigrants which in due course will provide the lead on tackling these problems, but details are not yet available. It would be in the interest of ESRC to monitor closely progress on this work.
- 6.12 A valuable Home Office report sets out the key issues which need to be investigated in such a study.²⁶ Many of these are to do with social and economic outcomes and attitudes that are central to the ESRC's mission and the opportunity needs to be taken for joint work. At the

²⁶ Glover, C., Loizillon, A., Portes, J., Price, R., Spencer, S., Srinivasa, V. and Willis, C (2001) *Migration: an Economic and Social Analysis*, Home Office, RDS Occasional Paper No 67.

same time an expanded BHPS with regular refreshment to incorporate immigrants, as successfully achieved in SOEP, would provide the research vehicle for some specialised ESRC-supported studies of the area; it might also better accommodate the changing nature of the immigrant population.

Transient statuses

- 6.13 Membership of a minority ethnic group is generally seen as a fixed characteristic that will have significance for the whole of the life course and, providing a population list is available, can be used as a basis for sampling. Other statuses of much interest to the review are defined by transitions which may or not be permanent, such as being an absent parent or becoming unemployed. The sample for the study of such groups has to be built up on the basis of screening the general population over an extended period or by spreading the sample widely enough to find enough cases from current records. For example, the US Fragile Families and Child Well-Being Study is based on 5,000 children born between 1998 and 2000 in 21 cities born to unmarried parents²⁷. It is tempting to pursue similar special population studies here, but on cost-effectiveness grounds we are not convinced that they should necessarily be prioritised. All such studies benefit from the existence of a control population with which the special population's experience can be compared. The existing core studies offer this facility. Depending on the size of the BHPS sample enhancement, then the special population will also be accommodated in sufficient numbers, arguing for embedding it in the BHPS rather than doing it independently.

Institutions

- 6.14 The review identified some interest in ESRC investment in longitudinal studies of institutions in which the focus of enquiry is aggregate units such as schools, hospitals or firms and in which the individuals involved with them are not followed specifically; business surveys are a common example of this type of enquiry. We see the great value of institutional data attached to individual longitudinal records collected directly. The richness of such area-based studies as ALSPAC is precisely because the study has been able relatively easily to build multi-layered data from these sources. We are not, however, persuaded that large-scale longitudinal studies of institutions in their own right should be supported currently by ESRC; though the matter should be kept under review.

²⁷ <http://crcw.princeton.edu/ff.asp>

Record linkage studies

6.15 The ONS LS and (potentially) the Scottish LS provide vital demographic information about population movement and key status changes between censuses, including parenthood and mortality data. The studies also supply population data on all the birth and age cohorts constituting the BHPS and the cohort studies with sufficient numbers to contextualise and benchmark the data from these other studies. The ONS has received ESRC funding for some time to support secondary analysis of the data by social scientists. The Scottish LS has substantial support from ESRC for the production of the dataset itself. Although record linkage studies of the LS kind were not central to the review, we attach high priority to continuation funding for this work.

Development

6.16 The core studies should be developed to support a wide range of scientific purposes. The resource-based approach to investment in longitudinal data needs to operate within the terms of research programmes that identify in broad terms the questions and hypotheses that the data will be needed to address. Life course theory provides the first steps towards the kinds of theoretical underpinning required, stressing the importance of looking at interactions between individual agency and contexts across the different domains of life.²⁸

6.17 Design decisions in one study will impact on those in another. Hence BHPS refreshment or expansion may remove the need for a study of a particular minority group or may drive the decision to start one. With the existence of ELSA, the coverage of ageing data in the BHPS and the cohort studies may not need to be as extensive as would have been the case without it. The need for such trade-offs makes the case for co-ordinated approaches across all the studies and for regular review to identify overlaps and gaps.

6.18 We believe that for any major new high cost venture, such as the enhancement of BHPS and the 2012 cohort study, the most effective way forward for would be for the Research Resources Board to establish a task force charged with the job of drawing up a detailed specification of the research design. Such a group should reflect expertise across a number of longitudinal studies and disciplines and should also have access to the widest possible range of expert UK and overseas advice on sample design and data specification.

Institutional data

6.19 The benefits of developing the portfolio along the lines recommended have been mentioned in various places but certain enhancements need specific attention because they require high-level negotiation and

²⁸ Phelps, E. Furstenberg, F. and Colby, A. (2002) Giele and Elder (1998) *op cit*.

costs are attached. Early on in the life of the birth cohort studies professionals such as health visitors, doctors and teachers supplied their services in the provision of data free. The need for such data is just as pressing today but, because of the greater fragmentation and cost consciousness of services, much more negotiation and higher levels of resources are needed.

Administrative data

6.20 The addition of administrative data to the datasets is seen by many of our respondents as hugely beneficial – a view which we endorse. Such identifiers as National Insurance Numbers (NINOs) if added to longitudinal datasets would hugely enhance their research potential because of the wide range of DWP employment, income and benefits data that could be linked via them.²⁹ However we are also conscious of the need for caution in seeing such data as some kind of panacea for augmenting longitudinal datasets and filling gaps in the longitudinal record. Apart from issues of data access, concerns about quality arise with quite a lot of the administrative information that is collected. Dialogue with data producers is needed as to how far the data can best serve the interests of a particular piece of research. We are aware that the issue of access to administrative data is under discussion by the UK Data Forum; we would encourage its members to take account of data quality issues as well as access and confidentiality.

Biomedical data

6.21 A common theme of the review was the importance of the bio-social interface with significance not only at the beginning of life but through old age. Already DNA from blood samples has been collected in the more medically driven studies such as NSHD, ALSPAC and ELSA, and in NCDS as part of the MRC-funded biomedical follow-up at age 44. Consideration should be given to the feasibility of collection of such data in all the portfolio studies. Collaboration with MRC over the funding of the data collection and analysis will be needed.

6.22 It is predicted that the evolution of long-term panel studies will be increasingly in the direction of physical and mental health measurement, so it is important to anticipate the variables for which data will be needed and to have to hand optimum means of measuring them. Input will be needed from social scientists and medical experts into the specification of medical data in the portfolio studies. Such experts could also usefully address the contentious issue of the social data content of the MRC/Wellcome-funded Biobank of genetic data for use in research. Researchers in the review have been highly critical of the poor quality of the social indicators in this data source. An expert group including social scientists could be the means improving it.

²⁹ For alternative approaches see Jenkins, S., Lynn, P., Jacle, A. and Sala, E. (2004) *Linking Household Survey and Administrative Record Data ; what should the matching variables be?* ESRC Research methods programme, Working Paper No 13.

ESRC should work jointly with MRC to establish such a group.

International collaboration

- 6.23 The full value of longitudinal studies is realised within a cross-national framework comprising comparable studies and through which the systemic and cultural components of life course processes can be elucidated. However as noted earlier there are difficult measurement problems to be resolved in relation to cross-country comparability, which argues in many cases for replications relying on functional equivalence of key variables rather than direct data comparison. In some cases, such as the CHRE, harmonisation was built in to the joint dataset from the outset around SOEP model variables. But if harmonisation was imposed on existing studies, as was the case with ECHP, some countries are likely to opt out.
- 6.24 We note that Britain failed to take the opportunity to sign up to one major initiative of this kind recently – the medically and demographically-driven Gender and Generation study which is undertaking four sweeps of longitudinal data collection in 15 countries starting with pregnancy. It is still not too late for Britain to get involved in the later stages using medical records and retrospective recall to fill the data gap.
- 6.25 On the broader front of the BHPS and the birth cohort studies, the scope for further development internationally could be usefully tested in conjunction with the Cornell harmonisation programme under Richard Burkhauser. The replacement of ECHP by EUSILC, based in the UK on the General Household Survey, is an important development. Currently this is a short-term rotating panel study spanning all European Union countries (four year duration initially) that might usefully be extended. ECHP data continues to be used through such collaborative networks as ECHR, which holds regular ‘EuroNet’ conferences. For the cohort studies the kind of design options suggested for 2012 have been used in other countries and the possibilities for exploitation of the communalities could be fruitfully explored.

Recommendations

14. *A national framework should be established under the auspices of the UK National Data Forum to provide an integrated portfolio of longitudinal studies for a range of research purposes in which ESRC is a major stakeholder. Widespread input to the framework from scientific interests across the social science disciplines should be facilitated.*
15. *ESRC should establish task forces to undertake detailed work on the design of an enhanced BHPS and a new birth cohort study with coordination between them to ensure that the two types of study complement one another in terms of a coherent scientific programme.*

They should draw on the widest possible range of subject-matter expertise and methodological advice, both in the UK and internationally.

16. *The potential for adding or linking additional data to existing and new studies should be fully explored, including administrative, biomedical (including DNA), environmental and other data subject to constraints of feasibility and quality.*
17. *New studies should seek to harmonise key data within the UK longitudinal and cross-sectional studies, and internationally where possible, to aid national and international comparison and replication.*

7 Data Quality, Methodology and Analysis

- 7.1 Assuring high data quality is central to the return to investment in longitudinal data because of the potential damage done to scientific inference when the data are subject to error from a range of possible sources. The main threats to data quality in longitudinal studies are measurement errors and missing data of various types. These threats apply to administrative longitudinal data as well as to data collected in the field, a feature that tends to be overlooked. The threats are shared in common with cross-sectional data, but in longitudinal research take on added significance because of their cumulative effects. Measurement errors are a more serious concern in longitudinal research because underpinning much of the analysis of longitudinal data is the measurement of change, which is highly sensitive to measurement error.
- 7.2 While cross-sectional surveys are facing increasing problems of total (unit) nonresponse, longitudinal studies face the corresponding problem at the initial wave of data collection and then experience losses from attrition at subsequent waves (i.e. a loss of respondents from the survey through moving home without a forwarding address or refusal). Bias due to attrition was referred to by more than one contributor to the review as potentially the 'Achilles Heel' of longitudinal surveys. Yet there are a variety of methods for minimising attrition and adjusting longitudinal data to alleviate its effects. Some of these methods are briefly reviewed below.
- 7.3 In general, it is a major responsibility of a longitudinal research team to undertake a broad appraisal of data quality from the outset of a longitudinal survey and essential that they have to hand the resources and the capacity to ensure high quality data. Moreover, the research team should provide users with a detailed account of the data quality in the study documentation, such as in a 'quality profile'.
- 7.4 There have been major ESRC initiatives in the general areas of methodology such as the now completed Analysis of Large and Complex Dataset programme (ALCD) and the current Research Methods Programme and the National Centre for Research Methods (NCRM) with its hub at Southampton and nodes at six other universities. The latter two programmes are both addressing issues of relevance to longitudinal studies, especially the NCRM and its nodes devoted to analysis at Bristol and Lancaster/Warwick, and potentially, the 'Real Lives' qualitative node located at Leeds/Manchester. As acknowledged in the NCRM goals, the challenge for this work, will be to translate the knowledge gained into improved practice. A common theme in our review is for more creative approaches to longitudinal research design and analysis – the need to 'get out of the box' of established UK practice. Methodological advances need to feed into

practice, and this requires capacity building in the research teams conducting longitudinal studies – the topic of the next section.

Methods for reducing losses from attrition

7.5 PIs consulted in the course of the review described a range of methods adopted in their own surveys to minimise non-response. The Oxford workshop sessions brought to light valuable approaches to incentives in US and Canadian surveys that could usefully be applied in British longitudinal surveys:

- Making substantial payments to respondents as incentives to participate in the study. The payments can take the form of a contract to participate in more than one wave of the study.
- Offering an additional incentive to respondents who make contact with the fieldwork agency at the time of the follow up to arrange an interview. As demonstrated in the US National Longitudinal Study of Youth, this procedure can be cost-effective, by making data collection more efficient and shortening the fieldwork period.
- Reissuing the interview to a more experienced interviewer.
- Refusal conversion handled by the research team; this is well developed in BHPS.
- Varying the mode of data collection (in person, telephone, post, internet) to suit respondents.
- Panel maintenance through continuous tracing operations between follow-ups (as in the birth cohort studies and BHPS).
- Regular communication with respondents, such as birthday cards.
- Feedback of findings through specially targeted newsletters and magazines (e.g. as in age 34 'sweep' of NCDS and BCS70).

7.6 The role of incentives in UK longitudinal studies should be studied further. In the UK loyalty has largely been relied upon as the basis of participation in longitudinal studies, although some small incentives are sometimes used. In the USA financial incentives and contracts to participate are common. Sometimes larger incentives can be offered to the most difficult respondents to obtain cooperation and there can be rewards for returning to a survey after dropping out. There are ethical issues about rewarding 'bad behaviour' more highly than 'good behaviour'. In Britain there has been concern that giving different incentives to different respondents could alienate all of them but US experience suggests that this is not the case.

Statistical adjustment methods for handling missing data

7.7 Despite all the efforts made to secure high response rates at each wave of data collection, there will inevitably be some unit nonresponse.

Statistical methods can be applied *post hoc* that attempt to correct for potential biases and to utilise the data available to achieve greatest efficiency. A wide variety of weighting adjustment methods have been developed to alleviate the potential biasing effects of unit non response (e.g. cell weighting, calibration methods, raking methods, propensity weighting methods.)³⁰ These methods mostly require the availability of auxiliary data for nonrespondents as well as respondents; alternatively they require data for respondents and external comparable data from administrative data or a high-quality large survey. In the case of initial non-respondents, there is generally little auxiliary data available, often restricted to the geographical location of the respondent's housing and population estimates for age distributions by sex and region. However, given the importance of using effective auxiliary variables in the adjustment process, there is a strong case for making special efforts to collect more data for initial nonrespondents, including, for example, attributes of the housing and neighbourhood and related administrative data where possible. In the case of attrition nonresponse, there will be powerful auxiliary variables available from the data collected at prior waves.

7.8 Another form of missing data is when a respondent participates in the survey but fails to provide acceptable responses to all the survey items. Methods for handling item nonresponse typically rely on some form of imputation to assign values for the missing items. The field of imputation has become highly developed in recent years and includes a variety of different methods, including hot deck methods, regression based methods, predictive mean matching methods, and multiple imputation methods.³¹ A key concern with imputation methods in general is the preservation of the covariance structure in the data set. With a cross-sectional survey, this concern relates to the covariances of all the variables collected at that time. With a longitudinal study the challenge is much greater since the covariances include not only the cross-sectional covariances but also the covariances across waves, including both prior waves and later waves. It is, of course, particularly important to preserve the covariances of the same variable measured on different waves. In order to maintain covariances with data collected at later waves, it will likely be necessary to make initial imputations for a given wave based on data collected in that wave and prior waves, and then revise the imputations when data from the next wave become available.

7.9 The application of the most effective weighting adjustment and imputation methods requires specialist expertise that the study team may not possess. This would need to be treated within a capacity building framework. Furthermore, the development of effective

³⁰ e.g. Kalton, G. and Flores-Cervantes, I. (2003) Weighting Methods, *Journal Of Official Statistics*, 19, 81-97.

³¹ e.g. Brick J.M. and Kalton G. (1996) Handling Missing Data In Survey Research. *Statistical Methods in Medical Research*, 5, 215-238.

weighting and imputation procedures is time-consuming and costly. Adequate funding needs to be provided for these activities

- 7.10 A key element in the use of imputation techniques is the ability to utilise auxiliary data that are available for both respondents and non-respondents; where such data are predictive of propensity to drop out then techniques for handling missing data will also incorporate bias corrections. In principle imputation techniques can simultaneously handle item nonresponse, wave nonresponse, and total nonresponse, although they are more often dealt with in separate stages using different techniques. We recommend, as a long term strategy, that research be conducted to develop the best methods for handling missing data of all kinds in longitudinal studies, that efforts be put into procuring good auxiliary data (including administrative data) for use in compensating for all kinds of missing data, and easy to use tools be developed for implementing missing data estimation methods.

Measurement errors

- 7.11 Random and systematic measurement errors can arise in a number of circumstances. Both can bias statistical estimates:

- Variation between interviewers is typically present. In some cases it may be possible to design studies, utilising overlapping fieldwork areas, such that interviewer effects can be adjusted for, but this is generally not feasible. In such cases interviewer variation becomes one source of measurement error 'noise'.
- Post field coding of open questions done by different coders can be another source of measurement error.
- Certain types of variable, such as attitudes, are often subject to large amounts of random and systematic measurement error; the former weakens the reliability of the attitude measure, the latter its validity.
- Different modes of data collection such as postal questionnaire versus face-to-face or telephone interview may be associated with different amounts of measurement error resulting in mode bias.
- Recall data will typically contain both 'random' measurement error and systematic biases such as 'telescoping' of event times.
- In longitudinal studies measurement errors will occur at each measurement occasion and longitudinal data analysis may suffer from an accumulation of such errors.
- In longitudinal studies there is a concern that participation in the study may affect responses at later waves, an effect often known as panel conditioning or time-in-sample bias. The conditioning effect may arise because sample members simply change the way they answer questions or because, as a result of their study participation, they change their behaviours or attitudes.

- 7.12 Various procedures exist for handling measurement errors, either utilising external estimates of, for example, error variances, or utilising internal modelling procedures such as path analysis models or more general structural equation modelling. Nevertheless, little use appears to be made of such procedures at present and capacity building in this area is important. One role of methodological panels (see below) would be to investigate the use of such procedures.
- 7.13 Methodological studies should be conducted to estimate the magnitude of measurement errors in key study variables. Resources need to be provided to support these studies. The methodological panels discussed below are an important vehicle for such studies.

Methodological panels

- 7.14 All longitudinal studies have arrangements for piloting questions and procedures before each round of data collection and some have a dedicated pilot panel for this purpose. However, these are all geared to testing instruments and procedures that are about to be implemented rather than carrying out more fundamental methodological research. There is a strong case for methodological panels being established for each of the major longitudinal studies going beyond testing arrangements for the next wave of data collection. Such panels have been used in a number of overseas studies such as SIPP and PSID. They could be used to:
- develop question wording and possible solutions to attrition, non-response and measurement error problems
 - pilot mixed-mode approaches to data collection
 - test innovative fieldwork procedures
 - test data analysis procedures, including those for handling missing data and measurement errors
- 7.15 The possibility of a more generic, free-standing, methodological panel study has produced more mixed reactions and on balance we support the reservations about it. The methodological panel linked to an existing longitudinal study can have its results dovetailed into design decisions as well as contributing to methodological knowledge more generally. Apart from a degree of artificiality about it, the generic panel's detachment from ongoing work is more likely to lead, we think, to targeting the latter at the expense of the former.

Documentation and dissemination

- 7.16 Study teams need to be funded not only to carry out methodological work but to report and disseminate the results. Each study needs to have funds to carry out preliminary analyses which, among other purposes, can help evaluate the quality of the data. Studies should be

funded to produce *quality profiles*, along the lines of that for the BHPS.

- 7.17 Longitudinal data constitute a historical record not only of the respondents but of the way the study was conducted. It should therefore be the responsibility of the PI to ensure that a 'collective memory' is developed from the outset of a study through documenting fully the methodology employed, and decisions taken in relation to such issues as design and data adjustment and confidentiality controls

Recommendations

18. *Sufficient funding should be provided to enable longitudinal study teams to employ survey methods that will generate the high level of data quality needed for longitudinal analysis and also to conduct methodological studies to assess data quality and to improve their methods.*
19. *Acknowledging the substantial past and present ESRC methodological initiatives such as ALCD and the current Research Methods Programme and National Research Methods Centre, more should be done to ensure that the knowledge gained is transferred directly into improved practice.*
20. *As well as funding for data collection, the study teams should be provided with sufficient funding for post-field data preparation, statistical adjustment, documentation and its dissemination, and preliminary data analysis.*

8 Building New Capacity

- 8.1 Research capacity is critical to the successful collection and analysis of longitudinal data. The ESRC has been instrumental in initiating developments that have made a direct contribution to capacity building in the area of longitudinal data. In particular, schemes such as the Analysis of Large and Complex Datasets (ALCD) programme have made an obvious contribution to both methodology and training (especially in Phase II). More recently the Research Methods Programme has made substantial progress in the development of research methodology and its dissemination through related training activities. The Research Development Initiative is also designed to build research capacity, largely through training related activities. Innovative activities such as the Research Methods Festival are likely to contribute to wider communication and networking within the research and postgraduate communities.
- 8.2 The mission of the ESRC National Centre for Research Methods (NCRM) is to provide a strategic focal point for the identification, development and delivery of an integrated national research, training and capacity-building programme. The aim of the NCRM is to promote a step change in the quality and range of methodological skills and techniques applied by the social science research community and to provide support for the dissemination of methodological innovations and excellence. In addition to the activities coordinated by the Southampton hub a number of research and training activities based at the nodes are also germane to longitudinal methods (especially at Lancaster/Warwick and Bristol).
- 8.3 New initiatives such as the Secondary Data Analysis Programme were specifically designed to encourage the expansion of capacity in areas such as the analysis of longitudinal data. To a more limited extent, peripheral developments in areas such as e-Social Science are likely to impact upon the development of longitudinal research capacity. At the same time specialist research organisations, for example the Southampton Statistical Sciences Research Institute (S3RI) funded by the Joint Infrastructure Fund (JIF), will play a vital role in methodological development and capacity building.
- 8.4 ESRC has recognised the importance of training in quantitative methods in the arrangements for recognition of MSc courses for ESRC funded studentships. MSc students are therefore provided with a broader generic training in research methods, both quantitative and qualitative, as well as subject specific training. The ESRC have also been proactive in encouraging the analysis of existing large scale datasets at the doctoral and postdoctoral level. In the longer term these changes are likely to have an impact and could potentially expand longitudinal research capacity within the UK social science community.

- 8.5 From our consultations we established general agreement that there is an urgent need to build upon these foundations that the ESRC has successfully laid. There was a consensus that there is a pressing need to enhance the capacity to develop and exploit the new longitudinal data resources.
- 8.6 Investment is needed to build capacity in three broad areas:
- a. To develop new data resources. We need to enhance the methodological capacity to improve data collection, data management and documentation, and statistical and analytic techniques.
 - b. To address the skills shortage. To exploit effectively the analytical potential of longitudinal data there is a need for a large number of well-trained researchers, covering a variety of different subject-matter disciplines. Therefore there is a pressing need for appropriate training at basic, intermediate, and advanced levels in methods of longitudinal analysis and in processing complex longitudinal data sets.
 - c. To develop a wider understanding of the research value of longitudinal data. There is a need to improve and make more widespread knowledge within the social science research community, the non-academic user community, and among key stakeholders.
- 8.7 Our consultations revealed a widespread view of the inadequacy of UK longitudinal research capacity. Because of the specialised nature of longitudinal research, there was a common view that needs could not be met through general purpose methods training programmes. We favour a broad programme of activities specifically organised to address the deficit in longitudinal research capacity addressed at the needs of the following groups:
- designers and producers of longitudinal data resources
 - methodologists working on both statistical and data collection methodology
 - data analysts - from 'entry level' through to advanced level
 - early career researchers
 - postgraduate social science students
 - undergraduate social science students

- 8.8 Apart from these groups it was argued at the consultative workshop that major educational initiatives directed at key stakeholders such as funding agents, managers of longitudinal research contracts and users of the results such as policy makers and journalists were also important to enhance understanding of the value of longitudinal data.
- 8.9 We suggest that a broad portfolio of activities should be developed to strengthen capacity in longitudinal research and that it would be prudent to build upon the progress that has resulted from earlier and current ESRC initiatives. We expect that further progress could be made in terms of the development and delivery of formal training (e.g. courses, workshops and seminars). In addition we uncovered some enthusiasm for mechanisms that would allow the acquisition of practical experience (for example visiting fellowships, apprenticeship schemes and mentoring).
- 8.10 We recommend that the teams running major longitudinal studies should be financed to develop in-depth expertise so that they become a resource to bring on young researchers and to provide teaching and advice to the social science community. They should also be funded to bring in leading international experts for training purposes. Internationally prestigious longitudinal studies serve not only to train, but also to recruit and retain high quality researchers in key disciplines, including high profile non-UK researchers.
- 8.11 We envisage that the ESRC would want to take a 'joined-up' view of capacity building. Therefore we recommend that capacity building should be tackled collaborative by the Research Resources Board, the Training and Development Board and the Research Grants Board, recognising that the Training and Development Board will have a key role in developing more detailed proposals to meet the needs of the different constituencies.

Recommendations

21. *To ensure that longitudinal studies use state of the art methods and that the full analytic potential of longitudinal data is realised, ESRC should provide substantial funding to expand and enhance capacity to undertake longitudinal research, building on its current programmes.*
22. *Advanced training in longitudinal methods should be targeted at analysts, data producers, methodologists, funders and other constituencies with a potential interest in longitudinal research. An appreciation of the potential of longitudinal data and basic analytic techniques is needed from undergraduate level upwards.*
23. *Funding for the main studies should allow for the development of high level statistical and survey expertise to help in training and the provision of advice.*

9 Data Access and Disclosure Control

9.1 It is critical that the respondents' confidentiality in a longitudinal study is maintained and that disclosure risks are minimised. Issues of data access and disclosure control are common to all surveys but they are far more challenging in longitudinal studies for three principal reasons:

- The wealth of data collected across several waves of a longitudinal study make the risk of identifying respondents much greater³².
- In order to take full advantage of the much greater analytical potential of longitudinal data, there is a need for much greater data access by many different researchers.
- Some of the methods commonly used for disclosure control (such as data swapping) are less well suited to longitudinal data.

9.2 There are two main issues which raise concern about access to longitudinal data:

- maintaining confidentiality and minimising the risk of disclosure of respondent identity
- types of data and the degree of sensitivity in relation to enabling access to them

Data from which respondents can be easily identified and/or contain particularly sensitive data need more protection than other data; both are common in the case of longitudinal data.

9.3 Thus, when providing access to longitudinal data a balance needs to be struck between providing data which are as valuable as possible for academic and applied research, the product of which will presumably be to the 'public good', and protecting the respondent's right to confidentiality. Notably to date there is no recorded instance of a confidentiality breach in Britain and according to US colleagues the great majority of respondents would not be concerned if there was. But this does not argue against sensible precautions.

Confidentiality and disclosure risk

9.4 In principle there are two ways in which respondent confidentiality is safeguarded:

³² Abowd, J.M., Woodcock, S.D. (2004) 'Multiply-imputing confidential characteristics and file links in longitudinal linked data. Privacy in Statistical Databases' *Proceedings Annals of the New York Academy of Sciences*, 3050 ,290-297; Boyle, P.J., Cullis, A., Feng, Z., Flowerdew, R. and Gayle, V. (2004) *Adding Geographical Variables and Identifiers to Longitudinal Datasets*, A Report to the National Longitudinal Strategy Committee and ESRC.

- Restricting the data that are released to minimise the risk of respondents being able to be identified – safe data
- Controlling the arrangements under which potentially disclosive or sensitive data are released – safe settings

Special licensing arrangements can be viewed as a form of safe setting with the licence agreement providing the safety rather than a physical setting. Often a mixture of methods is used.

- 9.5 Anonymising data by removing obvious identifiers such as names and addresses is a standard first step in all surveys. Thereafter some further disclosure control to reduce the risk of respondent identification is normally carried out before data are released beyond the study team, for example, for deposit at the UK Data Archive for use by secondary analysts. The data are made available to researchers who sign a formal agreement which details safeguards for the data and their use.
- 9.6 Two common procedures for reducing the risk of respondent identification are top-coding and collapsing detailed categories. However, these procedures can be particularly problematic for longitudinal analysis. For instance, top-coding income so that incomes above a certain amount (X) are classified as simply greater than X can be harmful for some analyses that examine changes in income over waves. Collapsing geographical detail into broad regions does not permit the detailed information about each individual's local context to be used to examine variations between local contexts. Moreover, disclosure of even less detailed geographical information could involve disclosure risks, as individuals who move frequently or between distant places are quite rare and this makes them easier to identify in longitudinal data.
- 9.7 The value of linking administrative data to longitudinal data sets is discussed elsewhere in this report. However, such linkages add greatly to disclosure risks. The matching itself needs to be handled under secure arrangements because the presence of the identifiers used for matching make the data highly disclosive.
- 9.8 Protecting respondents' confidentiality is particularly important when sensitive data are included in the data set. A particular case in point is the current interest in DNA and other biomedical data. Another example occurs with the linkage of highly sensitive data, such as criminal records, to the data set. A much higher level of protection is required for these data.

- 9.9 Assessing disclosure risk is a technically complex field, beyond the remit of this report.³³ However, decisions are required about how longitudinal data should be managed and there is a growing consensus that discussions about these issues need to involve all those responsible for managing longitudinal datasets.
- 9.10 There are a number of questions of confidentiality and disclosure that need to be considered in relation to how access to data is managed, including:
- What are the risks of disclosure of respondent information?
 - How damaging would disclosure be?
 - Who will have access to the data?
 - Should different user-groups have different access rights?
 - Will data be available under licence, safe settings or other arrangements?
 - Will data be perturbed before release?
 - Are current data access practices adequate and, if so, can they be adopted for future studies?
 - Is the current best practice for data access well established, and is it clear where advice about such issues can be sought?
- 9.11 Currently, our judgment is that longitudinal resources are managed with great care and that the experience that different centres have gained over the years has resulted in numerous examples of good practice as enshrined in ‘Codes of Practice’ to which potential users of the data have to sign up. However, we would argue that there remains a lack of consensus about how data access should be managed, and how rules and regulations concerning data protection and freedom of information should be interpreted.

Data release

- 9.12 A variety of possibilities are available, for releasing high risk disclosive or sensitive data, many of which have been implemented already. The four approaches identified below are typical of the restrictions applying here and in other countries such as the USA, which have developed access policies on similar lines. They vary in the data support costs required and involve different levels of disclosure risk, ranging from the most to the least disclosive. They all have financial implications both for longitudinal resource producers and users, which the ESRC needs to plan for in the future. Such planning should also be integral to the establishment of new longitudinal resources.

³³ Elliot, M. J. and Dale, A. (1999) ‘Scenarios of attack: the data intruder’s perspective on statistical disclosure risk’, *Netherlands Official Statistics*, spring, pages, 6–10; Elliot, M. J., Skinner, C. J. and Dale, A. (1998) ‘Special uniqueness, random unique and sticky populations: some counterintuitive effects of geographical detail on disclosure risk’, *Res. Off. Statist.*, 1, no. 2, 53–68; Tranmer, M, Pickles, A. Fieldhouse, E., Elliot, M., Dale, A. Brown, M., Martin, D., Steel, D. and Gardiner, C. (2005) ‘The case for small area microdata’, *Journal of the Royal Statistical Society A*, 168, 29-49.

- Providing data to the researcher to analyse on their desktop, with the detail on sensitive variables restricted to prevent disclosure (e.g. BHPS and the cohort studies). This approach is particularly attractive to many users, particularly in the UK where there is less of a tradition of more restrictive approaches to data access.
- Providing more sensitive data under a special license which involves the researcher and his/her institution committing themselves to particularly stringent requirements, with the possibility of serious sanctions if these are breached (e.g. 2001 Sample of Anonymised Records, special license household sample). This approach encourages both the researcher and their institution to recognise the importance of abiding by data access rules and may be particularly effective when the dataset being accessed is funded by ESRC as the sanctions may involve all ESRC data resources held at the Data Archive
- Remote access where the raw data are never released and analyses are run in-house on behalf of researchers who receive carefully edited outputs (e.g. Scottish Longitudinal Study). While this approach is more restrictive than providing raw data to users, it is a potentially useful approach for data that are particularly sensitive – anonymised data for which consent for use was not acquired are a good example.
- Safe settings, where researchers are required to visit a protected site where access to the data is carefully managed (e.g. ONS LS). One extension of the traditional safe setting approach is the use of virtual data laboratories, as established by ONS. These involve dummy terminals which can be flexible in their location and provide access to a central server which holds the data.

9.13 Special licenses are a relatively new approach that are seen as an attractive compromise between relatively cheap free access to data, which are aggregated to protect respondent confidentiality, and more costly safe settings where more detailed data may be available but the costs of support are high and which are less convenient for users.

9.14 The development of virtual laboratories by ONS also offers a potentially exciting opportunity for data access. Currently, such facilities exist in four ONS sites and discussions are ongoing about further regional sites. However, current ONS arrangements dictate that a user-support person is required to be present at all times that a researcher is using such a terminal and this has significant cost implications as the number of sites housing dummy terminals grows. It remains debateable whether more of these sites, perhaps based in universities, are required for providing access to sensitive data from non-ONS datasets. Given the potentially large costs of implementing such a strategy, we feel that this is probably unrealistic for many universities to

offer such facilities and that those working on reasonably rare projects that involve highly sensitive data should probably visit the centre that manages the data.

- 9.15 A mid-way alternative is that a small number of specialist 'longitudinal centres' are established across the UK (based probably in existing centres of expertise) and that these provide an in-house safe-setting facility for accessing a number of different longitudinal resources. This would have cost implications and could raise a number of practical difficulties, although it would make access to data easier, particularly for researchers short of funds.
- 9.16 International collaboration poses a particular challenge for the kinds of longitudinal resource development we have been advocating in this report as it does not sit well with the sort of licensing arrangements currently envisaged. However visiting status for an international collaborator under the terms of a contract with the host institution might be used to extend the license to work conducted overseas for all but the most sensitive and restricted data.
- 9.17 Finally, it is also possible that e-social-science may offer some novel approaches to data access through grid computing. To date, however, it is not clear that the 'middleware' required to facilitate such an ambitious approach is well enough developed.

Recommendations

- 24 *To capitalise on the investment in each longitudinal study ESRC should seek arrangements that allow for the widest exploitation of longitudinal data by social scientists while safeguarding the data provided by individual respondents. Licensing arrangements and safe settings appear likely to provide the best means of protecting the interests of respondents in relation to disclosive and/or sensitive data while supporting maximum research use.*
25. *The feasibility of establishing a small network of centres that provide support and a safe setting for the analysis of a range of longitudinal data should be investigated. Such centres could also provide facilities for cross-sectional studies.*
26. *To facilitate international collaboration, the feasibility should be investigated of:*
- a extending licenses to overseas collaborators through 'visiting' status;*
 - b licensing safe settings for using UK longitudinal data overseas e.g. in the secure enclaves established for analysing data collected by national statistical agencies.*

10 Governance and Funding

- 10.1 Longitudinal studies such as HRS in the USA and SOEP in Germany benefit greatly from guaranteed long term funding of 6 to 10 years at a time. British longitudinal studies in the past have suffered from a lack of extended secure funding that has resulted in too much intellectual effort having to be diverted into fund raising. The funding uncertainties have also affected the recruitment and retention of high quality staff. In addition, the search for funds to keep a study going risks diverting the focus of the study to meet the short-lived needs of funders. A longitudinal studies portfolio requires sound financial backing to ensure that the integrity of the studies can be preserved. Such a funding package should supply resources on a sufficiently long-term basis to ensure that the core team carrying out the work is adequately supported and that all the functions needed to optimise data quality are in place, including documentation of all key information. Similarly a sustained programme of first class methodological work is essential. Funding should also be available for preliminary analysis in accordance with a specified programme.
- 10.2 These requirements underline the need for mechanisms to ensure that long-term commitments can be sustained and as far as possible not be subjected to the vagaries of the political process. Long term agreements between research councils are in principle easier to achieve than with government departments - most obviously between ESRC and MRC – and should be given high priority.
- 10.3 Under the previous arrangements funding for any particular study could involve a baseline commitment from ESRC through the Research Resources Board coupled with additional funds obtained through parallel negotiations with government departments under a different time frame (possibly coordinated through the ONS-led Longitudinal Data Co-ordination Group). Although offers of additional funding are always tempting, we believe caution needs to be exercised particularly to avoid any threat to the long-term scientific goals of a study. In this respect short-term enhancement to studies to meet policy evaluation requirements should be examined very carefully because of the potential distortions to the design that such additions may produce and the potential problems caused when funding ceases. On the other hand, additional co-funding for sample enhancement of the kind supplied for the MCS Scottish, Welsh and Northern Ireland boosts and the BHPS Scottish boosts and Northern Ireland extension should be welcomed. In each case a judgment needs to be made whether the enhancement poses any threat to the integrity of the study or to the portfolio of studies as a whole.
- 10.4 Integrated funding arrangements are envisaged by the newly established UK Data Forum, currently made up of ESRC, MRC, government departments represented by ONS and the Cabinet Office,

and major charitable foundations. The National Longitudinal Strategy Committee is a sub-committee dealing specifically with longitudinal data that offers the opportunity for data producers and analysts from across the disciplines to have their interests in the national strategy represented. However, neither committee is directly responsible for brokering funding arrangements for specific studies. We think that it is undesirable for the directors of individual studies to have to deal directly with multiple funders with potentially conflicting interests. Apart from the time and energy expended, uncertainties are created which can be damaging to the development of a coherent design. ESRC should play the key role in initiating and managing funding consortia where appropriate, while ensuring that the scientific objectives of the studies concerned are adequately protected.

- 10.5 We believe that all research funders and research constituencies with a current or potential stake in longitudinal data should have their interests represented in the development of both the long term strategy and funding arrangements. This will help to ensure that the maximum funding and the widest range of expert advice are available. In the case of scientific advice the inputs supplied by an appropriate range of experts can be vital to the quality of the longitudinal resource produced.
- 10.6 However, it is important that responsibility for the implementation of the agreed scientific programme ultimately resides with the PI and the study team. This principle was preserved in the German SOEP when funding switched from the German Science Funding Council to the Federal Government. The mechanism of the 'Leibnitz Institute' operating independently of government was used to channel funds to the study thus ensuring that the scientific goals of the study were not compromised.³⁴ The view has been expressed that a similar mechanism, perhaps through establishing a Longitudinal Studies Foundation, might also be appropriate for the UK studies.
- 10.7 It should be noted that the idea of national planning and funding allocations to follow it is not universally accepted. It has been put to us that a key consideration for supporting a longitudinal study is that one or more scientists are inspired to carry it out and have the dedication and commitment needed to make a success of it. The early British studies all began on this basis and, with the possible exception of the 'Biobank', this model characterises most medical funding in this area. The Whitehall Studies of Chronic Illness in Civil Servants – which have never received any government funding – and the longitudinal studies of twins directed by at the Institute of Psychiatry are other good examples.
- 10.8 There is something of a tension between the purely 'scientific' approach favoured by medical science and that of social science

³⁴ Wagner et al *op cit*

directed towards the production of longitudinal research resources. The multidisciplinary and multipurpose aspects of the latter demand much wider input from a range of potential scientific users to optimise the value of the data than is the case with a purely hypothesis-driven study led by a small scientific team. However this does not remove the need for coherent thinking and long-term planning of the scientific programme or programmes that the multipurpose study will pursue. Such programmes will be open-ended in places to make space for unanticipated demands. As the late Cathie Marsh, the initiator of the Sample of Anonymised Records (SARS) programme, has pointed out "Data is usually expensive stuff and few of us can afford to be so high-minded that we restrict our attention to those hypotheses which we thought of before we collected it".³⁵ Serendipity must be accommodated but the main point remains. Funding decisions driven exclusively by resource generation considerations are unlikely to deliver what the research community needs. This also underlines the need for much wider involvement across the Boards of ESRC in policy towards the production and use of longitudinal resources.

10.9 Such considerations apply with equal force in cross-national longitudinal studies where lack of scientific autonomy in design decisions can seriously inhibit development. It has been argued that the European Community Panel Study (ECHP) could not be sustained because the PIs of the national studies involved became increasingly unhappy with 'top down' decisions about the data that should be collected whereas the success of such collaborative arrangements as SHARE and CRAG is precisely because the design and development is controlled by scientific experts experienced in longitudinal studies.³⁶

10.10 The formal governance arrangements for the birth cohort studies have been revised and formalised recently. They comprise a Steering Committee primarily representing funders' interests and a Scientific Advisory Committee of scientific experts overseeing the long term integrity of the studies. In the case of BHPS, with only one principal funder, ESRC, there is only one committee to promote and facilitate cross-study and cross-national comparisons. It has been put to us that the mechanism of a strong scientific advisory or oversight committee backed by specialist panels is an essential channel of advice reflecting scientific as opposed to funders' interests. Such committees help to ensure that each study retains scientific integrity. They supply protection to the research team while being responsive to the needs of the wider community of users of the data and results. Major US studies such as the Health and Retirement Study (HRS), have oversight committees which, unlike a purely advisory mechanism, have fully devolved powers to protect the interests of the study. The key issue is whether UK studies should have committees with such powers or whether they should be purely advisory. There is a case for making such a committee mandatory for each portfolio study and giving it

³⁵ Marsh, C. (1988) *Exploring Data*. Cambridge: Polity Press. p xviii.

³⁶ Burkhauser, R.V. and Lillard, D.R. *op cit*.

sufficient power to be a real protector of the long term scientific integrity of the study.

- 10.11 Apart from formal structures, widespread consultation with experts in the subject matter of each study, both within the UK and abroad, on study design and data coverage should be treated as a key component of study development.

Recommendations

27. *ESRC should ensure that the major longitudinal studies are funded on a longer-term basis than one or two waves at a time in order to provide stability and enable long term planning. It should negotiate and manage any co-funding arrangements, which should be welcomed provided that there are no consequences for the integrity of the study*
28. *ESRC should ensure that all research funders and research constituencies with a current or potential stake in longitudinal data have their interests represented in the development of both a long term strategy and funding arrangements for longitudinal studies.*
29. *ESRC should examine the case for a Longitudinal Studies Foundation as a channel for funding.*
30. *ESRC should ensure that each study obtains continuing outside input through such mechanisms as a steering committee on which sponsors are represented and a scientific oversight committee to represent the wider research community that the study serves.*

11 Collaboration

- 11.1 The idea of a framework for the development of a national portfolio of longitudinal resources is valuable in stressing the interconnectedness of all the studies in answering complementary research questions. These questions will be embedded in scientific programmes some of which are restricted to a single study or a limited section of the life course; others will work across the studies matching the particular hypothesis or research question that is under investigation to the study that can supply the relevant data.
- 11.2 For such a framework to operate effectively commitment to collaboration across all programme components and facilitating collaborative opportunities is crucial. Such opportunities exist at a number of a number of levels:
- research funding
 - across studies
 - across scientific disciplines
 - policy research and academic research
 - international programmes

Research funding

- 11.3 The establishment of the UK Data Forum is recognition of the need for the different funders of social science and medical data resources, ESRC, MRC, government and the main research foundations, for coordinated investment. In the case of longitudinal data such coordination is particularly important because of the long term costs and benefits attached to what are often very long-term scientific enterprises. Windows of opportunity to develop new resources do not always stay open and when they close it is not easy to reopen them as the 'missing cohort' issue shows. Within a particular study, especially of the cohort kind, failure to collect relevant data at the critical age or stage reached may be an opportunity lost for ever with the consequence of damage to the research programmes that depend on such information.
- 11.4 Collaboration across funding interests is a major means of protection against this happening. Collective responsibility will ensure that the widest possible range of interests is reflected in programme planning and the funding decisions that arise from it. As the portfolio evolves the range of scientific interests is likely to expand and the UK Data Forum will need to evolve to accommodate them. Environmental science is a critical area where future priorities are increasingly likely to lie, so representation of funders of this area of research will become important.

- 11.5 The House of Lords Science and Technology Select Committee's strictures on the poor performance of science funding in relation to research on ageing, should serve as a stimulus to thinking much more widely on this front. To achieve the interdisciplinarity of approach that the committee saw as sorely lacking requires more facilitation of collaboration through a variety of means. ESRC should take a lead role in thinking through the ways in which this might be achieved. In the meantime the steps towards closer collaboration between ESRC and MRC on funding decisions in the area of longitudinal data are to be welcomed and need to be built upon in terms of practical activities such as setting up joint working groups, to ensure that policies for collaboration are implemented on the ground.

Cross study collaboration

- 11.6 The case for such collaboration has been made repeatedly over the years. In fact some of the earlier ESRC reviews in this area saw the solution as managing all the main studies under one roof. This would never be realistic for the whole portfolio of studies now proposed. Therefore it makes more sense to think in terms of collaborative opportunities through which PIs and the teams they lead are brought together to share experience and ideas. A certain amount of such work of course takes place now on the basis of personal contacts. For example in the early development of the Millennium Cohort Study there was much sharing of information about measurement of infant development with ALSPAC and US studies. There is also, more formally, some limited cross-over of membership of advisory committees between the major studies, but more needs to be encouraged and perhaps required as a condition of funding.
- 11.7 ICT could also be given a stronger role through the establishment of common communication networks and websites that can be used to draw the studies together. However electronic communications will never entirely substitute for meetings where people engaged in programmes can interact over issues of common interest and concern. The National Longitudinal Strategy Committee has taken initial steps in this direction through organising PI meetings. The problem in such initiatives typically is the lack of continuity and follow-through of decisions taken. This requires infrastructure and resourcing, which currently are not there. An important part of the funding package should be to ensure that such an infrastructure is in place. A joint ESRC and MRC supported National Observatory for longitudinal research could provide the kind of framework that is needed.

Cross disciplinary collaboration

- 11.8 Every research council argues for more interdisciplinary work within its own boundaries with varying success. To extend the plea for cross disciplinary collaboration across research councils is therefore perhaps asking a lot. In the view of the House of Lords Science and

Technology Committee the Research Assessment Exercise has been one of the major inhibitors of effective research on ageing. This is because peer review on which research assessment has been traditionally based tends to be mono-disciplinary in the approach to research outputs. Academic careers tend to be based in disciplines, even within the big subject areas like medicine and education. It is a major challenge therefore to find the means of satisfying both the interests of individuals in career development and the disciplines to which they are affiliated, while at the same time recognising that scientific advance in all the key areas that we have identified requires breaking through the boundaries.

- 11.9 In Britain the ELSA project is an excellent example of achieving this breakthrough at least in relation to medical science, psychology, sociology and economics, and supplies a possible template for other such collaborative enterprises. The planning of the MCS similarly drew in advice from across the medical and social sciences. In fact the major multipurpose longitudinal studies do offer almost by their very nature the kinds of framework for interdisciplinary collaboration that is needed. The cohort studies have always recognised this through their advisory committee structure, which includes a coordinating committee and a number of specialist working groups. As the BHPS evolves towards much wider data coverage across the disciplines and wider scientific goals, its role as a base for interdisciplinary collaboration will increasingly be strengthened. The stage that has often been missing is to translate the interest in ensuring that appropriate data are collected for one's own discipline-based research programme, into cross disciplinary programmes of analysis. ESRC could again usefully take a leading role through funding policy in encouraging these developments not only in helping to make the barriers more permeable within the social science community, but between the social sciences and the other sciences.

Policy research and academic research

- 11.10 The national framework contains the two parallel strands of academic research and policy research. There is a cross-over through the research that policy departments commission academics to undertake sometimes using government-funded data and sometimes data funded elsewhere. However there is a strong feeling that has arisen through the course of the review that there are vast untapped resources available, particularly in government that could be used more widely across the science-policy spectrum. Government surveys have been deposited at the Data Archive for many years which has led to their widespread use by academics. Such initiatives as the Samples of Anonymised Records (SARS) based on Census data and the ONS Longitudinal Study itself have also contributed in a major way to expanded academic use. The recent announcement that the PLASC (longitudinal) data dataset based on individual educational records is to

be made available for research is a further example of a breakthrough in resource expansion.

11.11 Such developments are facilitated by close working relationships across the academic policy divide through secondments, shadowing, and other collaborative arrangements such as the ESRC Survey Link scheme that could be expanded. Policy works to different sets of priorities and timetables from academic research and the constraints need to be mutually understood. Data protection and disclosure control are only one of the many sets of considerations in the use of government data. Others are the standards by which work is judged for peer review and other purposes. Again, ESRC interests would be served through promotion of the expansion of opportunities for more exposure to different practice across the two communities and the research collaboration that can come from it. Research partnership with a university based on supplying academic (PI) leadership for a government longitudinal survey has worked successfully in the case of NLSY in the US and is another important means of bringing the two worlds closer together. The failure of attempts to replicate the model for the DfES-funded LSYPE (one of the candidates for the 'missing cohort') should not stop active pursuit of further collaborative arrangements of this kind.

Cross national collaboration

11.12 We have supported throughout this report, the extension of studies cross nationally through participation in international collaborative schemes such as promoted within the European Union for example and through collaborative arrangements between scientists with shared interests such as those formed around the household panel studies in SHARE and CNEF. There is no question that the kinds of questions that the longitudinal studies address need to be pursued internationally to realise the full value of the scientific programme. This is because replication of tests of scientific propositions across the different contexts that cross-national studies provide is the best way of establishing their validity. When a given proposition fails to hold we learn a lot from each country's institutional arrangements about the reasons why. We are therefore very supportive of such developments in the international sphere and believe that putting funding in place to support it is absolutely vital.

Standing conference

11.13 Much of the work in developing collaboration will be depend on shared interests and working contacts between researchers in different places. However such connections can be facilitated in various ways. One mechanism to consider is a standing conference that would serve as an umbrella for collaborative work. This would comprise an annual meeting, and meetings in between, supporting group work of various kinds. The consultative meeting in Oxford, organised as part of the

review, was welcomed as providing an opportunity for discussing for the first time longitudinal research questions from a variety of perspectives in a single setting. There was a call for repeating the meeting annually, which we support. Each conference would be focused on a single theme while supplying the opportunity to update and share experience on collaborative initiatives.

- 11.14 Although the Oxford meeting was directed principally at UK researchers and stakeholders the presence of experts from the US and elsewhere added considerable value in opening up new ways of looking at things. We therefore believe that there should be a budget to support such a meeting to which all researchers involved in the ESRC's portfolio studies should be invited, together with international experts. Every three to four years the conference should be truly international with papers invited from across the world rather on the model of the Montréal conference in January 2006 set up to advise Statistics Canada on their future investment in longitudinal resources.

Conclusion

- 11.15 Completing this report on the issue of collaboration brings us full circle back to the key requirement for successful development of longitudinal research resources in the UK with which we began. Through the efforts of individual visionaries in the early days of longitudinal enquiry, studies became established that have reaped enormous science and policy benefits. The studies' value continues to rise exponentially as the studies extend across time, which makes the case for the widest possible use of them. Collaboration over every feature of the programme through design to analysis is the best guarantee that this will happen and the studies' value fully realised.

Recommendations

31. *ESRC should seek means of strengthening collaboration with MRC and the other research councils through the National Data Forum over longitudinal research strategy and especially with MRC through the establishment of joint working groups of medical and social science researchers working on longitudinal research topics of joint interest.*
32. *To achieve maximum return from investment ESRC should encourage and facilitate collaboration over the design and use of portfolio longitudinal data in every way possible at all levels: including between longitudinal study teams, scientific disciplines, analysts, academic and policy researchers, UK and overseas researchers.*
33. *A standing conference on longitudinal studies should be established with an annual meeting and specialist panel meetings in between and with periodic extension to an international meeting.*