

**“Challenges for longitudinal research”
SYNOPSIS OF FINDINGS FROM A SCOPING STUDY**

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Contents

	Page
Executive Summary	3
1.0 Introduction	5
2.0 Aims and evidence	5
3.0 Longitudinal data sources	6
4.0 Key Themes	8
a) Policy-research	9
i. Communication gap	9
ii. Administrative data	10
b) Methodology–practice	10
c) Medical science-social/economic science	11
i. Regulatory framework	11
ii. Research paradigm	12
5.0 General issues requiring resolution	12
a) Methodological and ethical enquiries	12
i. Data linkage	12
ii. Design and implementation	13
iii. Causal inference	14
b) Longitudinal research topics	15
i. Historical enquiry	15
ii. Policy studies	16
iii. Life course perspective	16
6.0 Conclusion	17

Executive Summary

1. This report is an abbreviated version of a report on a scoping study conducted for the Board of the Joint Centre for Longitudinal Research, the aim of which was to see if there was case for establishing a Think Tank, ‘Long View’, devoted to longitudinal research. The study included interviews and other contacts with over 40 experts from different sectors of the longitudinal research community: academic research, policy, funding. They were asked for their views about challenges arising at three major interfaces:

- policy-research,
- methodology-practice,
- social science-medical science

Arising from the discussion, they were also asked to identify the overarching challenges in facing future longitudinal research.

2. This abbreviated report sets out the main findings. These are restricted principally to quantitative enquiries though many will be relevant to qualitative studies as well. The report focuses on common themes arising at the ‘meta-level’ in the design, conduct and use of longitudinal research rather than on the technical issues and substantive topics that are the subject of longitudinal enquiry. The report also does not address questions concerning the organisation and action plans of Longview that are the subject of the longer report supplied to the JCLR Board.

3. The scope of enquiry needed to embrace two features of the longitudinal research terrain: (i) major longitudinal data sources; (ii) networks with nodes focused on longitudinal research expertise and data use.

- i. *Longitudinal resources* In the UK context the major longitudinal sources comprise the national longitudinal studies including: the 1946, 1958, 1970 and Millennium birth cohort studies; the British Household Panel Study; the English Longitudinal Study of Aging; and (potentially) the Longitudinal Study of Young People in England, together with the wider range of locally-based and topic-focused longitudinal studies.
- ii. *Networks and nodes* These are based on the major centres for longitudinal data production such as: the UK Longitudinal Studies Centre at the University of Essex; the Centre for Longitudinal Studies at the Institute of Education; the Biobank at the University of Manchester; the Office of National Statistics-led consortium of Government Departments with an interest in longitudinal data; the Economic and Social Research Council’s National Longitudinal Strategy Committee; the Southampton and Manchester nodes of ESRC’s Research Methods programme; other (wider-remit) organisations with a significant role to play of which the newly established Data Forum, involving the research councils (ESRC and MRC), government departments and charitable foundations is the leading example.

4. Discussion of the policy–research interface revealed, on the part of academic researchers, knowledge and communication gaps in relation to the political drivers of the policy process and its timetables. On the part of policy makers the gaps were more in relation to the added value of scientific coherence, methodological rigour and analytic capacity, requiring long-term funding commitment. There was also insufficient appreciation on both sides of the research potential to be gained from large-scale administrative databases and of the ethical and technical issues involved in the data linkage that their use entailed.

“CHALLENGES” REPORT - 13/04/05

5. The methodology-research interface identified another communication gap, this time between methodological researchers and field work practitioners. Methodological innovations in such areas as longitudinal sample attrition could fail to impact on practice and some problems emerging through field work operations received too little methodological attention. There was a case for more dialogue across the interface and a need to build pilot operations for longitudinal studies into more systematic methodological vehicles for testing new methodology and generating new questions for research.
6. At the medical science - social science interface challenges were more to do with scientific traditions and parallel research programmes; and the need for more communication across them. These embraced typically, in the case of medical science, hypothesis-driven research conducted by a principal investigator and collaborators, and much more developed systems for addressing ethical issues and regulating data collection and use. This contrasted with the emphasis in the social sciences on the production of longitudinal research resources for analysis by a community of researchers for whom access was openly available via a data archive; and with the data collected and used in accordance with voluntary codes of practice rather than formal regulation.
7. The overarching issues extended the emergent themes of the earlier discussion in a number of ways, falling into two broad groups – methodological and ethical enquiries (methods) and longitudinal research topics (substance).
 - i. *Methods.* Administrative (including medical) data linkage challenges included resolution of ethical, data protection and quality control issues with important implications both for research users and the national and local administrative and research producers of the data. Data collection and implementation issues were also a major area for enquiry, with all components of survey design and field work operations requiring renewed scrutiny in a changing longitudinal research context. Such problems as attrition, missing data and measurement adequacy needed comprehensive methodological work involving both statistical modelling and field testing. The strengths and limitations of longitudinal data for scientific inference and policy decisions also needed to be charted with blueprints developed for optimum research designs and statistical modelling methods to employ.
 - ii. *Substance.* Across the academic research constituency there was interest in the use of longitudinal studies comparatively to chart historical and individual change, with possible international extension and triangulation with other data sources such as continuous surveys, randomised trials and ethnographies. Policy interest lay more in such topics as optimum sequencing and timing of prevention and intervention initiatives, the economic and social returns to them, population loss and replacement; and the ways in which policy evaluation could be brought more effectively into the longitudinal research domain. Potential was seen in the overarching ‘life course perspective’ as supplying the conceptual underpinning for both kinds of work. This perspective also provided the basis for prioritising data needs and for building the foundations for more cross-disciplinary collaborative research including work across the medical and social sciences.
7. The Scoping Study identified the huge range of interest, experience and enthusiasm for longitudinal research. All respondents felt that key issues of co-ordination, rationalisation and cost effectiveness in a field that has largely grown *ad hoc*, needed to be resolved. There are gaps in provision, in the exploitation of longitudinal research resources and in the communication and interpretation of longitudinal research products. Meeting the challenges set out in this report will hugely enhance the quality, productivity and satisfactions to be gained from the whole longitudinal research endeavour.

“There is a plethora of studies and a shortage of expertise”

1 Introduction

1.1 This brief report summarises findings from a scoping study for a Think Tank devoted to longitudinal research commissioned by the Board of the Joint Centre for Longitudinal Research¹. The Board comprises partners with responsibilities for the four British Birth cohort studies (1946, 1958, 1970, Millennium), the English Longitudinal Study of Aging, the ‘Whitehall’ longitudinal studies of chronic illness in civil servants and a number of other shorter-term longitudinal studies and initiatives. The full report for the Board set out the case for a new body or Think Tank, ‘Longview’ to take forward issues for investigation as identified in the scoping study. The case was accepted and the preparatory work for the establishment of Longview is now underway.

1.3 The aim of the scoping study was not to supply an exhaustive picture of the longitudinal research activity and all the issues it confronts, nor the range of substantive topics it addresses. Rather the idea was tap at the *meta-level* consensus, where it existed, in particular parts of the community, or across the board, about the key issues that needed to be resolved. The report’s main reference point is quantitative longitudinal research and it does not address the special set of issues involved in qualitative longitudinal enquiry. These are discussed in the report, “Changing Lives and Times” commissioned by ESRC in 2004 from Janet Holland, Rachel Thomson and Sheila Henderson. However many of the challenges addressed here are common to both kinds of study, sharing the common feature of follow-up of the same observational units (e.g. individuals, households) over time.

1.2 The scoping work took place over the period October-December, 2004 and included collection of evidence (usually by interview) with 44 expert informants from different parts of the longitudinal research community, including the ten members of the JCLR Board, most whom were interviewed. The findings present challenges for the various stakeholders in national longitudinal research strategy including: those who pay for it; those who undertake it; those who supply the methodological tools for doing it; and those who use the findings from it. These challenges arise at a time of increasing difficulties in matching to the funding available the demand for new longitudinal studies and sustaining the existing ones. In the case of social science funding the shortfall is already in excess of 50%.

2. Aims and evidence

2.1 The first aim of the Scoping Study was to identify the range of longitudinal activity in Britain and the key players engaged in doing it, or using its products. In recognition of a range of new initiatives from the research councils and Government directed at greater co-ordination in the production of longitudinal data and support for methodological development, a second aim was to identify gaps in the current range of strategising that needed to be filled. The brief for the study identified three interfaces where major challenges arose and where such work might yield the best returns:

- policy–research
- methodology–practice
- medical science–social science perspectives

¹ The Joint Centre for Longitudinal Research is a partnership between a number of organisations with responsibilities for national longitudinal research programmes and an interest in developing and promoting longitudinal study. The Partner Institutions are: Centre for Longitudinal Studies, Institute of Education; International Centre for Health and Society, UCL; MRC National Survey for Health and Development, UCL; National Centre for Social Research; International Centre for Child Studies. Thanks are due to the JCLR Board members and the many other experts working in the field of longitudinal research, who gave their time to supply the evidence on which this report is based. The views expressed and conclusions reached are, however, the responsibility of the author alone.

“CHALLENGES” REPORT - 13/04/05

2.2 Over and above solving problems at these interfaces, there were major issues requiring resolution, such as ‘data protection’, which were arising, or were predicted to arise, across the whole field of longitudinal enquiry. There was a clear need for detailed examination by experts of a number of such issues, with a view to making recommendations about the best ways forward and the need for substantive or methodological research.

2.3 Early on in the study, it became clear that its scope needed to embrace two major features of the longitudinal research terrain:

- the whole range of national, and local (often area-based) longitudinal studies and related forms of social science and Government enquiry
- the community of individuals engaged in, or relating to, various kinds of longitudinal study organised around different ‘nodes’ of responsibility and expertise in overlapping networks, spanning policy and academic research

Informants from these different sectors included:

- Academic experts with much experience of longitudinal research including those with major responsibility for running them, and those with major responsibility for national strategy concerning them
- Civil servants with an interest in, and experience of, commissioning longitudinal research, data collection and analysis, including the English and Scottish Registrar Generals, Treasury and Departmental officials (DfES and DWP)
- Representatives of funding bodies including ESRC, Wellcome, Rowntree and Nuffield.

2.4 Apart from contacting individuals in Britain, three relevant North American organisations were also investigated three of which three were identified as relevant to the scoping study and one of which (DRDC) was followed by telephone.²

3.0 Longitudinal Data Sources

3.1 The ONS publication *Tracking People*, first published in 1999, was followed up by the establishment of a database comprising longitudinal data sets, which is located on the United Kingdom Longitudinal Studies Centre (ULSC) website at the University of Essex. The database provides details of 337 studies worldwide, but for our purposes it is the British ones that are of major interest, and among these studies, those that are national or large-scale and longstanding local studies.

3.2 To simplify the mapping exercise for the purpose of this report the following core studies: can be usefully grouped as follows:

- *National Longitudinal Studies*
National Birth Cohort Studies (1946, 1958, 1970, Millennium)
British Household Panel Study
English Longitudinal Study of Aging
Longitudinal Study of Young People in England
Youth Cohort Study
Scottish School Leavers Survey

² Murray Research Centre in the Radcliffe Institute for Advanced Study in Harvard University, with responsibility for archiving longitudinal data sets and supplying advice about their use; Data Research and Development Center (DRDC) in the University of Chicago with responsibility for developing longitudinal research capacity among educational researchers around ‘scale up’ of experimental educational interventions (i.e. in British terms, ‘roll out’) through replications in different settings; Canadian Institute for Advanced Research, Ottawa, Canada.

“CHALLENGES” REPORT - 13/04/05

- *Area Based Studies*
Avon Longitudinal Study of Parents and Children (ALSPAC)
West of Scotland Longitudinal Study
Scottish Children’s Study
Isle of Wight Longitudinal Study
Aberdeen Child Development Study
- *Specialist Longitudinal Studies (selected examples)*
Edinburgh and Cambridge Studies of Delinquency
Whitehall Studies of chronic illness
Institute of Psychiatry Twins Early Development Study (TEDS)
- *Administrative Record Linkage Studies*
ONS Longitudinal Study
Scottish Longitudinal Study

This list excludes evaluation studies involving follow-ups, government cross-sectional surveys with longitudinal elements and specific topic focused studies. As noted above, the list also excludes the wide range of overseas long term longitudinal studies of which The Dunedin and Christ Church Studies in New Zealand are notable examples, as are the large number of household panel studies. The major longitudinal projects in the Nordic countries (especially Sweden) and the USA are also omitted. The international scope of longitudinal study coverage, if any, needs to be decided.

3.3 Apart from longitudinal studies involving panels or cohorts some respondents urged linkage to other related kinds of research design including:

- large scale randomised control trials
- evaluation studies involving the follow up of treatment and control groups
- biographical (or qualitative) longitudinal studies
- national continuous cross-sectional (monitoring) surveys), such as the *International Social Attitudes Study*, which as time series are longitudinal at the macro level

3.4 Apart from questions of design the studies are also characterised by their contributing disciplines and the constituencies they serve. The former comprise principally, psychology, sociology, economics, geography, health sciences/medicine epidemiology, demography, and statistics. The latter comprise the major policy departments of Government: Education, Health, Work and Pensions, Home Office, Inland Revenue, Deputy Prime Minister, Cabinet Office, Treasury and the English, Welsh and Scottish Registrar Generals. The main policy areas the departments relate to are; education, training and employment; income and expenditure, families and children; social security; housing; crime; health; social exclusion; citizenship.

3.5 Running parallel to policy interests is the remit for building the social science and medical knowledge base. This is the responsibility of the Research Councils, principally ESRC and MRC, and to varying degrees, the major Charitable Foundations, especially, Wellcome, Nuffield and Rowntree.

3.6 Across this range of provision and stakeholders in different parts of the longitudinal research community, there is a communications network, or rather a series of communication networks, to which stakeholders relate. These networks tend to be located around a number of ‘nodes’ reflecting concentrations of data and expertise of current or potential significance in terms of national longitudinal studies strategy. On the data production front the core nodes are clearly the UK Longitudinal Studies Centre (ULSC) at the University of Essex and the Centre for Longitudinal Studies in IoE. There is also the ESRC National Longitudinal Strategy Committee, originally part of ULSC and now reporting direct to the ESRC Research Resources Board. On the medical side MRC, building on a number of earlier reviews is in the process of setting up a comparable Longitudinal Strategy Committee. The Biobank, currently in its pilot phase, supports a major collaborative network comprising a ‘hub’ of a collaborative network located at the

“CHALLENGES” REPORT - 13/04/05

University of Manchester and six ‘nodes’ or Regional Collaborating Centres - embracing over 24 universities and other research facilities.

3.7 These are most closely matched in Government by the Office of National Statistics (ONS) led consortium of government departments with the brief of coordinating, across Government, longitudinal data needs. Another coordinating mechanism is the Office of the Chief Social Research Officer, headed by Sue Duncan, with the wider brief of co-ordinating and establishing standards across departments for the whole social research evidence base. There is an equivalent post, but with more of a commissioning function, in the Scottish Executive.

3.8 As part of a major new data strategy arising out of the renewal of funding for the ULSC, and more recently, the independent establishment of the ESRC longitudinal resource centre in CLS, there is also now the Data Forum headed by Professor Peter Elias from the University of Warwick. Membership includes the Research Councils, Government through the ONS consortium, and the major charitable foundations. The remit of the Data Forum is to advise funders of the need for longitudinal data, its under-supply or over-supply and the case for continuation or termination of studies and the setting up of new ones. More institutionally based nodes include the University of Southampton where the National Centre for Research Methods has been established under Chris Skinner with six newly announced participating nodes in different institutions. There is also the Economic and Social Data Service (ESDS) run from Manchester which also embraces the Essex-based ESRC Data Archive, and under Angela Dale in Manchester, ESRC’s Research Methodology Programme. Although none of these facilities are exclusively concerned with longitudinal study, it features in a major way in their programmes - not least because of the very high level of investment in it.

3.9 Other significant foci are the JCLR partners themselves and related university-based centres (e.g. the newly established Institute for Health and Well-being (University College, London), Avon Longitudinal Study of Parents and Children (ALSPAC) (Bristol), West of Scotland Study (Glasgow) and the Longitudinal Studies Centre (St. Andrews). Centres such as CASS (Centre for Applied Social Surveys) also have an important role, as does the ESRC Centre for Evidence Based Policy and Practice and associated ‘Evidence Network’ located in Queen Mary’s College, University of London. Notable medical centres with a major interest in longitudinal data include the Institute of Child Health’s Centre for Paediatric Epidemiology and Biostatistics, and the Epidemiological Resource centre at the University of Southampton. The Institute for Fiscal Studies, the London School of Economics research centres - Centre for Economic Performance and Centre for the Analysis for Social Exclusion - and in the University of Essex, the Institute for Social and Economic Research, are all major users of longitudinal data and should also be mentioned here.

4.0 Key Themes

4.1 With barely any exception the response to the enquiry was positive, if not in some cases highly enthusiastic. There was general recognition of the need for activity at the three interfaces posed in the brief for the study and for resolution of issues seen as presenting major challenges for longitudinal study.

(a) Policy –research

(i) Communication gap

4.2 This related to the failure of both academics and policy makers to understand and appreciate the different decision frameworks in which they worked - perhaps more the latter than the former. Policy operates in timeframes dictated by the parliamentary system, with priorities that reflect political as much, if not more than, analytic considerations. For longitudinal research to be effective in policy terms, therefore, it needs to work with the grain of the system while not

“CHALLENGES” REPORT - 13/04/05

sacrificing the fundamental commitment to building a knowledge base that is the hallmark of science.

4.3 On the policy side, particularly among policy makers, but also among policy research managers, there was sometimes insufficient appreciation of the strengths and limitations of longitudinal studies for particular policy purposes or full understanding of the design issues that could affect the quality of the data and the use to which data were put. Thus the national birth cohort studies are often seen as key tools in policy evaluation, but their effectiveness for this purpose is limited because of the historical aspect of any single cohort, i.e. its datedness in relation to new age-based initiatives. Only through repeated longitudinal (or cross-sectional) surveys can observed changes in a population, as opposed to the individuals who comprise it, be linked to policy shifts.

4.4 There is also often a focus on the cross-sectional as opposed to the longitudinal aspects of the data, i.e. using each follow-up as a representative cross-sectional survey of the British population. Apart from the age-based limitation of such data, statistically the sample is representative of the population cohort when the study began. When the cohort reaches adulthood the population cohort it relates to will not be the same as the population residing in country now because of the changes occurring through inward and outward migration. The original cohort becomes dispersed through emigration and is generally not followed up overseas. The national home population also includes immigrants who are excluded from a *national* birth cohort, the main feature of which is longitudinal records of the *same* individuals back to birth³. The BHPS has strengths compared, with the birth cohort studies in this respect because its basis in a sample of households means that the sample is continually being updated to represent the population now and is refreshed with new households.

4.5 Inferring causality from observations is an important goal of policy evaluation because investment in new initiatives rests on it. Yet the longitudinal study can only account for potential selection biases in the estimation of treatment group effects to a limited extent. This ‘quasi-experimental feature’ of longitudinal research design, relying on statistical rather than design controls gives good evidence in support of causal interpretations; their confirmation, however, requires more rigorous experimental approaches. (The issue of causal inference with longitudinal data is considered later.)

4.6 The relation between the national longitudinal studies and properly experimentally designed evaluation studies, with control groups for comparison and, ideally, randomised elements in the design, is an important one for examination, as is the link to the time series obtained from continuous (cross-sectional) and panel surveys of the BHPS kind. Where cohort studies pay-off in policy terms is in the insights given into the likely aetiology of long-term life course processes and consequently the prediction of probable outcomes from them. As has been increasingly recognised, such longitudinal studies are powerful tools in the formulation and evaluation of different policy options, but in isolation (i.e. the single birth cohort study), are limited as aids to appraisal of a new policy once implemented.

4.7 A solution to the communications gap in this area was seen in terms of much more targeted training both towards people who work in government departments and towards academics working on longitudinal projects. Policy maker-academic researcher exchanges were also seen as valuable in this respect. The main point was to develop a clear strategy for bridging the gap.

(ii) Administrative data

4.8 Another gap was revealed in relation to the production and management of administrative data sources and knowledge in the academic research community of their potential for research.

³ During the years of compulsory schooling in the 1958 and 1970 birth cohort studies the sample was in fact augmented with immigrants. This was because of the tracing method used based on school records of all children born in the relevant week, but no attempt was made to continue to make such additions past age-16.

“CHALLENGES” REPORT - 13/04/05

There are massive longitudinal resources embodied in administrative records, on employment, pensions, tax, crime and so forth, which are increasingly being brought together for particular research purposes. Legislation is required to do this, which is little appreciated outside Whitehall, where the belief is common that all government data are linkable, if not already linked! DWP has an information centre in Newcastle that has a huge bank of easily accessible linked longitudinal administrative records. Few academics are aware of the research potential such centres offer. If linked to the core longitudinal studies, they supply, for example:

- key population data on multiple cohorts against which to set data from a particular longitudinal cohort study
- longitudinal data enhancement, e.g. the newly established individual pupil records (IPR) in DfES, which produce the Annual Schools Census (PLASC) database, collect ‘key stage’ test scores and other information relevant to educational progress throughout each pupil’s educational career. Linkage to PLASC removes the need to collect such progress data via the longitudinal survey.
- the chance to fill holes in the longitudinal record brought about by non-response and attrition

4.9 There are, of course, a number of difficult issues such as data protection - varying from one administrative source to the next - that arise in such linkage. Criminal records or Biobank data, for example, pose a different order of problem from employment records or PLASC data. (Data protection questions are considered in more detail later.) Enhanced knowledge and understanding in the research community of such sources would identify more precisely what the demand is for their use.

(b) Methodology- Practice

4.10 Over the last twenty years there have been major methodological developments in the area of longitudinal research and much investment is ongoing in enhancing them further. ESRC’s current Methodology programme, the National Centre for Social Research Methods and so on, exemplify this development. However much of this work operates, to a large extent, independently of survey practice and there are relatively few facilities for testing out its products. The pilot longitudinal surveys funded by ESRC and Government and the continuous surveys run by ONS and other major agencies, offer numerous opportunities for methodological testing of this kind.

4.11 An area of considerable consequence to longitudinal researchers, for example, is attrition. Statistical work in progress shows good prospects for developing much more sophisticated statistical modelling of attrition within multi-level frameworks. Such work will generate improved protocols for contacting and interviewing procedures in data collection, for the specific data that need to be collected and for the re-weighting of data and data imputation, both within the longitudinal survey and through linkage to administrative data. One suggested vehicle for evaluating these methodological products is an omnibus longitudinal survey, perhaps built out of connected pilot studies, and serving as a test-bed for methodological research.

4.12 Methodological research serves the twin purposes of (a) solving problems in a particular survey and (b) producing more generalisable knowledge for application in comparable survey situations. Both kinds of work are done by survey organisations, including market research companies, with the main emphasis on (a); university based methodological research tends to focus more on (b). The kind of methodological test bed mentioned above could be used for both purposes. It could also serve more explicitly as a base for identifying problems requiring solution through statistical enquiry.

4.13 Research initiatives in this area supply the means of coordination and dialogue mainly, if not exclusively, within the academic methodological research community. This needs extension to embrace the survey practice community. Capacity building through training opportunities, e.g.

“CHALLENGES” REPORT - 13/04/05

the ESRC ‘Survey Links’ scheme, could follow. There are good US exemplars of such integration of survey methodology, practice and training such as the (cross-sectional) Detroit Area Study, run by the Institute for Social Research at the University of Michigan. Developing such an initiative in relation to longitudinal studies could be highly beneficial to social and medical science.

(c) Medical Science – Social Science

4.14 There is much acknowledgement in medical epidemiology of the value of conceptual frameworks shared with social science such as the life course perspective - involving transitions though multiple-life domains studied across time - in understanding the aetiology of illness. But in applying it medical science focuses on the operationalisation and testing of well-specified hypotheses through clinical procedures, rather than the more inductivist and exploratory approaches common in the social sciences. In the medical research there is also a whole framework for addressing the ethics of data collection and the regulation of access to informants that has no parallels in social science. Even the terminology differs between them with social scientists referring to ‘public access’ or ‘public use’ of Archive data; whereas medical scientists tend to refer to ‘shared data’ i.e. data that the principal investigator or research team is prepared to share with other scientists.

(i) Regulatory framework

4.15 Notably, the last major review of longitudinal research carried out by MRC (the Haggard Report) recommended an expansion of archiving and wider access to MRC-funded longitudinal data, but only under the conditions that advice and guidance was supplied by those scientists who had generated the data. It was feared that if such restrictions did not apply data could be misinterpreted leading to contradictory results. There are also fears for the integrity and survival of the studies if the nature of the consents given and assurances about confidentiality were breached. In the area of ethics, the dominance of the ‘Multi-centre Research Ethics Committee’ (MREC) System in controlling and policing use of subjects in medical research is the price any medical scientist has to pay in doing research involving human subjects. The system comprises a network of local committees (LRECs) staffed mainly by medics: yet increasingly their range extends to work in the social sciences. Recent examples involving the cohort studies are the MRC-funded medical sweep of the 1958 Birth Cohort Study where medical procedures were a major feature. More problematically the Millennium Cohort Study, although receiving originally no medical funding, had to get MREC clearance because of the need to contact health visitors as part of the tracing of new births, and because of the plan to link Hospital Episode Statistics and Vital Registration data.

4.16 In one sense social science may have been lax in some of these areas, operating more in accordance with the ethical codes drawn up by the British Market Research Association and the Social Research Association in guiding field procedures. As data linkage possibilities extend, ethical issues increasingly arise, as they do in multipurpose studies involving both medical and social data. Consequently, a whole new approach to ethical clearance is needed. This is required in relation to permissions for data linkage, in some cases data collection and increasingly, publication of results

(ii) Research paradigm

4.17 Medical science is hypothesis-driven and funding for longitudinal data collection is unlikely to be released unless a scientific programme of hypothesis testing can be demonstrated. Hence in the medical follow up of NCDS about a quarter of the funding was devoted to analysis projects following data collection and consequently an embargo on external use of the data is effectively in place until this work has been done. The ESRC has taken almost the opposite position, with the establishment of what has been, for some time, a major Board of Council devoted to the generation and promotion of research resources. The Research Resources Board invests

“CHALLENGES” REPORT - 13/04/05

ESRC funds in data collection enterprises to which no analysis is attached. The BHPS and the ESRC - supported Cohort Studies data collection sweeps are currently funded on this basis, relying on the assumption that the right decisions will be made about variables to include that will be of value to research users of the data.

4.18 The hypothesis-driven approach tends to produce a rather closed system of use with collaborators sharing out the hypotheses between them and a certain reluctance to see the research programme extended to others. The research resource approach leaves too large a gap between longitudinal survey design and data use – and often too little time to formulate proposals for the exploitation of the data. This warrants another major area for enquiry to see whether common ground between the two approaches can be found.

5.0 General issues requiring resolution

5.1 Respondents differed in relation to the emphasis they placed on the various challenges facing longitudinal research, reflecting different stakeholder perspectives. The main distinction was between methodology/ethics and substance. Thus some respondents thought the main focus of interest should be on methodological investigations of the kind discussed earlier; others thought the main thrust should be the pursuit of major substantive topics, which longitudinal research was particularly well-placed to tackle. Both kinds of investigations are being pursued in the different national initiatives and research programmes discussed earlier. Hence the interest here is directed more at the *meta-level* of mapping the terrain, reviewing what is known about it, and identifying gaps that need to be filled to enhance the knowledge base.

(a) Methodological and ethical enquiries

(i) Data linkage

5.2 Data linkage, extending to such sources as the Biobank, was mentioned repeatedly as the key issue confronting longitudinal research of the future with the need for a comprehensive regulatory framework to be drawn up for its use. ‘Quality Audit’ of administrative data - along the lines developed by ESRC’s National Longitudinal Strategy Committee for the ESRC-funded studies - was also critically important. Such audits would embrace key quality indicators showing the strengths and limitations of the data for different research purposes and guidance for use: how should the data be analysed and for what purposes, e.g. in the modelling of adjustments for attrition and imputing missing data? Audits would also offer pointers to improving what was on record, feeding back into the administrative systems for data collection.

5.3 What restrictions should be placed on the use of linked data and how should they be implemented? There is a difference of opinion in relation to what were described as ‘models of access.’ Thus the idea of giving access to administrative records for linkage purposes only in a “protected environment” along Stats Canada lines, and as currently applied in the English and Welsh census-based LS, is one option. Another favours placing trust in universities that could be licensed to ensure that research users obey strict confidentiality rules. Sanctions against breaching the terms of the licence would include termination of funding.

5.4 Allied to quality audits and access arrangement are ethical codes of the kind discussed earlier. The major longitudinal studies have developed their own policies in relation to the release of confidential data through which respondent identity might be revealed. The level of aggregation permitted for geographical data, such as postcode and enumeration district levels, can be critical in this respect. ESRC’s National Strategy committee has paid particular attention recently to this issue. Access to selected respondents from large-scale quantitative studies for follow-up through qualitative case study, for example, is another area of concern. Such work is valuable in unravelling biographical processes within the broader framework provided by the longitudinal study, but raises a further set of issues concerned not only with confidentiality but

“CHALLENGES” REPORT - 13/04/05

respondent burden. Every respondent lost to a longitudinal study represents a costly hole in the longitudinal record, which questions the extent to which such access should be given. Concentrated work on such issues could aid national strategy for developing common codes of practice and regulatory frameworks.

(ii) Design and implementation

5.5 Apart from methods for dealing with the overriding issues of attrition and missing data, as discussed earlier, more specific methodological issues arising in practice were those to do with all features of longitudinal research operations, including:

- ‘dependent interviewing’ i.e. supplying to the interviewer, data collected earlier in the study,
- panel maintenance,
- communications with and feedback to subjects
- non-response data
- post-field work operations (data cleaning and editing)
- database development and documentation

Some of these are fully covered through other initiatives and would therefore be marginal to Longview’s remit. Others could be central to it.

5.6 An overarching concern was the timing and length of intervals between follow-ups, which has huge cost implications and the ages, stages and periods at which new studies were needed, which we return to later. This is a major focus of the work of the Data Forum, but there is limited scope for the Forum to undertake the necessary investigations, which means that specialised external inputs would be highly valued.

5.7 Variable specification and operationalisation were also seen as critically important. Variable specification is usually arrived at through scientific consensus from experts in the field. This consensus derives from current theoretical perspectives and the variables they encompass, including judgements about what is most likely to be seen as essential in the future. What has been described as ‘fading relevance’ of longitudinal data reflects the tendency in any given follow-up for the selection of variables and measurements methods to reflect prevailing theoretical frameworks and operationalisation strategies. New perspectives can thus demand new variables but the facility for accommodating these in existing cohort studies is limited largely to the recoding of existing data or seeking the relevant data for linkage from other sources such as administrative records. This perhaps presents a bigger challenge for social science than medical science where theoretical frameworks tend to be more stable.

5.8 With respect to operationalisation, there is a diversity of approaches to question design currently in use, which weaken opportunities for cross study comparisons. An important aspect therefore of strategies for co-ordination is *question harmonisation*, i.e. reaching consensus about appropriate data collection methods for use at particular time points in all surveys. Such organisations as the Centre for Applied Social Surveys (CASS) and ONS have made great advances in such data harmonisation in recent years and the result of their work needs to be much more widely disseminated.

5.9 A related topic concerns effective psychological measurements for longitudinal research purposes. The typical interview with a respondent in a longitudinal survey is no longer than one and half hours and often less than this. Optimising measurement efficiency is therefore at a premium. It tends to be overlooked that some of the frequently used psychological tests in longitudinal surveys have their origins in clinical practice targeted at making therapeutic decisions about individuals for which high test reliability is mandatory. Test reliability is a function of test length; hence the large number of items typically involved in such measurement. For survey purposes such reliability requirements can be relaxed because the nature of

“CHALLENGES” REPORT - 13/04/05

statistical enquiry rests fundamentally on group comparison (as in Analysis of Variance) whether conducted at any particular time point or as in repeated measures across time, where random error will tend to cancel out. This does not of course remove the need to identify and control statistically any possible biases that can arise from (systematic and random) measurement error in longitudinal analysis, using such methods as structural equation modelling. A whole programme is needed to review psychological measurement from this perspective, with a view to producing short forms of all major psychological measures for use in longitudinal surveys.

(iii) Causal inference

5.10 Finally another area of much concern to respondents concerned causal inference using longitudinal data. Education Policy makers want to know whether changing features of the education system will produce the desired effect of enhanced educational attainment in children. Scientists want to improve their understanding of why certain phenomena such as social exclusion or health inequalities happen. The former requires interpretation of empirically demonstrated relationships between two variables – in causal terms. The latter requires hypothesis testing in the sense of fitting to empirical data an explanatory model postulating that variable A causes variable B. Fundamentally both are concerned with making valid predictions that reflect causality.

5.11 Threats to the validity of such inferences encompass various sources of variation in the data failure to control of which can lead to biased estimates of effects. Such biases can be inherent in the research design, constituting a threat to its ‘internal validity’ or to the generalisability of the results – ‘external validity’. Internal validity is maximised in the randomised control trial that allocates subjects randomly to treatments. External validity is enhanced through replication across time, across populations, across measurement methods and across settings. In these terms, as noted earlier, longitudinal studies are typically described as ‘quasi experiments’. They are able to establish temporal sequences implied from data patterns – A precedes B rather than B precedes A – but are potentially subject to biases due to unmeasured variables that may be confounded with the variables postulated to produce given effects. Is it features of educational experience that produce the return to qualifications, or some unmeasured characteristic of children and their families that ensures their selection into particular forms of education? Are the returns entirely attributable to what goes on in the classroom or to compositional characteristics of the school the child attends or the community in which the school is located?

5.12 Statistical modelling supplies answers to such questions through analysis of data once collected and great advances have been made in recent years in the methodology involved. Other solutions reside in design decisions. Large scale longitudinal studies based on representative samples with wide data coverage encompass much of the population variation from which biases may arise, enabling their effects to be estimated and controlled. When repeated across time, as in the cohort studies series or as in BHPS, they also support investigation of cohort and period (historical change) effects at given ages and whether relationships are stable or change across time within and across cohorts.

5.13 There was a strong call for a comprehensive enquiry to establish the strength and weaknesses of different kinds of longitudinal studies with respect to causal inference in different policy and scientific settings. Such an investigation would include a mapping exercise to chart different approaches to statistical estimation using longitudinal data and to assess the scope for further development. The enquiry would also work towards formulating strategies for ‘triangulating’ conclusions using data from different studies. It would also seek to establish principles to govern the setting up of new studies and for augmenting old ones that would have most pay-off in scientific and policy terms. For example, the optimum timing for a new longitudinal study could be dependent on anticipated changes in the social and political context. The timing of data collection within a study similarly needs to be determined on such ‘best

“CHALLENGES” REPORT - 13/04/05

scientific value’ grounds. Further ramifications of this point are considered later when the ‘life course perspective’ is discussed.

5.14 In the furtherance of such aims one suggestion was to bring longitudinal studies more closely into line with the evaluation of Government policies, as has already happened to a certain extent with the evaluation of Sure Start initiative and the Children’s Fund. For Sure Start this involved augmenting the sample by extending what was already over-sampling in disadvantaged areas to supply sufficient controls against which to compare the Sure Start children. In the case of the Children’s Fund, it meant extending data collection to the Millennium Cohort Study older siblings to serve as controls. There could even be a case for manipulating some part of the Cohort Study samples experience by ensuring that they encountered new policies and initiatives in a designed way. Such a development is fraught with difficulties in terms of potential damage to the integrity of the Cohort Studies, but needs to be explored.

5.15 Finally another less problematic enhancement along these lines is the development of comparative longitudinal data sources through the promotion and coordination of longitudinal research in other countries. This has already occurred in relation to panel studies, with the establishment of the European Panel Study, but for a variety of reasons to do with costs and inefficiency, this collapsed a few years ago. However the potential is considerable and there is already an initiative to develop a European Cohort Study half funded by the European Commission and half funded by participating countries.

(b) Longitudinal research topics

5.16 Topics for research were not stressed in the brief for the scoping study, so what arose in the consultations tended to arise *ad hoc* and in no way spanned the range of possibilities. The studies that were mentioned ranged from major historical enquiries to targeted projects supplying guides to policy and practice.

(i) Historical enquiry

5.17 A major investigation to which the cohort studies link themselves particularly well could be the development of the welfare state and its impact on life in Britain since World War II. The use of the Cohort Studies series as historical records has been relatively little exploited in the past, partly because of the technical difficulties in aligning for comparison such massive independently-produced data sources. The book *Changing Britain, Changing Lives* was prompted by the realisation that all three national birth cohort studies (1946, 1958 and 1970) would all be in the field in 1999/2000 and can be seen as a ‘first shot’ in this direction. The full development of such an enquiry would require much more work on data equivalence and imputation possibilities across the studies, much more longitudinal analysis and much more detailed mapping of the changing social, economic and political context. Such a study also lends itself to comparative extension with replication in other European countries, like Germany and Sweden, where comparable historical and life course data could be assembled.

(ii) Policy studies

5.18 Policy makers’ interest lay more in gaining effective guidance on policy options in relation to public investment and new initiatives. Studies are needed to illuminate the:

- optimum timing of prevention and intervention programmes
- movement through, and out of, the labour market
- role of assets and benefits, including pensions, in shaping lives
- processes of and perceptions of retirement
- migration, population loss and replacement - of particular concern in Scotland
- intergenerational transfers of inequalities and social, economic and health mobility

“CHALLENGES” REPORT - 13/04/05

(iii) Life course perspective

5.19 A unifying framework for both kinds of study is the ‘life course perspective’. With origins in the developmental and health sciences, psychology, sociology, geography, demography and history, this approach reconciles the interests of diverse academic disciplines and policy needs. Its primary emphasis is on the importance of historical shift - ‘cohort effects’ - on development in context, i.e. the impact of social and economic change on developmental processes and their outcomes in different social environments. Influences are located in four domains:

1. History and culture: *Location in time and space*
2. Development of the Individual: *Human Agency and Resources*
3. Social relations: *Linked lives* (in families, in the neighbourhood and through institutions)
4. Intersection of Age, Period and Cohort: *Timing*

5.20 The major research themes reside in the interactions of these influences, embracing biological disposition and environment (proximal and distal), in shaping life course transitions and the pathways (or trajectories) that comprise them. There is a particular emphasis on concepts such as risk and protection, capital accumulation, turning points (e.g. escape from disadvantage), vulnerability and resilience. Such a perspective brings the different academic disciplines together in what is, by necessity, a multidisciplinary framework for understanding human lives. It also maps effectively on to policy concerns in such areas as education, training and employment, income, housing, health, citizenship and participation, social inclusion and cohesion, supplying guides to effective prevention and intervention and social, economic and health returns to investment.

5.21 There is growing acknowledgement in Government that joined-up policies to match the demands of the life course require joined-up activity in the work of departments. The Chief Social Research Officer has the task of trying to bring this about, but it is a formidable challenge. This is because joining-up works against the traditions of departments for which ownership of policies via the ministers responsible for them is a critical part of their functioning.

5.22 It would be valuable to explore the full ramifications for science and policy of the life course approach for longitudinal research strategy and design. Such an enquiry maps onto the discussion earlier about scientific inference. Growing interest in aging and retirement, for example, reflects changes in both the biological and social parameters of the life course, demanding new longitudinal research (ELSA) to understand their significance across all the policy domains. The changing demography of Britain with substantial ethnic minority populations needs to be reflected more faithfully in longitudinal study designs. Population transformations such as the falling birth rate and outward migration from Scotland also need to be addressed. Other drivers arising from scientific and technological development, such as genotyping of DNA and establishing ‘immortalised cell lines’, place a different set of priorities on longitudinal data collection strategies and uses. Decisions in the past about these have tended to be made *ad hoc* rather than in terms of a national strategy. Ongoing monitoring of longitudinal priorities, rather in the ‘Foresight’ mode, is not currently being undertaken and would have significant pay-offs nationally for science and for policy.

6 Conclusions

6.1 The Scoping Study identified the huge range of interest, experience and enthusiasm for longitudinal research. All respondents felt that key issues of co-ordination, rationalisation and cost effectiveness in a field that has largely grown *ad hoc*, needed to be resolved. There are gaps in provision, in the exploitation of longitudinal research resources and in the communication and interpretation of longitudinal products. Strengthening capacity requires effective mechanisms for building confidence, fostering commitment and generating intellectual rewards. Meeting the challenges set out in this report will hugely enhance the quality, productivity and satisfactions to be gained from the whole longitudinal research endeavour.