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ABSTRACT

This paper reviews research on processes linking low incomes, deprived neighborhoods, and adverse outcomes for British children, identifying gaps and limitations in existing datasets and research strategies. Four domains are examined: education, health and psychological outcomes, crime and related behavior, and items linked to transitioning to adult life (e.g., unemployment, homelessness, and early family formation). The paper describes the basic model, which identifies household resources, particularly income, and distinguishes between transmissions and processes broadly within the family and individual sphere. It then examines possible data requirements and mechanisms in more detail, evaluating how far the available data sources include the appropriate data. After discussing neighborhood effects and data on service quality, the paper explores the technical questions of data linkage and ethical and legal constraints. It concludes that there is not one study that encompasses all that would be needed to chart and explain the relationship between poverty in childhood and the major outcomes in the short and medium term, though with the increasing sophistication of research measurement, studies demonstrate state-of-the-art data collection. Recommendations for future research are noted. Three appendices present information on modeling individual effects, the dataset, and modeling neighborhood effects. (Contains 67 references.) (SM)

LINKING CHILD POVERTY AND CHILD OUTCOMES: EXPLORING DATA AND RESEARCH STRATEGIES

Department for Work and Pensions
Research Working Paper No 1

By

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CHAPTER 1 - INTRODUCTION

1.1 Background to the scoping study

This paper was jointly funded by the Department for Work and Pensions (DWP) (formerly Department of Social Security), HM Treasury (HMT) and the Social Exclusion Unit (SEU). In addition, funding was provided by the Treasury's Evidence Base Policy Fund. The tender brief for this study requested a scoping paper 'to outline different research strategies, based on existing data, new data or both, to help understand the processes that link low incomes, deprived neighbourhoods and adverse outcomes for children across generations'. The intention was to provide 'both a short and long-term framework to commission further research to inform policy development... and to shed light on the relative importance of policies to raise incomes, improve public services and tackle the problems in deprived neighbourhoods.' The last point was a specific reference to the growing number of area-based initiatives (ABIs) that are targeted at poor neighbourhoods or poor children or both, and from which evaluation data are beginning to emerge.

The objective for the scoping study was explicitly *not* to review current knowledge about child poverty based on an overview of existing research. A number of studies that cover this ground extensively have been published since the scoping study was commissioned. These include Jonathan Bradshaw's edited collection *Poverty: the outcomes for children* (Bradshaw et al., 2001); Brewer and Gregg's 'Eradicating Child Poverty in Britain: Welfare Reform and Children Since 1997' (IFS Working Paper, May 2001), as well as forthcoming studies such as Bradbury et al. (2001).

Rather than simply add to this collection, the aim was to identify gaps and limitations in existing datasets and research strategies that might be the basis for further research that could build on existing studies, for example by data enhancement or data linkage between one or more sets of data, or by newly commissioned data collection exercises. This exercise was to be informed by a more technical discussion of the types of data required to answer some of these more challenging long-term questions about child poverty and child outcomes. Duncan et al.'s (1998) analysis of longitudinal data linking childhood poverty and subsequent life chances, drawing on the Panel Study of Income Dynamics (PSID) in the US with data on children born between 1967/73 and followed from birth to age 20, is one example of this type, where data on low income in early childhood was linked to subsequent educational progress.

The main thrust of this review therefore encompasses both these key themes – that is, it reviews current and likely future datasets and developments, and makes a technical assessment of what would ideally be required. While the intention is to make this as comprehensive and complete as possible, we would not claim in the limits of a short study to have uncovered every initiative or likely development in the pipeline nor indeed all the ways of handling possible future research.

The aims of the study were therefore:

1. to clarify the key issues;
2. to construct a framework for research;
3. to review the data available, and the scope for data linkage to study child poverty and child outcomes;
4. to make recommendations about possible future research developments.

1.2 Policy relevance

While the scoping study was explicitly *not* a review of research findings we were encouraged to keep the relevance to policy firmly in mind, and to locate this technical research exercise in the wider framework of policy objectives of sharply reducing and finally eliminating child poverty in a twenty year time frame.

The existence and persistence of child poverty in Britain are now very well documented from cross-sectional surveys, panel studies and administrative data. The steep rise in child poverty since the latter part of the 1970s through to the late 1990s is also very well documented, as are the exceptionally high rates of child poverty in Britain in comparison to other European countries (DSS, 2000). As a concomitant of these high rates the intense geographical concentration of poor children is also increasingly well mapped (Noble, Evans et al., 2001). What is less well understood are the links over time between the experiences of child poverty, medium and long-term child outcomes, the intervening effects of 'within family' processes, local services and neighbourhoods, particularly the high geographical concentrations of poor families in some areas. Duncan et al. (1998) draw attention to the 'surprising volatility' of family incomes in the US, a finding which appears to be emerging from studies in the UK that have repeated data over short intervals of time. This more dynamic picture provides the critical backdrop for more effective policies to reduce and eliminate child poverty.

There are several additional issues to be kept in mind in this discussion of the possible links between the experience of growing up in poverty and subsequent outcomes. First, there may not be a single critical time point for all significant outcomes. Thus, the repeated finding about the importance of the early years for significant intervention may apply strongly to early cognitive skills and subsequent educational achievement. Certainly Duncan et al. (1998) suggest from their PSID data that family income levels for ages 0-5 may have a strong influence on educational progress, but have much less impact on some health and behavioural outcomes. But students of the long-term effects of preschool intervention, studies that cover 20 years of development or more, will know that subsequent events are also important at sustaining or undermining these early gains (Schweinhart et al., 1993). And there may well be other critical periods such as the decision to stay on at or leave school at the minimum age, or the series of transitions into adult life (in employment, housing, family etc.). This possibility - of different critical periods

for different outcomes - immediately introduces substantial complexity into any dataset that might meet the many potential data requirements to answer this set of questions.

Second, intensive long-term evaluation studies of the effects of early intervention on later development underline the way that initial interventions do not have simple linear effects (as originally might have been assumed) and may act through intermediate routes, for example, by strengthening parental support at critical periods rather than by enhancing children's cognitive skills. It may be that the growing number of major evaluations commissioned to study interventions such as Sure Start aimed at children growing up in poverty will, in time, bring in more information about these patterns to supplement the picture emerging from national cohort and panel studies.

Third, it may well be that these experiences of poverty are different for different groups who may be categorised under the general heading of 'child poverty'; for example different ethnic groups and family types, as well as those living in urban or rural areas and in different regions. There are also groups such as those with special educational needs, children with disabilities or those growing up in care whose experiences might be different. In all these cases, much of the data available with a longitudinal component do not contain the necessary classifications or numbers to follow these groups in any detail. Again this adds a substantial complexity to any potential dataset. Can it contain enough cases of these different groups over time to permit different patterns or trends to emerge, and their possible causes and correlates?

Finally, there is the question of the relative importance of the different levels - individual, family, neighbourhood and services - on these different outcomes. Apart from the conceptual question 'what is a neighbourhood effect?', there are design considerations about how best to take these questions into account. Although there is some dispute about the relative importance of these components (Kleinman, 1999; Berthoud, 2001; McCulloch, 2001) our position is that the issue of 'neighbourhood effects' is yet to be resolved and the resolution will depend on appropriate data, measurement and analysis.

Some of the key policy relevant questions might therefore include:

- what are the processes or 'pathways' that link low income, deprived neighbourhoods and poor outcomes for children (particularly linking poverty measures to child outcomes at the individual level)?
- what are the key transmission mechanisms (for instance, within the family)?
- how different are the pathways for different outcomes and for different groups of children?
- are there key stages (e.g. the early years)? Do these vary for different types of child outcome?

- what are the consequences of different levels of exposure to poverty (length of time, intensity)?
- is the 'poverty' experienced by children best measured by household income?
- in addition to measuring household income, how far is it possible to measure the ways that such income impinges on children (i.e. do they get more of or less than their 'fair share' of household resources)?
- what is the impact of assets and access to financial resources ('financial exclusion') in the light of the growing policy interest in the impact of access to such assets?
- are there clear 'cut-off points' where children living in persistently poor circumstances have significantly higher risks of poor outcomes? And how far does this lend support to area or individually targeted programmes?
- what is the impact of geographical concentrations of poor families and children?
- are there advantages in growing up in socially mixed rather than in socially uniform neighbourhoods?
- what is the relative impact on long-term outcomes of policies aimed at raising incomes, or policies to improve local services?
- how far is there an independent contribution to life chances, from sets of attitudes and orientations towards opportunities – for example in exercising choice in service provision (e.g. choice of school)?
- how far can comparative studies with other countries throw light on these mechanisms, given the UK's apparently poor record relative to many other European countries in the level and persistence of child poverty?
- how far can simulation methods of the effects of tax and benefit changes (e.g. Polimod and Euromod - Piachaud and Sutherland, 2001) contribute to the assessment of child poverty and the impact of potential future policies?

1.3 Scope and coverage

We have taken age 0-20 as the potential range to cover children and young persons, though there arguments for extending this selectively to age 24 in view of the extended transition period for many young people. And we have included most of the major 'outcomes'. We set out four domains – education, health and psychological outcomes, crime and related behaviour and a collection of items linked to the transition to adult life, such as

(un)employment, homelessness and early family formation. Much of our coverage in these areas must necessarily be illustrative. Our coverage is also largely restricted to the UK, and several of the studies listed cover only parts of the UK. We have not covered comparative material, though we would underline its value in exposing some of the special features of the position in the UK (e.g. Jenkins and Schluter, 2000), and possibly the consequences of different mixes of policy on levels of child poverty. There is also scope for comparing the findings of studies such as Duncan et al. (1998) with similar work in the UK. Following the growing emphasis on the problem of child poverty across Europe, a number of initiatives are underway. Bradshaw and colleagues at the University of York are comparing child benefit packages across 22 countries, including all EU countries. An EU COST Action 19 programme on child wellbeing started in 2001, and Bradshaw and colleagues have also established a cross national database of economic indicators of child poverty for the multinational project on measuring and monitoring children's well-being, available from Bradshaw at York University (www.user-users.york.ac.uk/~jrb1/current.htm).

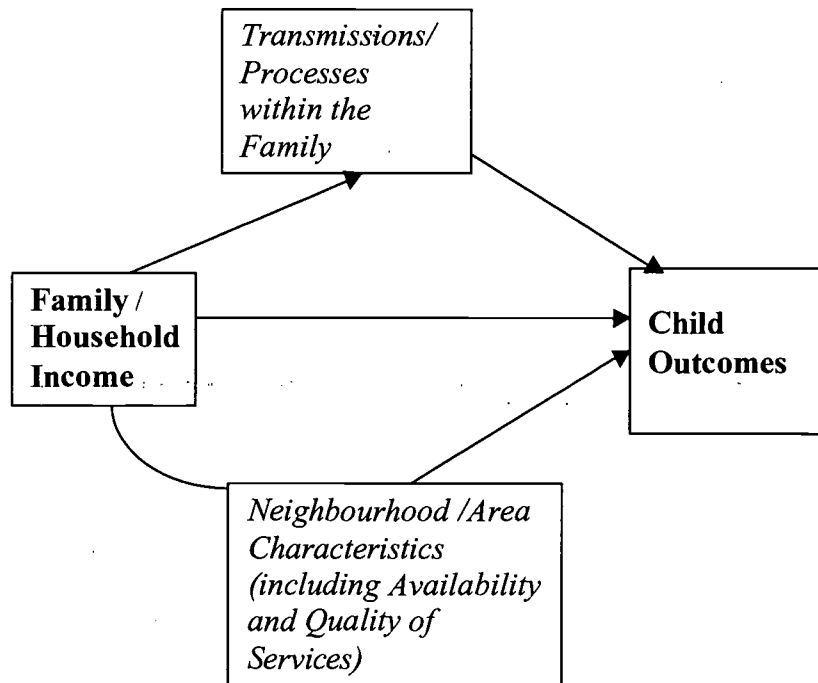
In Chapter 2 we set out our basic model. This identifies household resources, particularly income, broadly defined and it distinguishes between transmissions and processes broadly within the family and individual sphere, from neighbourhood and area characteristics. In Appendix 1, we consider some of the statistical issues raised by the model. In Chapter 3 we then look at the possible data requirements and mechanisms in more detail and evaluate how far the available data sources include the appropriate data. Appendix 2 sets out, in tabular form, brief descriptions of these datasets. In Chapter 4 we look at neighbourhood effects and data on service quality. Appendix 3 considers some of the technical issues. Chapter 5 explores both the technical questions of data linkage and the ethical and legal constraints. Chapter 6 makes outline recommendations for future work.

CHAPTER 2 - MODELS AND DATA

2.1 Underlying model

The pathways by which child poverty can lead to poor child outcomes - or, more generally, how family income explains child outcomes - are set out in Fig. 2.1. The model represented by Fig. 2.1 underpins this paper. We elaborate this model here and draw out some of its implications. In Chapters 3 and 4, we look at the model's components in terms of measurement and data. In Chapter 6, we recombine these components to show what could be done at present to estimate the model, what would be possible with new analyses of existing data, and what new data are needed in order to obtain a more complete picture of all the pathways.

Fig. 2.1 Links between child poverty and child outcomes



Note

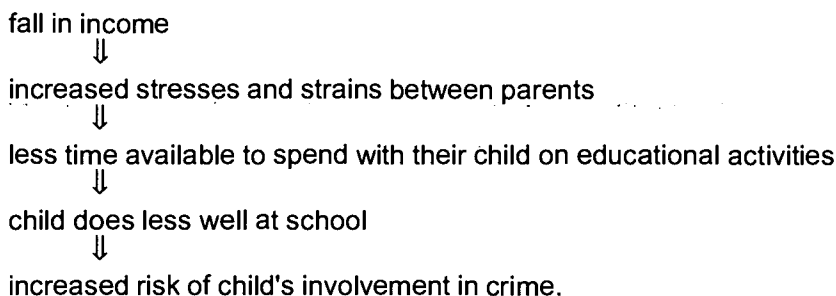
The arrowed lines represent associations that are potentially causal; the curved line represents an association that it is not causal.

The outcome variables ('child outcomes') appear on the right hand side of Fig. 2.1. The key explanatory variable in the model is family (or household) income, not so much its level at a particular point in time but more how it changes from period to period, and not only its representation as a sum of money but also its wider meaning in terms of command over resources over

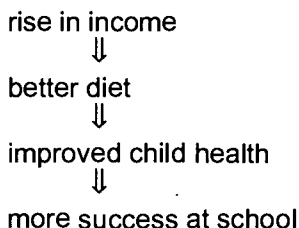
time. We have chosen to focus on income in this report, and therefore variables like employment status and parental educational qualifications are hidden from view, essentially to the left of income in Fig. 2.1. These variables may, as it were, partly determine the levels of family income (we elaborate on this point below). Chapter 3 sets out in detail what outcomes need to be considered, and also describes the measurement of income and income dynamics.

There can be direct links between income and child outcomes. For example, an increase in family income can mean that parents are able to afford to have their child at school beyond compulsory leaving age. Most of the links, however, are indirect. There are groups of intervening variables that can provide a better understanding of just how income influences outcomes or, to put this another way, variables that can help us to understand what the processes might be that lie behind the well-established association between income and child outcomes. The upper part of Fig. 2.1 represents processes within the family that can mediate, or transmit these influences; the lower part represents characteristics of the area in which the child lives that might also have an effect.

The model in Fig. 2.1 is, like all models, a simplification. For example, the box labelled 'processes within the family' contains a range of variables, some of which could themselves be linked in an explanatory framework. One instance of a chain of influences might be as follows (where the influences are ordered chronologically and '↓' represents a link that is potentially causal):



In this example, there are two processes within the family: the parental relationship ('stresses and strains') and the time given to the child for educational activities. Also, we find that educational attainment is an intermediate outcome, part of a process that relates to the risk of crime. But, in other cases, educational attainment would be the final outcome, as follows:



Here, health is an intermediate outcome and educational attainment the final outcome.

It is important to recognise that there can be ambiguity about what process comes first in a chain. For example, a fall in income could lead to less spending on a child's education, lower educational attainment and hence poorer mental health for the child, but it would also be possible for poorer mental health (resulting from the loss of a peer group perhaps) to precede lower attainment.

Another simplification in Fig. 2.1 is that it does not allow for 'feedback' mechanisms. It is, for example, possible for a rise in income to lead to a child staying on at school, in turn creating a more harmonious family situation and hence other positive outcomes for the child/young person. Models that allow for feedback - sometimes known as non-recursive models - can be difficult to estimate statistically. It is beyond the scope of this report to go into these issues in any detail but, in Appendix 1, we briefly describe the statistical approaches that could be applied.

There can also be some doubt about whether changes in income are always 'exogeneous' with respect to certain child outcomes. For example, long-standing illness or disability in a child – a candidate for an outcome variable - can lead to (rather than be caused by) reduced family income if a parent has to give up work to care for the child and does not receive a compensating benefit.

The selection of 'process' variables also needs to be made with care. We argue that they should not, for example, include variables like educational qualifications and employment status which, although associated with income, are not necessarily determined by it. Unemployed or unqualified parents are generally poorer - because they are unemployed or unqualified or both. If we are interested in the effect of income on child outcomes, it makes little sense to dilute that effect by including employment status in the model either as an intervening variable or as a control variable that is correlated with income.

Single parent status is a particularly difficult variable to locate in the model. It can describe a mother's position at the time the child is born or her position arising from the breakdown of the parental relationship after birth. This breakdown could have been precipitated by a fall in family income and could, in turn, lead to a further fall in family income as a result of a separation or divorce. We might, however, want to consider estimating separate models for two and single parent families because the processes linking income to outcomes might be different for these two groups (and for other social groups as well). There is, for example, some evidence from research in the United States that improvements in family income for previously single parents, as a result of moving into a new partnership, do not necessarily lead to uniformly better outcomes for children (McLanahan, 1997).

We recognise that it is not always easy to ascribe changes in child outcomes with confidence to changes in income. This is especially so when most of the

available data are observational rather than experimental. (We discuss the potential for an experimental approach in Chapter 6.) Although we argue for the importance of changes in income that arise from changes in, say, employment status, others might reasonably argue that employment status itself is the fundamental explanatory variable and the resulting change in income is merely an intervening variable.

Assertions about the importance of income on child outcomes cannot escape from the possibility that there are essentially unobservable characteristics of parents - sometimes referred to as 'endowments' - that affect both family income and child outcomes. To the extent that these are fixed then their effects can often be eliminated by examining the effects of *changes* in income on changes in child outcomes (a point we return to in Section 3. 3). Another way of controlling for them to some degree is to compare outcomes for siblings within the same family, subject to the same parental endowments but possibly different family and institutional environments.

Turning to the lower part of Fig. 2.1, there will usually be an association (shown by the curve joining the two boxes) between family income and area characteristics. On average, although certainly not exclusively, poor families live in disadvantaged areas. It is widely believed (although the evidence base for this belief is not strong) that family influences on child outcomes are stronger than area influences (McCulloch and Joshi, 2001b). Hence, the important question is whether area characteristics have an influence on child outcomes having allowed, or statistically controlled for family characteristics and parenting behaviours. Allied to this question is one about the effect service quality has on outcomes – can a good local school, for example, mitigate the effects of poverty and a run-down neighbourhood? Some studies (e.g. Mortimore et al., 1988 [pp 214-216]), suggest that 'effective schools' may in part be able to do this. We return to these issues in Chapter 4.

We should note at this point that our remit was the relatively narrow one of considering the links between child poverty and child outcomes, not the broad issue of considering all the ways in which family characteristics and parenting behaviours might be associated with child outcomes. In other words, our model - represented by Fig. 2.1 - aims to set out the links between income and outcomes, rather than all the links that might account for variability in these child outcomes, not all of which will be related to income.

A time line - from left to right - is implicit in Fig. 2.1. This reinforces our view that longitudinal data - with their focus on individual change - are likely to be much more useful than cross-sectional data - which focus on levels at a point in time - for estimating any model taking this general form. We do not, however, usually know what time lags to expect - how quickly does a rise in income, perhaps induced by a change in policy, lead to, say, a more stable family environment and how quickly is that transmitted into higher educational attainments for children? And time lags for effects emanating from rises in income might be different from those emanating from reductions in income. Indeed, there is no reason to assume that the effects of changes in income will be symmetrical in the sense that a rise in income might have a stronger

effect on an outcome than a fall of the same magnitude, especially if the effects of the fall can be mitigated by drawing on savings accrued during the period of higher income.

It would also be possible to extend Fig. 2.1 - essentially horizontally to the right - to capture inter-generational effects. This would then represent possible 'cycles of disadvantage' (or advantage), whereby grandparents' low income leads to poor outcomes and hence low incomes for the parent and this, in turn, leads to poor outcomes for the child.

We have set out a model in this section that will guide us through the various data and analysis issues in subsequent chapters. Our treatment of this topic is necessarily rather brief and schematic. It is also rather general; more specific research questions would lead to refinements. This is, to some extent, brought out in Chapter 3 where the income, process and outcome variables are discussed in a more explicit way. We have, nevertheless, discussed some of the implications, limitations and possible elaborations of a model of this kind.

2.2 Types of data

We have reviewed a wide range of data types, set out below:

2.2.1 Cross-sectional survey data

This type of data provides a snapshot of information about individuals at a particular time point and, if the surveys are repeated, a series of snapshots of different individuals at different points in time. Although, with cross-sectional data, it is not possible to trace individuals over time, it is clearly possible to make comparisons over time at an area level with repeated cross-sectional data, provided that area boundaries (and questions asked) remain consistent. Cross-sectional studies would not normally provide the type of data needed to study relationships of the type set out in Fig. 2.1. They might, however, be part of a process whereby a suitable group was identified and 'screened' for more detailed study.

2.2.2 Longitudinal surveys and panel studies

Surveys and studies in this category are designed so that changes at an individual level can be tracked, thereby meeting a major weakness in cross-sectional studies. An issue with the major longitudinal birth cohort studies is the relative infrequency of measurement, restricting for example the analysis of income dynamics. Panel studies that typically have a shorter cycle (often annual or biannual) and follow a representative sample of panel members in households, including to the new household units they may subsequently form or join, can provide the necessary frequency of measurement to study such dynamics. The weakness in such studies might be the relatively small number of children, particularly of those growing up in poverty or in different ethnic groups, unless this was tackled by disproportionate sampling of such groups for this purpose.

2.2.3 Administrative data

Administrative data are principally those collected by central or local government for administrative purposes rather than for research. Such data are increasingly being made available for analysis by researchers outside government. The data can be divided into 'event based information' (e.g. registration of birth or death, examination results) or some form of continuous record that can be sampled at a specific point in time (e.g. DSS/DWP benefit claims).

Administrative data can be analysed both cross-sectionally and longitudinally. Thus it has been possible to string together benefit datasets by using individual National Insurance Numbers (NINOs). Much of the administrative data (e.g. Child Benefit, Income Support) contain a very specific set of information and so the amount of background information is limited. However it is, in many cases, virtually a census of children or total population in a specific category. As well as being 100% comprehensive geographically and therefore ideal for small area or individual-level analysis, it also has the advantages of being non-intrusive for the people involved (subject to data protection issues being met) and cost-efficient as it is already routinely collected. A weakness of benefits data is that they are restricted to those claiming - not, in general, the same as those eligible for that particular benefit unless take-up rates are very close to 100%. However, it is also the case that all survey data suffers from response rate problems, and this may be more pronounced for those living in poverty or in disadvantaged areas.

2.2.4. Service quality data

Data are now increasingly routinely collected on the quality of services (e.g. OFSTED reports for schools) and in some cases in numerical format (e.g. rating scales or quantitative process or outcome measures). Thus the OFSTED database contains not just school reports, but also numerical scales recorded during the inspection at school, subject and class level. The data also includes some 'value added' information in the PICS (Pre inspection school and social context reports) and PANDA (Performance and Assessment) systems which will be extended as more linked individual pupil performance data become available following the introduction of the unique pupil numbering system. The OFSTED database also includes details on all institutions providing state supported education for three and four year olds, and will, from 2002, include a register of all childcare provision with quality assessment data. Service quality data might serve as an important and low cost supplement to individual survey data to complement consumers' views on service quality.

2.3 Criteria for including surveys and administrative data

The criteria we have used to identify surveys and administrative data for inclusion in this report are that:

- (i) it contains individual data on income (from all sources), or, at the very least, valid income proxies, ideally enabling the analysis of income dynamics.
- (ii) it contains individual data on one or more key child outcomes (as defined in Chapter 3), or scope for data linkage to add such data from other sources preferably at an individual level by, for example, accessing educational performance data at an individual level and linking this to survey data.
- (iii) there is some possibility of geocoding these individual data to link them to a 'neighbourhood' or proxy for such, ideally by address or postcode.
- (iv) it contains data on transmission mechanisms or processes (as defined in Chapter 3).
- (v) there is the possibility of linking individual data to data on the accessibility of services and their quality.

We have not come across any data sources entirely satisfying all five criteria. We have, therefore, applied a more inclusive criterion and have considered studies or datasets that meet at least conditions (i) and (ii), and if only (i) and (ii) then there should be some data on income dynamics as well as on levels.

The datasets we have reviewed are listed and grouped in tabular form in Appendix 2. Please refer to this Appendix for further details of studies referred in the main text.

Generally, as suggested earlier, the most useful data sources are those that are longitudinal, and include children in their samples. There are a number of cross-sectional surveys collecting data only about adults (usually 16 and over) - such as the General Household Survey (GHS) and the Labour Force Survey (LFS) - that are extremely limited in terms of providing data to answer the central questions posed by this study, though they may provide the source of 'screening' data for subsequent more focussed surveys. The large sample for the LFS does, however, mean that it might be used to provide area data on, for example, qualifications, health, working patterns as well as income at a reasonably low (at least local district) level of aggregation, especially if data from successive years were amalgamated. There are typically about 17,000 cases aged under 25 in each year's LFS data covering the whole of the UK. The LFS, because of its sampling procedure, has a short longitudinal element as cases are retained over one year. This has ingeniously been used to study

short-range dynamics in income following unemployment (Gregg and Wadsworth, 2000).

In this chapter we have set out the broad research and data requirements needed to link child poverty and child outcomes. We now move on to consider the measurement of the various parts of the proposed model, and to describe studies and datasets that could be used to estimate it.

CHAPTER 3 - INCOME AND RESOURCES, PROCESSES AND OUTCOMES

3.1 Introduction

In this chapter, we list the concepts and variables that need to be measured. We do this first for household income and resources, then for child outcomes, and finally for the intervening processes that may link growing up in poverty with subsequent development.

In Appendix 2, we review in summary form the data that are available (or may become available) in order to estimate the strengths of the pathways set out earlier (Fig. 2.1). The topic of neighbourhood effects and services is covered in Chapter 4.

3.2 Income and resources

In order to examine the outcomes for children growing up in poverty we must have good measures of how severe and prolonged such poverty has been. A number of points need to be made before we simply equate childhood poverty with household income.

First (without going into an extended discussion of the measurement of poverty), there are many ways that poverty experienced by children might be measured. Increasingly such poverty has come to be measured in terms of relative income - that is, equivalised household income falling below a point such as 50% or 60% of the median income. This is the measure used in the Households Below Average Income (HBAI) series, now based on the annual Family Resources Survey (FRS), where the series is presented both before and after adjusting for housing costs (BHC, AHC). Similar measures are used in cross-national statistics (e.g. Bradbury and Jantti, 1999). These measures clearly fit the league table or monitoring function approach where such data can be compared over time in the same country or cross-nationally, using either the threshold point at a fixed time period or updating it to the current year. However, this way of measuring poverty might not necessarily fit so easily with the different requirements of unravelling the links between children growing up in poverty and subsequent outcomes, where the threshold of 50% or 60% of the median income may or may not be so significant a cut-point. We raise this not to propose an alternative but simply to point out the step from 'child poverty' to a particular threshold point on the overall income distribution.

Second, it is increasingly clear that if we are to take 'command over resources over time' seriously, then some form of repeated income measure or 'income dynamics' data are required. The frequency of this information is also critical. Thus, recent studies using UK data becoming available (e.g. Hill and Jenkins, 2001), including administrative data (Platt, forthcoming), confirm the picture from earlier US studies that more frequent data extracts show much more

'mobility' than might have been expected, even though this mobility may be short range and may vary for different groups and areas.

The requirements for systematic household income data collected in a standardised way at repeated time points, ideally on an annual basis, rules out all but a very few studies. Probably only the British Household Panel Survey (BHPS) currently meets such a requirement over an extended time period, and covering the whole of the income distribution.

Third, to establish household income and resources requires information on other household members, to calculate 'equivalence' income scales, as well as data on housing costs for AHC estimates. It requires a very heavy battery of questions on income, benefits received and household assets, which compete with other topics for space in surveys. Table 3.1 sets out some of these elements in more detail. Those concerned to measure other aspects of child outcomes are often reluctant to devote more than a limited number of questions to this area (not least because heavy questioning on income is thought likely to reduce overall survey response rates). Alternative approaches that might be considered would include the approach to measuring poverty that uses a lack of socially perceived 'necessities' in addition to direct measures of income. This approach, pioneered in the Mack and Lansley (1983) study *Poor Britain*, later updated as *Breadline Britain* (Gordon and Pantazis, 1997) has now been brought up to date in the national survey *Poverty and Social Exclusion in Britain* (Gordon et al., 2000). This latest study used the ONS Omnibus Survey to establish, on a national sample, the consensus on what items were perceived as 'necessary' and used a follow-up sample from the GHS to establish which households possessed these items, and whether this was by choice or for financial reasons. Thirty items were identified as socially perceived necessities for children and the proportion of children lacking these items was assessed. The survey also included a number of other ways of measuring poverty and social exclusion, including a subjective measure.

Given the high cost of the full battery of questions to assess household income it may be worth examining studies of this type for effective proxies for the full income measures, rather than simply use a limited number of questions on income (e.g. income bands) that may not provide comparable and reliable data.

Fourth, in considering 'child poverty' we should raise the difficult question of intra-household income transfers. In principle, we need to know something about how effectively household income reaches children. This may raise long-running questions about which adults are formally paid the income/benefits intended for their children, but also something about direct expenditure on children. It may well be that poor parents spend disproportionately more on their children than they receive in benefits. Witherspoon et al. (1996) showed, in terms of non-dependant deductions for housing benefit, that some parents shielded their non-dependant young from the full rent contribution. It would be important to throw light on some of these areas if we are to trace income effects on child outcomes. For obvious

reasons many of the studies that deal with intra-household income and expenditure are small qualitative studies, rather than large scale surveys.

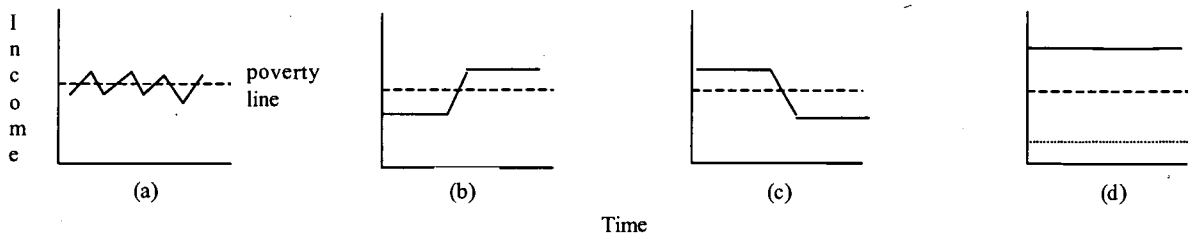
Table 3.1: Some requirements for measuring household income

<p>Levels Weekly/monthly/annual wage/salary for each earner in household; Other income - investment, private means, 'informal economy'; Means-tested and other benefits (JSA, Income Support, Housing and Council Tax benefits etc.); Disability related benefits (IB, DLA).</p>
<p>'Wealth' Level of savings/assets; Level of debt.</p>
<p><u>Income/Wealth proxies</u> Car ownership; Tenure: own house or mortgage; Council Tax band on house; Number of consumer durables, essential household items.</p>
<p><u>Housing Costs</u></p>
<p>Other: 'Shock absorbers' - insurance, savings, parental contributions etc. Data on disability and other needs that may require higher income for the same standard of living.</p>

3.3 Income variability over time

There are a number of different ways in which income can vary over time, as illustrated by the four panels in Fig. 3.1. Periodic measurement, ideally on an annual basis, is needed to distinguish between the different patterns. These patterns could have different implications for child outcomes. Thus, families falling into the type represented by panel (a) move in and out of poverty rather frequently, perhaps as a result of unstable employment patterns. Their children's outcomes might or might not be better than those families in panel (d) which stay permanently in poverty. In many ways, the most 'useful' patterns for research investigations are those shown in panels (b) and (c) as they describe situations of real change, either improvements or declines. If there is indeed an explanatory link between income and child outcomes then the expectation would be that outcomes for children in families in panel (b) would change for the better, and perhaps be as good as those for children in families in the top group in panel (d). Children in families subject to misfortunes that place them in panel (c) would have worsening outcomes, perhaps worse than those in panel (a) and as bad as those in the bottom group in panel (d).

Fig. 3.1: Income dynamics



It is beyond the scope of this report to go into detail about how to measure income (and poverty) dynamically, to take account both of transitions between income levels and also of durations in these different levels. The report on a collection of US studies edited by Duncan and Brooks-Gunn (1997) uses a three-way classification - always, sometimes and never poor - to measure income dynamics. Although considerably more useful than a single cross-sectional measure (poor/not poor), such a measure is somewhat limited in that it is not explicitly based on change, and hence ignores both the direction and magnitude of any changes. As we have just pointed out (and as we discussed in Chapter 2), we are likely to get a more complete understanding of the links between child poverty and child outcomes by analysing the effects of changes in income on outcomes. Consequently, an analysis based on income change, and taking into account both the direction of change and the possibility that the effects of change vary according to initial income levels, is likely to be more informative.

In addition to survey data, administrative data extracts can provide some handle on variability among low-income households. Linking WFTC to IS/JSA-IB data at an individual claimant level would form a major dataset for families with children as WFTC goes some substantial way up the income distribution. The possibility of linking such administrative data is reviewed in Chapter 5.

We could consider using changes in income proxies as proxies for changes in income. However, housing tenure or car ownership, for example, might be much 'stickier', especially in terms of downward movements, than income. Social mobility - intra-generational changes in social class - will also be correlated with income changes but, again, people can be socially mobile without changes in their income, and can remain in the same social class (or socio-economic group) whilst experiencing substantial changes in income.

3.4 Child outcomes

We have, for the purposes of this paper, adopted the following definition of a 'child':

- all children and young persons up to their twentieth birthday.

Hence, anything that happens to them up to the age of 20 is potentially an 'outcome'. This includes, for the great majority, applications and entries to Higher Education (HE) but not HE outcomes, and excludes some early labour market experiences. Given the increasingly extended period of transition from dependent to independent adult status, there are arguments for extending the age limit upwards to 25 years, when the benefit system treats a claimant as eligible for the full adult rate. However it is probably better to see the process as a series of different transitions that take now place from the middle 'teens to the late 20s – from school or education into employment, in housing or in family formation. If we wanted to encompass all this we would have to extend until this later stage of family formation and parenthood, now postponed for many to their late 20s or early 30s.

The list of child outcomes is potentially very long. We have focused on 'objective' outcomes which we have grouped into four 'domains': education, health and psychological outcomes, crime, and a miscellaneous group of outcomes in late adolescence, many associated with transition to adulthood and independence. We do, however, consider some 'subjective' and attitudinal measures. The distinctions - and overlaps - between outcome variables and the process variables described in Chapter 2 need to be borne in mind. It is beyond the scope of this paper to go into detail about specific instruments for measuring the outcomes.

3.4.1 Educational outcomes

These can be grouped into attainments, behaviours, and attitudes.

(a) Attainment:

- Baseline scores at entry to primary school around the age of 5 - these should be available in a standardised form by 2003.
- National Curriculum tests in English, Mathematics and Science - the SATs - at ages 7, 11 and 14.
- Examination results at age 16 (GCSE) and ages 17 and 18 (A/S and A levels).
- Standardised tests of reading, mathematics etc., collected for research purposes.

It is important to remember that assessment arrangements in Scotland differ in important respects from those in England, Wales and Northern Ireland. Also, the range of post-16 qualifications continues to expand.

(b) Behaviours:

- Staying on at school or in Further Education beyond age 16.
- Application to HE.
- Entry to HE.
- Entry into training.
- Truancy/absenteeism.

- Exclusion from school (temporary and permanent).
- Special Educational Needs (5 stages).

(c) Attitudes:

- Educational aspirations (especially at younger ages).
- Attitudes towards the value of lifelong learning.

3.4.2 Health and psychological outcomes

These can be grouped - somewhat arbitrarily - into states, behaviours, and beliefs and perceptions.

(a) States:

- Acute and chronic morbidity (both physical and mental and to include rare conditions such as 'neglect').
- Disabilities.
- Accidents (both within and outside the home).
- Height and weight (including obesity).
- Dental health.
- Levels of fitness.

(b) Behaviours:

- Exercise and sporting activity.
- Diet and eating habits.
- Use of tobacco.
- Use of alcohol.
- Use of drugs.
- Sexual behaviour in adolescence.

(c) Beliefs and perceptions:

- Determinants of good health.
- About oneself - self esteem.
- Behaviour problems (as perceived by parents and by teachers).

3.4.3 Crime outcomes

- Cautions.
- Convictions, fines, and incarceration.
- Attitudes towards to the law, and towards illegal acts.

3.4.4 Miscellaneous

- Early/teen and lone parenting.
- Homelessness.

- Early labour market experiences.

3.5 Intervening (transmission, process) variables

These can be grouped into the domains used for the child outcomes in section (3.4). In addition, there are some variables that apply across the domains. It is important to bear in mind the points made in Chapter 2 about not treating variables that could determine income as intervening variables. There is an element of doubt about their status as intervening variables of a few of the variables listed below, and these are indicated with '*'.

(a) Intervening variables for education

Educational inputs and activities at home and from the wider family:

- reading to, and hearing children read;
- helping with homework;
- using the Internet for homework etc.;
- attending parents' meetings etc.;
- number of books in the home;
- educational visits.

(b) Intervening variables for health and psychological outcomes

- parent child interactions;
- diet/nutrition;
- parents' health behaviours - smoking, alcohol abuse*, drug use*;
- home safety precautions.

(c) Intervening variables for crime outcomes

- parental involvement with*, and attitudes towards crime;

(d) Intervening variables for miscellaneous outcomes

- parental control;
- advice about sex, contraception etc.

(e) Cross-cutting variables

- housing stress and physical quality - persons per room, damp etc.;
- family size and composition (but not family type);
- parental control - setting boundaries etc.;
- how income is used.

3.6 Datasets

Appendix 2 sets out the studies we have reviewed in terms of how well they cover the different elements discussed in this chapter. We have grouped them into categories or types - those studies that we believe are or will be useful for analysing the links between child poverty and child outcomes, sub-divided into surveys, evaluation studies and aggregate datasets; those that could make a contribution, albeit limited; and those that we considered but decided had little to offer in this particular area of investigation, valuable as they are for other questions. We also consider how well the different studies match up to the requirements for research in this area and, to a degree, their relevance for policy.

CHAPTER 4 - EFFECTS OF NEIGHBOURHOOD AND SERVICES

4.1 Introduction

The model set out in Chapter 2 (Fig. 2.1) highlights the possibility that where a child lives (or used to live) has an effect on their outcomes, over and above the circumstances in which they grow up at home. It might be the case, for example, that a child's life chances are improved if they grow up in a poor family who happen to live in an advantaged area or neighbourhood, or diminished if they grow up in a rich family living in a disadvantaged area. There could also be a 'double penalty' of growing up poor in a disadvantaged area and a 'double reward' of growing up rich in an advantaged area. More detailed discussion of these issues, and the social theories behind them, can be found in Sampson et al. (1999) and McCulloch and Joshi (2001b). Similar questions have been widely debated in the health care field (see, for example, Sloggett and Joshi, 1994), and underpin the debate about 'underclass' and 'social exclusion' (Crane, 1991; Glennerster et al., 1999; Lupton, 2001).

As well as questions about measurement and analysis, hypotheses of this kind raise a number of conceptual questions. Perhaps the most fundamental of these is what we mean by 'neighbourhood' and how closely the usual ways of defining neighbourhoods spatially relate to what individuals themselves regard as their 'neighbourhood', which may increasingly be influenced by the importance of non-spatial networks. With technological advances, it is now very common to define neighbourhoods by administrative boundaries – for example, wards and postcode sectors in the UK, Census tracts and ZIP codes in the US. This has the considerable advantage of defining a collection of mutually exclusive and exhaustive groups but at the expense of a loss of construct validity in terms of the contextual effects we would like to capture. (A useful discussion of these issues is given in Hinds et al., 2000.) Construct validity will be reduced first, if there is variability within individuals about what they regard as their neighbourhood, which could depend on the domain of interest (services, shops etc.), and on the ages of their children. Second, individuals within a ward, say, are likely to vary in their views about what they perceive to be their neighbourhood. Ideas and perceptions about neighbourhood and 'community' may well differ between urban and rural areas - or indeed by ethnic group. Actual behaviour may vary as well. For example, distance travelled to secondary school by pupils of Bangladeshi origin in one major conurbation was approximately half that travelled by white pupils. African Caribbean pupils typically travelled 30% further than white pupils – only 17% attended the physically nearest secondary school, whereas nearly 60% of Bangladeshis attended their physically nearest secondary school (Smith et al., 1999).

There are other possibilities for defining neighbourhoods. Travel to Work Areas (TTWAs) have been constructed from commuting flows for the 1981 and 1991 Censuses to define local labour markets. They therefore have some face validity but are generally too large to serve as local neighbourhoods. Thus London is treated as effectively two TTWAs. Primary school catchment

areas are another possibility but they are not necessarily mutually exclusive. Census Enumeration Districts (EDs) - Census Output Areas (OAs) in 2001 - are perhaps too small, though they could in principle be the building blocks for larger areas. Local Authority Districts are almost certainly too large. One way round at least some of the difficulties highlighted here might be to use boundaries defined by tenants' and residents' associations, but these organisations are far from exhaustive, and themselves often have overlapping and varied catchment areas.

As well as the conceptual problems that have to be faced, there are also important practical matters to consider. In particular, neither wards nor postcodes have boundaries which are fixed in stone. Instead, the Electoral Commissioners regularly change ward boundaries to reflect changes in populations, eliminating some wards and creating new ones. The Post Office is driven by the workloads of postal workers, not the concerns of social scientists. The basic household postcoding system (the full seven character code) may be changed or reissued after a period of time. Many of the boundaries that are set for other services (health, police etc.) are not to the same areas. The PAT18 report on Better Information (Social Exclusion Unit, 2000) grappled with this critical issue (in Annex G) and came up with a number of recommendations about setting consistent and centrally registered changes in boundaries. At present, only something like the Ordnance Survey national grid (eastings and northings) remains consistently the same and is included in the postcode directories for each postcode centroid. The position is, however, rapidly improving, as are the technologies using various Geographic Information Systems (GIS) to link information collected to different boundaries (e.g. from census to census where district, ward and ED boundaries may all be different).

As we will often be interested in the effects of changes in neighbourhoods ('neighbourhood dynamics') on outcomes, it is important to be able to separate genuine changes in the local context from changes induced by boundary alterations. This could prove to be a very complex exercise in a national level dataset.

4.2 Measurement issues

There are a number of ways of measuring area characteristics:

1. With aggregate administrative data;
2. With modelled survey data;
3. With aggregate survey data;
4. By aggregating individual survey responses;
5. By different kinds of systematic observation.

4.2.1 Aggregate administrative data

The amount of information available from administrative sources has increased very rapidly in the past two years. Typically these are very large,

intensively postcoded (better than 99%) extracts from central record systems (many from the DWP which covers GB and may also process the data for the equivalent department in Northern Ireland). Thus, the Income Support/Income Based Job Seeker's Allowance (IS/JSA-IB) datasets contain several million cases and can be used to indicate the local prevalence of, for example, people in receipt of these major means tested benefits. Similarly, data from the JUVOS system is used to provide the monthly claimant based unemployment counts at ward level. The claimant data may be aggregated to 1991 ward boundaries, as in the NOMIS system. However, access to individual-level records also allows the data to be aggregated to other geographies. For example, the Oxford Index team recast the unemployment count to 1998 ward boundaries (which fitted to unitary authorities in England in the late 1990s when the Indices of Deprivation was constructed).

Thirty three indicators covering six 'deprivation domains' were used to construct the English Indices of Deprivation 2000 (ID 2000) for every ward in England (Noble, Smith et al., 2000a). The ID 2000 and some of the administrative data used for its construction are now available through the ONS neighbourhood statistics website. The Welsh Index of Multiple Deprivation 2000 measures six domains of deprivation at the Electoral Division level (Noble, Smith et al., 2000b). The Measures of Deprivation for Northern Ireland (Noble, Smith et al., 2001) contains new data such as prescriptions for depression or anxiety used to measure mental health at the local level; crime data; and individual-level education performance data for all Northern Ireland school leavers over a three year period. This index is available at ward level for all wards in Northern Ireland to 1991 boundaries. In addition, for Northern Ireland, three Enumeration District measures have been produced: Income Deprivation, Employment Deprivation, and Economic Deprivation, the latter an equally weighted combination of the Income and Employment measures. These provide information about pockets of deprivation within wards. Altogether, these measures provide a rich backdrop of information about the area of residence.

4.2.2 Modelling survey data

There are several ways that large-scale national surveys have been used to construct small area estimates. At one level this can simply be through aggregating successive cross-sectional survey data. For example, Berthoud (2001) aggregated two years of Family Resources Survey (FRS) data to generate an estimate of household income at postcode sector level. 'Modelling down' techniques on national survey data to provide estimates for different types of areas (e.g. working class estates in the north west region) have been used with attitudes surveys to give estimates of local perceptions in the 'Geography of Misery' series (Burrows and Rhodes, 1998). However, the most developed work in this field is now being undertaken by the Small Area Estimation Programme in the Methods and Quality Division at ONS. This programme involves joint work with seven National Statistical Institutes (EURAREA) to develop the theory, methods and application. For more information, see:
www.statistics.gov.uk/nsbase/methods_quality/eurarea/default.asp.

Heady and Hennell (2000) illustrate the way these techniques work to derive small area estimates of income using data from the FRS. Other possible small area (usually ward, sometimes local district) estimates for unemployment, children's mental disorders, and variables of interest to the ONS Neighbourhood Statistics initiative are also being explored within this group.

4.2.3 Aggregate survey data

Probably the best source of aggregate survey data is provided by the Census in that it covers the whole of the UK in detail. Census data are, however, limited in scope (by excluding any questions about income, for example) and quickly become out of date. The currently available data (from the 1991 Census) are likely now to be somewhat inaccurate, but the situation should improve by 2003 as the Small Area Statistics generated by the 2001 Census become available. Other large, repeated surveys – most notably the Labour Force Survey – offer the opportunity to generate some aggregate data at the local level, including income data, by combining surveys from a number of years (see Section 2.3).

There are, however, dangers in using any kind of aggregate data (for a ward, say) to represent all families in a ward. It is, for example, possible that the neighbourhood characteristics of those families living close to the boundaries of a ward are better represented by the aggregate of the adjacent ward.

The balance of the research evidence – most of it from the US – suggests that the best way of estimating neighbourhood effects is to measure variables that have face validity as predictors of child outcomes. So, for example, a measure of air pollution might predict child health but could hardly be expected to be a predictor of crime whereas a measure of social cohesion might predict crime and not child health.

4.2.4 Aggregating individual survey data

One study that has done a lot to further the measurement and analysis of neighbourhood effects is the Project on Human Development in Chicago Neighborhoods (PHDCN). This is a major interdisciplinary study aimed at deepening society's understanding of the causes and pathways of juvenile delinquency, adult crime, substance abuse, and violence (for more information, go to <http://phdcn.harvard.edu/>). It is a longitudinal study with between 20 and 50 households selected from each of 343 Chicago areas (amalgamations of Census tracts). The more detailed measurement work was confined to 80 of these so-called neighbourhood clusters. Sampson et al. (1999) propose three scales that are potential predictors of child outcomes:

- i) 'Intergenerational closure' – are the adults and children in a community linked to one another? Essentially, this is whether the parents in a neighbourhood know their children's friends and the parents of these friends.

- ii) 'Reciprocated exchange' – what is the intensity of interfamily and adult interaction with respect to childrearing? For example, do parents and others in the neighbourhood do favours for each other.
- iii) 'Informal social control and mutual support' – do residents intervene on behalf of children, both to support them and to act to reinforce limits in terms of their behaviour?

Responses to the items that make up scales of this kind are then aggregated over individuals to create measures of the neighbourhood. In order for the measures to be both reliable and valid, samples within neighbourhoods need to be selected randomly and to be of a reasonable size, and there needs to be at least some degree of agreement between the responses of individuals within neighbourhoods.

As well as interviewing local residents to measure perceptions of local areas, Raudenbush and Sampson (1999) discuss the advantages of what they call systematic social observation scales, obtained by observers travelling around areas, taking notes and using videos to measure the extent of social and physical disorder in terms of, for example, drug dealing, prostitution, uncollected rubbish and graffiti. These methods, and the associated statistical techniques needed to estimate reliabilities, have been labelled 'ecometrics' by Raudenbush and Sampson (1999).

In the UK, measurement of local neighbourhoods has used network analysis (Mitchell, 1969), drawing on theories about reciprocity (Bulmer, 1986) and data from surveys of mutual aid provided by kin, friends and neighbours (e.g. Willmott, 1986; 1987; see also the 'social capital' module in the 2000 General Household Survey).

4.3 Analysis issues

There are several issues that any analysis of neighbourhood effects needs to address. The first is the one raised in Chapter 2 – given that family and local contexts are correlated, is it possible to obtain separate estimates of them? It seems most likely that impacts are mediated through different family and neighbourhood variables, as Rutter et al. (1998, [pp199 onwards]) argue in their review of poverty and social disadvantage. A related question is whether the direct effect of neighbourhood can be disentangled from the effects of services such as schools provided for that neighbourhood. If not, then there is a danger of ascribing effects to variables such as a concentration of poverty when really the effect can be explained by the quality of local schools (which might be correlated with area poverty rates). We discuss the question of service quality in (4.4). These two questions raise some technical issues which, along with others, are discussed in Appendix 3 and are summarised below.

A third question is whether neighbourhood effects vary in importance across the range of child outcomes set out in Chapter 3. Linked to this is the

possibility that effects will vary in size according to the age of the child. It may be unlikely that there will be strong neighbourhood effects on children's early school attainments (when family influences will still be strong) but plausible that these effects could be stronger in adolescence (when the influence of the family declines in importance and the influence of peer groups increases). This hypothesis is not, however, supported by McCulloch and Joshi (2001b).

A fourth question relates to geographical mobility. Is it the neighbourhood of current residence that is most important for adolescent outcomes, or the neighbourhood experienced by the child when younger? Again, the answer could vary according to the outcome under consideration, possibly being different for crime than for health. One might also expect to observe 'dose-response' associations, with stronger effects for children as length of residence in the neighbourhood increases.

Finally, in order to reach a fuller understanding of the effects of neighbourhoods on child outcomes, we need to see what happens to these outcomes as neighbourhoods change, or as the child moves from one neighbourhood to another. Are there positive effects on outcomes if a neighbourhood improves or if a child moves from a disadvantaged area to an advantaged one, even if the family's own circumstances do not change? This implies that, as well as longitudinal data on children and their families, we also need longitudinal data on neighbourhoods. Administrative data collected over time are beginning to yield consistent information on small areas, and also something about the groups who move in or out of such areas, as they can be identified in national administrative data. Data from evaluation studies may throw light on the impact of changing key features, and whether these have variable effects in different areas or for different groups.

Summarising Appendix 3, the crucial issue, when wishing to get good estimates of neighbourhood effects, is to collect and model data on outcomes and their correlates for *individual* children. Models based solely on ecological, or aggregate, data are misleading. Ideally, these individual data should be obtained from a clustered, or multilevel design so that between area variability can be separated from between individual within area variability, and both these sources of variation can then be modelled statistically. There will always be an element of doubt about the validity of neighbourhood effects because where people live is not the result of random distribution but a mix of choice, constraint or sometimes policy (to disperse particular groups) and these factors are likely to be related to outcomes for their children. This problem can be alleviated by including in a model a range of measures at the individual and family levels.

4.4 Measures of quality of local services

A further part of the jigsaw of identifying neighbourhood effects would be to incorporate some measures of access, both physical and psychological, to local services and the quality (and, by extension, service effectiveness) of those services as they affect children.

The ID 2000, Welsh Index of Multiple Deprivation 2000 and the Measures of Deprivation for Northern Ireland each contain a domain of deprivation entitled 'Geographical Access to Services', which gives a ward/Electoral Division level score for people's access to certain key services. It would, in principle, be possible to produce 'child oriented' access domains at a small area level that measured access to services that are most relevant to children of whatever selected age range (for example, the English ID 2000 has an indicator of access, measured by distance, to primary schools for 5-8 year olds). Some of the main issues that would need to be considered include selection of appropriate services; adequate measurements of distance (in the ID 2000 and the Welsh IMD 2000 access was measured 'as the crow flies' whereas it was possible in the Northern Ireland Measures of Deprivation to refine this to measure distance by road); availability and cost of public and private transport; and issues of cultural or physical accessibility eg for disabled people).

There are clearly increasing amounts of data purporting to assess quality of service. Typically these are professional ratings or other indicators that focus on an institution - for example OFSTED reports on schools or preschool facilities. In certain cases there may be rating scales or performance data. League tables of schools - based on pupils' performance in tests and exams - and hospitals - based on mortality data - purport to measure quality. However, their failure to adjust for the intake characteristics of pupils (in the case of schools) and the caseload of patients (in the case of hospitals) renders doubtful their value as indicators of quality. However, as noted in Chapter 2, there are moves to improve this aspect of school based assessment as linked individual pupil performance data become available. This issue is considered in some detail by Goldstein and Spiegelhalter (1996) and in the associated discussion - see also Goldstein, 2001).

It would, however, be a major task to unbundle some of this information routinely to a local area, though as information builds up about usage and catchment area it might be technically possible to link this information on quality to local areas. In other cases it might be possible to link data on individuals directly to the institution to which they are attached.

In cases where service use is more intermittent or perhaps periodic (e.g. hospital, dentist, day-care centre), the issue might be as much one of access as of quality. But, in principle, it should be easier to link such information to individual surveys to fill out individual-level data with some information on institutional quality (of, for example, school attended). However, this is far from routine and opens up questions of ethics and data protection (discussed in Chapter 5), if there is to be any direct data linkage at this level.

4.5 Data

Notes on the main datasets are tabulated in Appendix 2 (see Section 3.6 for more details). At this point we simply list some relevant aspects of the major surveys that allow for the possibility of measuring 'neighbourhood effects'.

ALSPAC (Avon Longitudinal Study of Parents and Children)

Because this study initially included all births in a relatively small area, the sample is highly clustered by whatever aggregation is chosen. As it also includes data on primary schools attended and health services used, it would be possible to separate out different local contextual effects. Data are well postcoded.

BHPS (British Household Panel Survey)

The initial sample was clustered by postcode with, on average, about 30 respondents in each of 250 postcode sectors.

EDUCATION MAINTENANCE ALLOWANCE EVALUATION

This study of the EMA Pilot Areas, which were selected because of high rates of deprivation and low staying on rates, was based on a random sample of 10,000 16/17 year olds in the 10 pilot areas and 11 matched control areas. Individual respondents were also matched in the analysis. One conclusion from the interim first year results (Ashworth et al., 2001) was that the overall positive effects varied for different groups of young people and areas.

MENTAL HEALTH OF CHILDREN AND ADOLESCENTS SURVEY

The initial sample was clustered by postcode with, on average, about 25 respondents in each of 475 postcode sectors.

MILLENNIUM COHORT STUDY

The sample is clustered by ward, with 200 wards in England, 73 in Wales, 63 in Northern Ireland and 62 in Scotland. The wards are stratified by a measure of child poverty, and it is intended to collect both respondents' views about their neighbourhood and aggregate measures.

SoLIF/SoF (Survey of Low income families/families with children)

The initial sample was clustered by postcode with, on average, about 30 respondents in each of 150 postcode sectors. The restricted nature of the sample, to low income families at least for waves 1 and 2, means that analysis of neighbourhood effects would be problematic.

SURE START EVALUATION

The impact study will be clustered by local Sure Start project area. Although it has not yet been decided how many of these areas will be included, it is unlikely to be less than 100.

INDICES OF DEPRIVATION 2000 (ID 2000)

The English ID 2000 were produced at ward level using ward boundaries at 1st April 1998. For all of the 8,414 wards in England (wards in the City of London were combined, as were wards in the Isles of Scilly) there is an income deprivation; employment deprivation; education, skills and training deprivation; health deprivation and disability; housing deprivation; geographical access to services deprivation; child poverty and Index of Multiple Deprivation score and rank. In addition, there are six district-level summaries of the Index of Multiple Deprivation.

WELSH INDEX OF MULTIPLE DEPRIVATION 2000

The Welsh IMD 2000 was produced at Electoral Division (EDiv) level. For all 865 EDivs in Wales there is an income deprivation; employment deprivation; education, skills and training deprivation; health deprivation and disability; housing deprivation; geographical access to services deprivation; child poverty and Index of Multiple Deprivation score and rank.

MEASURES OF DEPRIVATION FOR NORTHERN IRELAND

The Measures of Deprivation were produced at ward level, using boundaries existing at the time of the 1991 Census. For all 566 wards there is an income deprivation; employment deprivation; education, skills and training deprivation; health deprivation and disability; geographical access to services deprivation; housing stress; social environment deprivation; child poverty and Multiple Deprivation score and rank. There are six Local Government District summaries of the Multiple Deprivation Measure. In addition there are ED level measures of income deprivation, employment deprivation, and economic deprivation, with two ward-level summaries of the economic deprivation measure.

THE CENSUS OF POPULATION

The 1991 Census of Population will soon be superseded by the 2001 Census of Population which should be released in 2002/3. The most relevant subdivision will be the census Output Areas (OAs), broadly equivalent to Enumeration Districts in the previous census, with targets of 100-125 households in England, Wales and Northern Ireland and fewer in Scotland. Unlike the previous ED divisions that do not have socially meaningful boundaries, the 2001 OAs will be defined in ways that take some account of, for example, housing tenure.

CHAPTER 5 - DATA LINKAGE: TECHNICAL, LEGAL AND ETHICAL ISSUES

5.1 Introduction

In this chapter we review the issue of data linkage at both the individual and small area aggregate levels. This raises technical as well as legal and ethical issues. At one extreme there are examples where extensive data systems, depending on data linkage, have been set up. For example, Leeds City Council operates a system to link data at an individual address level across many different departments, including free school meals, income support and housing benefit, educational performance etc. At the other extreme, there are cases where researchers working for local authorities have been stopped from linking data, for example a project that set out to link the school/education based free school meals data with the Housing Benefit system. While this example appears to be anomalous, other cases may be explained by the different powers, formal access rights to data etc held by different groups seeking to analyse the data. Thus, what may be possible for central government departments (or in some cases for one department but not for others) - and possibly by extension to the 'agents' of this department (including researchers working under contract) - may not be possible for researchers acting on their own account, or under charitable or research council support. These complexities make it very hard to indicate any general guidelines, though at one extreme there should be no blanket refusal unless there are specific reasons (e.g. legal restrictions – see below).

In our review, we came across three major initiatives within government that have focused on these general issues of the practical, legal and ethical issues of data linkage, all from slightly different perspectives. These are:

(i) the Policy Action Team 18 report Better Information (SEU, 2000), including the helpful contribution made by the then Data Protection Officer (now Information Commissioner) on the use of data. The concern of this group was to explore the possibility of establishing more up to date and comprehensive datasets to throw light on the problems of deprived neighbourhoods. Stemming from this are the various developments following PAT18 within government, including the major ONS 'Neighbourhood Statistics' initiative - see:

<http://www.statistics.gov.uk/neighbourhood/home.asp>

(ii) the GSS 'task group', initially at the DfEE, now at ONS, on the issue of linking administrative data within government. This group has focused on setting guidelines and procedures for data linkage within government. The group has commissioned a lengthy technical review published by ONS (Gill, 2001). While this review covers ethical and legal issues its central focus is technical data matching problems.

(iii) a high-level advisory group run under the auspices of the Performance and Innovation Unit (PIU) in the Cabinet Office, and chaired by Lord Falconer, into 'Privacy and Data Sharing'. The group has a number of external

experts/interested parties. The minutes of this group have been made public on its web site at:

www.cabinet-office.gov.uk/innovation/2000/privacy/datascope.shtml

although its final report has yet to be released. The focus of this committee is more on the general issues raised by record linkage and privacy not only within government but also more generally in the commercial sector, and the interface between the two. The same stance of there being lack of any clear guidance or understanding of what is being done, can and should be done runs through the minutes of this group. The final set of minutes (18th April 2001) indicates that the thrust is towards setting guidelines and principles in the balance 'between privacy and data use' and establishing greater 'transparency' over different aspects.

What follows can only be a partial coverage of this very wide territory, and not in any sense final guidance in a very complex field. We begin by looking practically at what is happening now (with a few selected examples), and then what may be possible in the near future. We briefly address the legal and ethical issues in the final section.

5.2 Current position on data linkage

In one sense there is nothing new about data linkage. Many studies have collected and combined information from different sources, for example cohort studies such as the National Child Development Study (NCDS) collected data from schools and teachers using schedules sent out to schools with NCDS subjects in them. And some form of automatic or semi-automatic data linkage is not that new either. Gill (2001), in his comprehensive review of data linkage techniques, reminds us that the Oxford Record Linkage project, originally used to link patient records automatically across hospitals in the Oxford area, dates from the late 1960s/early 1970s. Gill's account defines the term 'data linkage' as essentially the combination of two or more different records 'that are believed to belong to the same person, family or entity' (p.13). The ONS Longitudinal Study, based on a 1% sample of census records since 1971 is linked into the national registers of births, deaths and new cases of cancer.

What, however, is new in the last few years is that central records have increasingly been computerised and systematised, and therefore indexing and linking schemes have been built up for management purposes. Thus many local authority housing benefit systems (e.g. the ICL HBIS) have a unique numbering scheme at *individual* level that potentially allows individuals (including children) to be tracked across benefits units and linked over time if, for example, there are repeat claims at a later date. These are primarily for management purposes (for example, to avoid duplication, prevent fraud etc). And nationally in recent years, very elaborate schemes have been developed as part of the Benefits Agency's 'Generalised Matching Service' (BA-GMS) to detect possible fraudulent benefit claims. These link together national benefit and other systems, including data from a very wide range of government and other sources to identify anomalies in claiming, or to track individuals where fraud may be suspected. These records, of course, include full identifiers,

which can be used as the search mechanism. While the intent is to track individual cases, the result has often been to build up impressive and comprehensive sets of data. Thus, the related Housing Benefit Matching Service extracts a full set from the Housing Benefit/Council Tax Benefit system from more or less every district council in GB, every three months, at an individual claimant level. These data are then cleaned and turned into a standard format file (Local Authorities use many different commercial non-standard packages). While this data is collected for anti-fraud purposes it can, in principle, be used for other objectives (e.g. tracking down under-claiming). A final example of the development of data linkage for predominantly management purposes is in the evaluation of the 'ONE' benefit delivery project at the DSS, where information on different benefits has been brought together into a single benefit administration system.

These three examples of developments predominantly for management purposes demonstrate the sheer volume of such information now collected and the potential scope for linking this information together for research purposes, and specifically on the question of child poverty and child outcomes. But only very recently has this potential been exploited by researchers.

5.3 Types of data linkage

5.3.1 Administrative data to administrative data at individual level

This could involve either linking extracts from different time points to one another at an individual level to create a longitudinal database, for example using NINOs (encrypted in a standardised way) to link together extracts of, say, Income Support. Or the scope could be extended by linking across data extracts from different benefit or tax credit systems either cross-sectionally or longitudinally, e.g. fitting in WFTC cases to IS and JSA-IB which would cover a very large proportion of low-income households containing dependent children. Again, longitudinal analysis would require a matching variable, typically a NINO, though in principle, within government or for those working for government, it would be possible to match using the type of matching techniques described in detail by Gill (2001) where names and addresses or other identifiers can be used.

We give some examples of recent developments in this area that indicate what is practically possible.

(i) Linking Housing Benefit data extracts at Local Authority level

In a study of welfare dynamics among lone mothers, Noble, Smith et al. (1998) linked together seven individual-level extracts of Housing Benefit/Council Tax Benefit (HB/CTB) over a three year period in one large district authority where individual reference numbers were used. This allowed both longitudinal analysis and potentially follow-up of individual household

members where households had re-formed during the time period, provided they remained on benefit in the same Local Authority.

An extension of this method of data linkage is reported by Platt (forthcoming), who used HB/CTB data from a very large metropolitan district extracted quarterly over an 18-month period and traced the patterns for dependent children by ethnic group. The individual numbering system used in this authority allowed individual children to be tracked and not just benefit units. This HB/CTB system was also (unusually) ethnically coded, allowing the results for different ethnic groups of children to be followed up. She was able to demonstrate different patterns of welfare dynamics for different ethnic groups. She also looked specifically at those approaching 16 to measure their subsequent pathways, thus illuminating something about the likelihood of such children themselves moving on to means tested benefits in their own right.

In both cases the data are fully postcoded, potentially allowing patterns of welfare dynamics to be analysed with a local area dimension.

(ii) Linking national benefit datasets over time

The DSS 5% Quarterly Statistical Enquiry (QSE) samples of the major means tested benefits report trends and numbers and types of benefit recipients down to local district level. Noble, Evans et al. (2001) report a study for the SEU where a full 100% extract of DSS benefit (IS, JSA-IB) data was linked using standardised encrypted NINOs. This study had annual data extracts covering the period 1995-1998, though only the data for 1995 and 1998 were analysed. Since 2001 the study has been extended to data for 2000 giving a five-year span. As the data are also very well postcoded (better than 99%) the study was able to track change over time at the local district level and to examine both geographical movement and movement between certain benefit categories for the two time points. Because of its 100% coverage, virtually all areas contain significant numbers of claimants allowing reliable ward level figures to be produced. So far only IS and JSA-IB benefits have been used in this way. The shift from Family Credit administered by the DSS to WFTC administered by Inland Revenue has meant that WFTC data have not, to date, become available for this purpose at the 100% (see below for some of the reasons).

(iii) Lifetime Labour Market Database (LLMD)

Using National Insurance (NI) data from the old NI (NIRS) computer, researchers at the DSS have constructed an 18 year panel for a 1% sample of the caseload using their NI contributions record to build up information on labour market experience (see Ball and Marland, 1996 for an early output from the LLMD). The NI contributions give some indication of earnings levels, type (class) of contributions, pension and NI credit arrangements etc. This is for the whole working age population. Subsequently this NI information has been linked to the New Earnings Survey (NES) panel data where the 1% extract is based on the same sampled digits from the NIRS extract, allowing

matching via the NINO. The NES gives earnings data and industry. A further development is to link these data into information extracted from the 5% sample for the DSS QSE as this sample includes the same NINO digit selection. Data on IS and subsequently JSA-IB are available since 1992. This has been extended to other datasets such as JUVOS (unemployment data, see below). This growing dataset is potentially a powerful way of looking at long-term income dynamics, but at this stage it would appear to contain relatively little other information relevant to child poverty and child outcomes. Postcoding is apparently very limited as the data are mainly supplied by employers through their annual Tax and NI returns (form P14). However, it is a useful example of the way that data can be built up through linkage to address key policy questions (for example, information on pensions using lifetime earnings data).

(iv) Joint Unemployment and Vacancies Operating System (JUVOS)

The JUVOS cohort is a similar 5% sample of claims for unemployment related benefits using the NINO as the sampling mechanism. This forms a longitudinal database going back to 1982/3, which is updated on a continuous basis. This allows analysis, including event history analysis, of length of spells of unemployment, number of spells and intervals between them. It has been used as a sampling frame for further studies and as a benchmark for evaluating special programmes. Most recently, it has been used in the 'macro-evaluation of the New Deal for Young People (White, 2000) by providing comparable data on young people not in the New Deal. The JUVOS data (or Claimant Count System) are limited to claim related information, plus usual occupation and marital status. They also contain information about the reasons for a claim ending. There is no information about other household members or children.

(v) New Deal Databases

There is now a large number of New Deal databases administered by the Employment Service, which include 100% scans of administrative data. These draw on data from the overall Labour Market System (LMS) and are also linked to the JUVOS system and with other relevant government datasets such as benefit data using the NINO. Some research use has been made of these datasets to evaluate the New Deal programmes and, for example, to contribute to the Index of Multiple Deprivation. Currently these databases contain limited information relevant to linking child poverty and child outcomes. However the New Deal for Lone Parents and New Deal for Young People are likely to be the most relevant.

5.3.2 Administrative data to administrative data at aggregate levels

Administrative data can also be linked to aggregate information either on an area basis, for example by using postcoding, address or other locational data, or it could be at an institutional level. Thus within DfES, there are individual pupil records from SATs, GCSEs and other examinations, but there is also a mass of school based information from the annual school census and other

sources. As the move to introduce a unique pupil number (UPN) nationally gains ground it will be possible to build up a database of individual pupil performance data together with school data and also some indication of school-level performance variables (e.g. simple value added estimates). Typically pupil results contain a school reference code (DfES No.). They are not currently postcoded to home address in England or Wales, but the equivalent data in Northern Ireland at post-primary level are all individually well postcoded (better than 99%). Many schools that use the SIMS (school information management system) in England, however, already include address files with individual postcoded records for all their pupils. There are research projects that have drawn on this information (Gibson and Asthana, 1998; Smith et al., 1999). Also, from 2002, school census data will include postcode of residence and also ethnic group for individual pupils (currently only available in school aggregate form).

Information about school quality from OFSTED inspections can also be linked through the DfES number to individual schools. Published reports do not include the standard rating scales used by the inspection team to rate the main dimensions of school quality. However, these have been used by researchers to link to area, pupil and school-based data.

5.3.3 Linkage between survey data and administrative data

Administrative data can be linked at an individual level to survey data or in the form of aggregate neighbourhood or service quality data. Clearly the opportunity for such linkage is greatest at the data collection point by the data collectors as they will have access to the individual ID and can seek the necessary informed consent. Subsequent linkage at an individual level would be difficult because of the likely absence of crucial identifiers (though see Gill, 2001, for matching on a probabilistic basis). Matching pupil postcode records with pupil examination data where there was a date of birth and gender flag in both datasets and the data were grouped by individual secondary school or exam centre number, produces only very few ambiguous matches at school level (Smith et al., 1999).

Survey records have also been successfully matched to subsequent administrative data. Thus, following a detailed survey of claimants answering a screening question on limitations to their mobility, their administrative records were studied to assess how many subsequently successfully claimed Disability Living Allowance (Noble and Daly, 1996; Noble and Platt, 1997). In this case, the Data Protection Registrar's advice was sought about the subsequent data linkage.

Matching survey data to area based or institutional service quality data requires linking variables. Typically the full postcode would link to local geographies, though as noted above postcodes do not remain invariant. Institutional number (e.g. school DfES No.) would be a way of linking to other datasets, though again these can change (through school closure or merger) and there are not always reliable look up tables to match old and new lists. Recent examples of such matching would include linking survey data to ward

level index of deprivation scores (ID 2000). The spread of up-to-date postcode directories, and powerful postcoding packages that work with varied address formats means that there should in principle be little technical difficulty in making the match when using current data. Historical data are potentially much more of a problem because changes in boundaries, postcodes etc. may not have been adequately recorded.

5.3.4 Aggregate data to aggregate data

This would typically require matching ward codes, postcodes, ED (or OA) codes or other geographical referencing. As noted above, changing boundaries are not always well recorded. However, there is a growing number of studies that have linked different geographies together over time, though there is inevitably some degree of smoothing in the process. Examples would include ward-to-ward linkage across different censuses and the development of look-up tables for this purpose (e.g. by Wilson and Rees, 1998). More fine grain links have been made between census enumeration districts in 1981 and 1991.

5.4 Future prospects

Some of the data linkage possibilities have been listed above. This is a rapidly developing field. Until about 1996/7 the idea of routinely extracting and analysing data from the IS/JSA-IB would have been both technically at the edge of possibility and also firmly ruled out by administrative decision. Exceptionally, a study supported by the DSS and carried out at the Centre for Research in Social Policy (CRSP) at Loughborough, using a paper extract of local DSS case level data, demonstrated the potential of such analysis (Dobson et al., 1996). The climate has altered significantly since 1997 as the advantages and power of such administrative data are realised. It seems that such analysis for research purposes, given appropriate safeguards, can be undertaken in ways that meet the requirements of the Data Protection Act. There are several projects underway that are exploring the more extensive use of such data (over longer time periods and involving more datasets).

Two further areas of possible development should be flagged. One has already been proposed and is currently under development, the other is a possible future development.

5.4.1 Programme evaluation using administrative data linked over time

At least one proposal to evaluate a New Deal programme has suggested drawing on a range of such administrative data in individual form to throw light on the overall impact of the programme at the local level. This would be a complement to more focused survey or observational studies on programme effects. The intention would be to build up a range of individual-level data from the IS, JSA-IB, WFTC, JUVOS and other relevant administrative data sources, including education and training databases if these were part of the

targetted outcomes of the programme. The programme areas would have to be identified geographically and, using some form of matching, control or contrast areas would be selected (though randomisation could in principle be employed if target areas had not already been identified). The administrative data could then be used to monitor changes in the control and experimental areas over time. Crucially, by matching individual-level data, it would be possible to say something about geographical inflows and outflows to the area, which could be exceptionally difficult to pick up by other means. Also, importantly, the administrative data could in principle be used to say something about the prior conditions (if such data were available before the intervention began). This is already possible as such data exist nationally effectively since 1995 in a form that allows small area classification.

More speculatively as a further stage, such data could in principle be used to undertake the type of social policy 'experiment' employed in the US in housing reallocation projects – for example, to assess the impact of poor neighbourhoods by selective reassignment of poor families to areas with low levels of poverty and subsequent monitoring of their progress in the new environment. An example would be the 'Moving to Opportunity' project in Boston (Katz et al., 1999), though these experiments would appear to raise in sharp form not just the ethics of such monitoring but also the modes of selection.

5.4.2 Exploratory analysis of audit and logging data

One of the major problems with administrative data is that, while they may authoritatively identify the patterns and movements over time, they give virtually *no* information about the reasons for any movements. There are a number of further possible developments, which may provide some partial help. There exists a number of auditing and other logging systems covering large areas of administrative data within government. Many of these have been developed to identify and check possibly fraudulent activities. Thus some benefit systems have a logging procedure that records any changes in the benefit files and codes reasons for the change. Many of these are trivial but others include significant events (e.g. changes in relationship, additional children). If it proved possible to convert some of this information into a usable database it could be a very powerful device for charting and explaining income and other forms of mobility among children growing up in poverty.

A further possibility is that information on neighbourhoods, or at least areas, obtained from a range of surveys that have a clustered design could be built up over time, perhaps by ONS, into a data bank that could be shared between surveys. This would be a research analogue to the way that market research companies build up information on (postcode) areas based on aggregating data from many sources to create an overall profile.

5.5 Legal and ethical concerns

This is a highly technical and legally bound area and therefore only some very general observations are in order. The overall impression is that, on occasions, a strict blanket interpretation has ruled out activities that would be acceptable to the Data Protection Registrar (now Information Commissioner). Her discussions with the PAT18 team (SEU, 2000) very helpfully indicated that the Data Protection Act (DPA) is not intended to 'prevent the sharing of information for beneficial purposes' nor 'does the DPA or DPR prevent personal information being aggregated into general statistics....The publication of aggregated statistical information (from which individual information cannot be deduced) is not blocked by DPA or DPR.' (SEU, 2000 [p17]).

Para 2.7 from SEU, 2000 based on 'Helpful Discussions with the Data Protection Registrar'.

Data protection and area statistics

- Neither the DPA nor the DPR is there to prevent the sharing of information for beneficial purposes - so long as the information is handled in accordance with the law.
- Nor does the DPA or the DPR prevent personal information being aggregated into general statistics. To do this, personal data can be anonymised by the department that collects it and then shared; or it can be anonymised and aggregated by someone else (for example, ONS) acting as an agent and bound by confidentiality.
- The publication of aggregated statistical information (from which individual information cannot be deduced) is not blocked by the DPA or DPR.
- The main influence of the DPA is that it makes it clear that Government must act within the law in collecting and processing data. This means that those collecting data have to know and abide by the powers under which they collect information and observe any constraints on its use. (Often these powers and constraints are in entirely separate legislation, or the common law duty of confidentiality.)
- Departments and agencies are not always aware of the powers under which they collect, process and share data. Some departments have carried out audits of their powers. This should be encouraged further.
- When an audit throws up problems, legal powers may need updating to allow for the lawful use of information. In some cases the law can be met simply by being explicit when collecting information about what statistical purposes it might be used for.
- Generally, it should be possible for agencies to share the data to generate area statistics - but this needs to be planned from the moment the data is collected, not thrown in as an afterthought.
- The DPA is a framework not a barrier. The DPR has a role in facilitating data sharing for joined up government.

There may, of course, be very specific reasons why some datasets cannot be linked or used. Thus, it appears that the 1970 Finance Act may rule out data

collected by the Inland Revenue (IR) from being transferred to other departments. Thus, while it was possible to make use of Family Credit when this was administered by the DSS, since 1999 its successor WFTC has been administered by the IR and its use is now more restricted. However, the Tax Credits Act 1999 allows the Inland Revenue to disclose tax credits information to the DSS (or their contractors) for their social security benefits, child support and war pensions purposes. It is not clear whether this would extend to its use for research purposes. This will become increasingly important as other major benefit systems are transferred to the IR if they are subject to these same restrictions.

Use may also be barred by explicit undertakings made to respondents or rulings by Ethics Committees or other bodies. Thus research access to individual pupil data records in Northern Ireland required not just the permission of the NI Department of Education but all secondary schools, as undertakings had been given that only aggregate data would be released to any other party. Research ethics committees play a key role in the case of data that involve NHS patients, access to medical records, to NHS premises or facilities or to for example, foetal material, the recently dead in NHS premises etc. Details of the Local Research Ethics Committees (LREC) and to the Multi-centre Research Ethics Committees (MREC) where the research involves five or more LRECs can be downloaded from the Central Office for Research Ethics Committees (COREC) at <http://www.corec.org.uk/>.

Access may also depend on who is undertaking the research, and whether they are acting as 'agents' or 'contractors' for groups which legitimately have such access or entitlement to use the data for research purposes.

However there appears to be no blanket ban. Research, particularly that associated with key government objectives (of which the reduction and elimination of child poverty would be an outstanding example) constitutes 'beneficial purposes' which could be contrasted with other (potentially harmful) purposes such as the better targetting of individuals, for example to deny them credit.

Under the Data Protection Act 1998 data collection, processing, transmission and storage has to be in line with the eight *Data Protection Principles* (see box below).

1. Personal data shall be processed fairly and lawfully and, in particular, shall not be processed unless-
 - (a) at least one of the conditions in Schedule 2 is met, and
 - (b) in the case of sensitive personal data, at least one of the conditions in Schedule 3 is also met.
2. Personal data shall be obtained only for one or more specified and lawful purposes, and shall not be further processed in any manner incompatible with that purpose or those purposes.
3. Personal data shall be adequate, relevant and not excessive in relation to the purpose or purposes for which they are processed.
4. Personal data shall be accurate and, where necessary, kept up to date.
5. Personal data processed for any purpose or purposes shall not be kept for longer than is necessary for that purpose or those purposes.
6. Personal data shall be processed in accordance with the rights of data subjects under this Act.
7. Appropriate technical and organisational measures shall be taken against unauthorised or unlawful processing of personal data and against accidental loss or destruction of, or damage to, personal data.
8. Personal data shall not be transferred to a country or territory outside the European Economic Area unless that country or territory ensures an adequate level of protection for the rights and freedoms of data subjects in relation to the processing of personal data.

For research use a key section in the 1998 Data Protection Act is Section 33 ('Research, history and statistics'). Provided that data are processed in ways that meet the 'relevant conditions' that is:

- (a) that the data are not processed to support measures or decisions with respect to particular individuals, and
- (b) that the data are not processed in such a way that substantial damage or substantial distress is, or is likely to be, caused to any data subject.

then the 'further processing of personal data only for research purposes in compliance with the relevant conditions is not to be regarded as incompatible with the purposes for which they were obtained.' (Section 33). Such data can be kept indefinitely and such personal data 'which are processed only for

research purposes are exempt from Section 7 [Rights of Access to Information] if:

- (a) they are processed in compliance with the relevant conditions [as above], and
- (b) the results of the research or any resulting statistics are not made available in a form which identifies data subjects or any of them'. (Section 33.4)

While this sets the main conditions to do with not targetting individuals and disclosure, it appears to be compatible with a significant amount of use for research purposes. It does not, of course, give any indication about the processing of any particular dataset and the undertakings or powers under which it may have been collected. There may also be questions of ownership and access rights, for example to the data in the form required to make any such linkage effectively.

In addition to the concern about the general implications of the Data Protection Act 1998, there is also concern that linking data together in this way may make it potentially easier to identify individuals and thereby breach Section 33, even if only inadvertently. This would seem to be less of a problem with the primary usage where the data collector must, in principle, have some form of access to the identifying data in the first place to collect the information, but rather to subsequent secondary use by others. This may be a particular problem where research projects are required to deposit data in archives and other locations. Access to the primary identifying data would normally be covered by the survey practice of keeping data anonymous, and identifying lists and codes in a separate highly secure file or system. Secondary processing problems might be covered by reducing the amount of information available in data with small area geocoding. Thus, the full Labour Force Survey dataset is available to researchers from the Essex Data Archive, but the LFS set with local district codes (the so-called LFS LA) contains only a restricted dataset. Other anonymising techniques include the rounding of numbers (used in the ONS Neighbourhood Statistics) and 'Barnardisation' (randomly adding or subtracting cases where there are very small numbers) of aggregate data (used in census SAS or Local Base Statistics datasets). Other methods might include signed undertakings on accessing such data by researchers, as currently happens to a number of datasets that are covered by legal agreements and where any disclosure could lead to immediate identification (e.g. Census of Employment where data from employers is collected under statutory powers, and could easily identify local employers and possibly commercially sensitive information).

What is needed is a guide to good practice in this field which would make clear what is legally permissible and what would be good practice in meeting the requirements of the Data Protection Act 1998 for fair data processing for research purposes.

A further important development might be to undertake key data matching and linkage in secure locations for example, under ONS jurisdiction with regulated access to any product.

CHAPTER 6 - CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The first conclusion we draw from this study is, in one way, a negative one. The large range of material we have covered, and the extent of possible child outcome measures, indicate clearly to us that there could not be a *single* study that took on board *all* that would be needed to chart and explain the relationships between the experience of poverty in childhood, however defined, and the major outcomes in the short and medium term. And even if this were possible, then the 'subjects' at the centre of this exercise would surely come to view the research imposition on them as overbearing, as every aspect of their lives was scrutinised directly or indirectly.

With increasing sophistication of research measurement, the studies we have reviewed (listed in Appendix 2) demonstrate the current state of the art in terms of data collection. Thus, ALSPAC might represent the currently best achievable dataset on early child health and development; EPPE the best for child outcomes in the early years, linked to service quality and preschool type; PRILIF and SoLIF, along with the FRS, as the gold standards for measuring the complexities of household income and benefits data; the Home Office self report studies (e.g. Youth Lifestyles Survey) the best available for assessing offending behaviour among young people; the birth cohort studies best at measuring educational progress and achievement; BHPS best at measuring income or poverty dynamics; and the clear potential for the use of administrative data to measure poverty dynamics for people in receipt of benefits.

But clearly each of these studies does not 'play' so strongly in other parts of the field. Those that are strongest in the income domain often have very light coverage of other fields, particularly some of the more difficult to measure outcomes (for example, offending behaviour). Indeed, apart from the many studies that demonstrate an association between income and outcomes, we are aware of very few studies based on UK data that go beyond that towards estimating at least some of the paths in our basic model represented by Fig. 2.1. McCulloch and Joshi (2001a,b) link income and neighbourhood data to cognitive outcomes for children of the NCDS cohort and a recent DSS-sponsored study looks at the link between income dynamics and adolescent outcomes using BHPS data (Ermisch and Francesconi, 2001). The Education Maintenance Allowance pilot studies also suggest that raising incomes via allowances may promote staying on at school, but that this may vary by geographical area and social group (Ashworth et al., 2001).

From another perspective only the panel studies and to a limited extent (but with potential, we would argue, for more) the administrative datasets allow for a very strong handle on the crucial question of the time dimension, or the welfare or income dynamics. To date, the major longitudinal birth cohort studies have had too infrequent a cycle to pick up more than rather broad changes, although they do cover all the period of 'childhood'. Strikingly, the

more fine grain and closely spaced studies are, the more variability or mobility there is, underlining perhaps in new ways the uncertainties and instabilities of at least some child poverty at the beginning of the 21st century.

Finally, on the question of geographical linkage there are variable prospects for effective data linkage, depending in part on whether samples are clustered in some way. Again the position might vary from, at one extreme, administrative data that include every case, studies that are concentrated in one area or region (for example, ALSPAC), surveys with a national clustered sampling procedure (MCS), and at the other extreme a more or less evenly spread national sample survey with very few cases in any area (as in the 1946, 1958 and 1970 longitudinal cohort studies, where date of birth was the criterion for entry).

Hence our first conclusion is that it would not be feasible to design a research exercise that somehow maximised on all these very different features. So, in another way, our first conclusion is positive - we do not see the need for a large amount of totally new data *collection* exercises. If such were needed, they should probably best be built into, or derive from existing and planned studies. For example, future waves of BHPS could be expanded to include new samples of young people and to collect more detailed data about families with young children. But we do believe there is scope for a lot more data *analysis*. To put this another way, we believe the infrastructure is, or soon will be, in place to provide answers to the questions posed at the beginning of this report. Some of the answers might not emerge for some time but that is the nature of research that needs, and relies on, longitudinal data. We know no way of speeding that up.

6.2 Research strategy

We therefore see the most effective strategy as being one that starts from the existing range of possible datasets and builds on these. There would be six major elements to such a strategy:

6.2.1 At the individual level: linking administrative data over time

As we have noted, administrative data have been used for many years, and programmes to link datasets have existed at least since the 1960s (for example, the Oxford Record Linkage Study – Gill, 2001). However, this development has gathered speed in the last few years as more central government systems have become available for analysis in various forms. Many of these are directly relevant to children (for example, the Child Benefit system), child poverty (for example, DSS benefit systems that include details of children), and data on outcomes (for example, pupil records and examination results). There are technical issues in linking these data together, but there are increasing numbers of projects doing this and techniques, data availability and linking variables have become more readily available. We see very substantial steps being made in this area as some of the exercises currently underway come to fruition (for example, work in ONS to generate

reliable small area income estimates – see section 4.2.2). While there have been longitudinal datasets covering the labour market domain for many years (see section (5.3.1) on the JUVOS cohort and LLMD), those including children are much more recent. At the same time, ethical and data protection issues that are associated with this type of data linkage have become clearer, as we set out in Chapter 5. While there are a number of major outstanding issues, for example the location, storage and research access to such linked datasets, we would argue that this development could make a major contribution to a framework of data linking child poverty, child outcomes, service quality and neighbourhood-level data.

However, it is likely that such administrative data would always explain only *part* of the story and leave other bits tantalisingly out of reach (as people leave the benefits system or other aspects of the state's purview). It might be that, in due course, everything will be logged in some system or other, but we are sceptical whether administrative data *on their own* could ever close the door on what is needed to unravel the linkage between child poverty and child outcomes. However, in our view it will have an increasing role, sometimes in support of other more intensive data collection, and sometimes as a precursor to more intensive studies (as it can act as an effective research 'screen' for picking out overall patterns across very large population-wide datasets).

So some part of the effort in the future should go into developing such a framework of relevant administrative data, by building on what has already been done, but also experimenting with further developments, particularly trying to generate more dynamic sets of information. The model could be the existing JUVOS cohort or LLMD systems. Such developments on the child poverty/child outcome field should be linked to other developments to produce codes of practice, and procedures and location for storing and granting access to these growing bodies of data. It is clear that some of the ethical and legal issues touch on these second-order uses. It may be acceptable for one group to link such information and use it for a research study, but access by subsequent groups may throw up problems if, for example, additional data result in potential (unwitting) disclosure. This may require a central resource such as ONS as the holding agency and possibly their also providing 'safe-setting' analysis facilities as they do at present for the ONS Longitudinal Study. Therefore, our recommendations are to:

1. Build up a longitudinal administrative database directly relevant to child poverty along the lines of the LLMD initiative.
2. Explore the use of further administrative data that may throw light on any changes/dynamics.
3. Develop mechanisms to link and access these data securely.

6.2.2 At the individual level: linking administrative data to surveys

With the increase of information in a form where linkage between administrative data and surveys could potentially occur (for example, unique pupil numbers and the associated educational records; health records), we would argue that many existing research studies could, in principle, add

significantly to their impact and value by linking in such data. This is likely to require more accessible information about what is available, information on the possible mechanisms for linkage, and it would certainly require codes of practice about ethical and legal issues.

We give four examples of surveys that could profitably add in significant amounts of individual data from administrative sources. In each case, there is already some work along these lines either in place or planned, but facilitating it in the areas of particular relevance to this report could be valuable.

1. Linking more local health, education and socio-economic data (including possibly benefits data) into ALSPAC.
2. Linking data from Child Health Records and other routine health data on, for example, hospital admissions into the early waves of the Millennium Cohort Study.
3. Linking educational data, and data about schools, into the British Youth Panel component of the BHPS.
4. Linking administrative data, especially benefits data, into evaluations of area-based initiatives such as Sure Start and New Deal for Communities.

6.2.3 At the aggregate level: linking administrative data about neighbourhoods and services to individual level surveys

Just as individual administrative data could be linked to individual survey responses, so could administrative data about neighbourhoods (however defined) and services be linked to records that have the relevant geocodes. There is a growing body of neighbourhood statistics - the Indices of Deprivation 2000, data generated from censuses, schools' examination results and so on - that could be linked. Some words of caution are, however, needed about this approach. These were highlighted in Chapter 4 and in Appendix 3. For example, is the neighbourhood statistic necessarily valid for the sample member (because of boundary problems and sampling issues)? In addition, we have already flagged the issue (well covered by the PAT18 report) of changing administrative boundaries, postcodes and other geographies, which can make any longitudinal comparisons exceedingly difficult. We believe the issue of estimating neighbourhood effects and separating them from the effects of services is a complex one that warrants further investigation.

Again, we give three examples where aggregate data could be linked to studies:

1. Not only neighbourhood-of-residence data but also adjacent neighbourhood data could be added to ALSPAC for different time points, thus creating the possibility of a thorough examination of neighbourhood effects on child outcomes.
2. MCS and all evaluations of ABIs would benefit from the addition of relevant neighbourhood data.

3. Clustered surveys - for example, SoLIF/SoF and the Mental Health of Children and Adolescents Survey - could draw on outside neighbourhood data to help explain any neighbourhood effects in the data.

6.2.4 Constructing and using neighbourhood data from clustered designs

Most big national surveys have a design that is geographically clustered, commonly by postcode sector. Clustering is generally used for sampling efficiency. It would be possible to exploit the information contained in the clusters much more than it is at present. For example, it would be possible to get an estimate of the mean prevalence of mental health problems per cluster for families with a child aged 5 to 15 from the Mental Health Survey of Children and Adolescents. This information could then be used in a statistical model to explain any variability in prevalence across postcode sectors. Moreover, some of the problems discussed earlier about the need to separate within and between neighbourhood variability in order properly to assess neighbourhood effects are less acute with clustered designs so that the combination of survey generated and administrative data will be more convincing.

6.2.5 Using data from evaluation studies and designed experiments

This fifth element of our strategy is a little different in that it refers to a different research approach. This report has concentrated on studies and data sources that can provide estimates for some or all of the pathways specified in Fig. 2.1. In other words, we have been concerned mostly with observational data that can reveal associations and that can also, in certain circumstances, provide explanations of whether and how changes in income lead to changes in child outcomes. There is, however, another way of learning about the link between income and child outcomes and that is by deliberately changing income and seeing what happens to later outcomes. In some ways, this happens all the time, especially with the benefit system as new benefits are brought in or upgraded (and so some gain) and others are reduced or phased out, creating losers. The introduction of the National Minimum Wage in 1999 may have boosted incomes for some low income families. The impact of the switch from Family Credit to WFTC or other significant changes in benefit levels might similarly be explored. In all these situations, it is, at least in principle, possible to monitor the effects of changes in income and to relate them to changes in child outcomes. The problems with this approach are, first that it is often very difficult to separate the effects of the change in income from other changes in society that everyone experiences, and, second that the inferences are often based on aggregate data rather than on data for those individuals who either did or did not experience a rise in income.

Therefore, a more convincing approach to the question of what happens if children in families experience a marked rise in income is to do an experiment of some kind so that some but not all families in poverty receive additional income. Those families, ideally selected by chance, receiving the income boost are compared with those - the control group - who are not so lucky. This approach has been tried in the United States (for example, the Negative

Income Tax experiments) and, more recently, in Canada as part of the Self-Sufficiency Project (<http://www.srdc.org/english/projects/SSP.htm>). Education Maintenance Allowances (see Ashworth et al., 2001), introduced on a pilot basis in England in 1999, represent a similar idea. The main concern of experiments of this kind is to establish whether or not rises in income lead to improved child outcomes. Methods for the design and analysis of studies to evaluate the effects of this kind of intervention are given in, for example, Plewis and Preston (2001) and the references therein.

6.2.6 Better exploiting existing data

The final recommendation is more one of a *mechanism* for deriving the maximum advantage from the very wide range of data and data sources we have reviewed. This is based on the observation that the range of research skills involved in studying the links between child poverty and child outcomes is enormous (that is, expertise is required across disciplines to take in a very wide range of substantive areas). If we combine this with the point that no *one* single data source or study, however linked, rich and extensive, could answer the range of questions set, then the solution has to be as much organisational as technical. What we have in mind here is that working groups or teams of some kind could be established around certain key cross-cutting themes – that is some part of the field denoted in Fig. 2.1. Their responsibility would be to draw on the wide range of evidence emerging from the type of study we have reviewed, to give what in the jargon has been called 'best evidence synthesis' (Slavin, 1986). This differs slightly from the normal meta-analysis approach to quantitative reviewing, where all studies, as it were, are grist to the mill. This alternate method implies a strict quality control in studies that will be taken into account. This would seem to be more appropriate when the issue is not simply 'did treatment X work better than treatment Y' where the Cochrane style meta-analysis may be most appropriate, but a much more complex sequence of events and processes of the kind we have outlined in Chapters 2 and 3. Here the quality of the data and the analysis required may be crucial to discerning a robust set of conclusions.

More work needs to be done to fill out this recommendation, but it might entail cross-disciplinary groups meeting or working to review relevant studies. They might also be able to suggest additional data collection elements to forthcoming studies, in order to throw more light on a sequence for which there was not, as yet, sufficient data. Thus, it might be that such a group would identify a data need that might be met by a future element in the Millennium Cohort Study or ALSPAC. For example, if there were strong evidence that children in long-term poverty seemed to have more problems in the transition to secondary school and rapidly fell further behind (this is an *example* not a substantive point, though it is based on US evidence that children do drop back in educational performance over the summer vacation), they could then encourage or commission these studies to look more closely at this kind of question.

It may be that this is done already, and indeed there are many groups that operate in this way round the birth cohort studies. It is also possible that the

new national co-ordinating centre for evidence based policy and practice, established by the ESRC at Queen Mary and Westfield College, University of London (<http://www.politics.qmw.ac.uk/currentnews.shtml>) will take up issues of this kind. The centre also has nodes at the Social Policy Research Unit at York and one specifically related to children at City University. But, if so, we would suggest that these groups could be funded to be dedicated in their focus on child poverty and child outcomes, to reflect the centrality of these issues to policy in the medium and long terms.

6.3 Further specific suggestions

The six proposals in (6.2) represent our main general conclusions. In addition, we make a number of more specific suggestions - illustrative and certainly not exhaustive - about analyses of existing data that would, we believe, enhance our understanding of the links between child poverty and child outcomes. We list them in the order in which they could be carried out, starting with the earliest:

1. It should be possible to use the data from the Mental Health of Children and Adolescents Survey to establish if there are any 'neighbourhood' (that is, sample postcode) effects on the health outcomes, having controlled for family income. This analysis could serve as an exemplar of how the clustering built into many survey designs could be used, by linking external sources of data at the neighbourhood level to the individual file.
2. It would be possible to extend the analysis in McCulloch and Joshi (2001a) who use data from the children of the NCDS cohort. The child outcome - a score on a picture vocabulary test - could be related to parental income at three time points (when the cohort member was aged 23, 33 and 42), to the income of the grandparents and to a measure of the parenting behaviour at home. This would add to our understanding of the effects of income dynamics, and inter-generational transmissions of income, on child outcomes.
3. With the collection of more child outcomes in PRILIF and SoLIF/SoF, it should be possible (by 2003) to look more closely at the link between income dynamics and child outcomes from those two studies. The relatively long time span of PRILIF would be helpful here as, eventually, will the extension of SoLIF to include all families with children. The analyses of the data from these two studies would be strengthened by the collection of some of the process variables described in Chapter 3.
4. Data on attainments at Key Stage 2 for the ALSPAC cohort should become available for analysis by 2004. These (and other outcomes) could then be used in a model that would come close to the one set out in Fig. 2.1, especially if neighbourhood and service data were linked to the individual data file. It is worth noting that the ALSPAC data are not publicly available and their use requires funds that contribute to the life of the study.

5. Data for children aged about 30 months should become available from both MCS and the Sure Start evaluations by 2005. This age is perhaps a little young to expect substantial income effects but, by 2007, when the children will be approaching the start of school, more informative analyses should be possible.
6. Additional administrative information that is currently not available for research purposes, particularly the WFTC data, should if possible be added to existing administrative datasets made available for analysis. If this is not possible for legal reasons, consideration may need to be given to appropriate legislation.

There are also some other outstanding questions that would benefit from further research:

- There is little information about intra-family transfers of income and especially about how family income is used for children, and whether and how this varies by family income levels. While our brief was essentially to review quantitative studies, this might be an example where there was need for both quantitative and qualitative enquiry. Estimations by Platt (forthcoming) show that in families with larger numbers of children living on basic means tested benefits there is proportionately less funding per child, as family size increases. However, we have very limited information about the impact of this constraint on actual allocations within the family. It would probably require qualitative studies to illuminate this area.
- Defining a 'neighbourhood' for the purposes of this paper and whether this can be turned into some administrative routine. There is evidence that some countries (for example, the Netherlands) do have ways of identifying 'neighbourhoods' in a better than administrative sense. It would be worth investigating to what extent Census Output Areas in 2001, and aggregates thereof, represent 'neighbourhoods'.
- The problem of identifying groups such as ethnic minorities that may follow very different trajectories than other groups. Most survey data have very few cases for some ethnic groups. Most administrative data are not ethnically coded. The Millennium Cohort Study will in time fill out this picture as it over-samples areas with high levels of ethnic minorities. There may be scope for some existing surveys to undertake booster samples to extend this aspect.
- Similarly there may be other booster samples or follow-up studies that could be undertaken to enhance data on key groups or key age points. For example, if the DfES Longitudinal Study of Young Persons' Transitions goes ahead, it could be invaluable in helping to fill the gap of what is sometimes referred to as the 'missing cohort' problem; the cohort of children born in the middle 1980s who are now in the late stages of compulsory schooling and about whom little is known.

- Data on access to and use of services needs to be developed.
- More thought needs to be given to the question of measuring service quality and how 'quality' data can be integrated into analyses linking child poverty to child outcomes.

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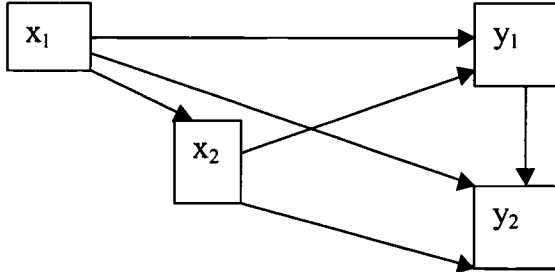
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APPENDIX 1 - MODELLING INDIVIDUAL EFFECTS

Let us first consider the model shown on p.8 and assume that we have measures of changes in income (x_1), diet (x_2), health (y_1) and school success (y_2). We will also assume, for convenience, that all of these measures are continuously distributed. This is a recursive model that can be illustrated as:



We can write down this model just as a series of regression equations:

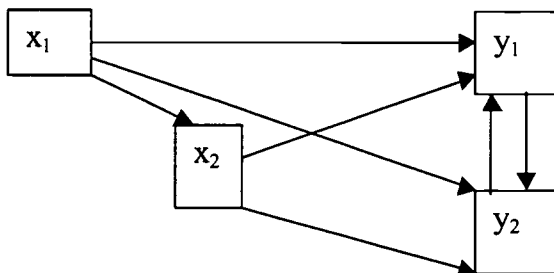
$$x_2^{(t)} = a_0 + a_1 x_1^{(t-1)} + e_1 \quad (1a)$$

$$y_1^{(t+1)} = b_0 + b_1 x_1^{(t-1)} + b_2 x_2^{(t)} + e_2 \quad (1b)$$

$$y_2^{(t+1)} = c_0 + c_1 y_1^{(t+1)} + c_2 x_1^{(t-1)} + c_3 x_2^{(t)} + e_3 \quad (1c)$$

where the superscripts (t-1, t, t+1) represent an assumed time ordering although, in practice, some measurements will be obtained at the same time. In equation (1a), x_2 is the change in diet (from time (t-1) to time t) and x_1 the change in income (from time (t-2) to (t-1)) and similarly for the other two equations. These equations can be estimated separately and the estimates will indicate how strong the 'causal' links are.

It is, however, possible that school success and health form a feedback loop as illustrated:



The equations are now:

$$x_2^{(t)} = a_0 + a_1 x_1^{(t-1)} + e_1 \quad (2a)$$

$$y_1^{(t+1)} = b_0 + b_1 x_1^{(t-1)} + b_2 x_2^{(t)} + b_3 y_2^{(t+1)} + e_2 \quad (2b)$$

$$y_2^{(t+1)} = c_0 + c_1 y_1^{(t+1)} + c_2 x_1^{(t-1)} + c_3 x_2^{(t)} + e_3 \quad (2c)$$

where (changes in) health and school success are assumed to be measured at the same time (t+1), and where each influences the other. Equations (2b) and (2c) form a set of simultaneous equations because y_1 and y_2 each appear on both the right and left hand sides. As they stand, these equations are not identified and cannot, therefore, be estimated. Restrictions would need to be imposed - for example, excluding x_1 from (2b) and x_2 from (2c) - and then a technique like two stage least squares could be applied. Further details about these issues, as they apply to longitudinal data, can be found in Plewis (1985, [pp67-71]).

APPENDIX 2 – DATASET

A. List of the most useful surveys/datasets

(i) Surveys/Panels with Longitudinal Data

STUDY A1 ALSPAC (Avon Longitudinal Study of Parents

<http://www.ich.bris.ac.uk/ALSPACext/Default.html>

Study Design A longitudinal study of all children born to mothers who, when pregnant, were resident and whose expected date of delivery was between 1 April 1991 and the end of 1992. 14K; those moving out of Avon have been retained in the sample.

Child Outcomes Education: test data, school entry assessment and KS1 SAT data.

Health: Wide range, including extensive physical samples.

Crime: Self-reported at age 10.

Income Some data on four occasions.

Income proxies.

Processes Wide range for education and health.

Neighbourhood Data The study initially included all births in a relatively small area, so the sample is highly

chosen. It also includes data on primary schools attended, health services used and

Strengths

- (i) Present day longitudinal data on childhood and hence relevant to current policies;
- (ii) Strong on outcomes and on processes;
- (iii) Potential to analyse neighbourhood effects.

Weaknesses

- (i) Restricted to Avon;
- (ii) Income data less strong than outcome and process data;
- (iii) Data collection runs in advance of resources to analyse the data.

STUDY A2 BCS70

<http://www.cls.ioe.ac.uk/Bcs70/bhome.htm>

Study Design A longitudinal study of all UK births early in April 1970 - originally about 17K - followed

Child Outcomes Nearly all outcomes covered.

Income Some data on two occasions.

Limited income proxies.

Processes Wide range.

Neighbourhood Data Not clustered; not geocoded until adulthood.

Strengths

- (i) Strong on outcomes and on processes;
- (ii) Covers all the UK.

Weaknesses

- (i) Refers to the previous generation of children, perhaps restricting its policy relevance;
- (ii) Income data not strong;
- (iii) Problems of attrition and non-response at age 16;
- (iv) No neighbourhood data.

STUDY A3 BHPS: British Household Panel Survey

<http://www.iser.essex.ac.uk/bhps/>

Study Design A longitudinal (panel) survey of a probability sample of households in 1991, originally

annual survey of each 16+ adult member of an original sample of 5000+ households followed to new households that they may form and interviewed with other adults in its eleventh 'wave'. From Wave 4 a survey of young people - the British Youth Panel adult respondents aged 11-15 in a separate panel study. Approximately 1600 young once in the BYP.

Child Outcomes Nothing under age 11, wide range over 16. Focus of BYP on health and health behaviours more recently.

Income A core questionnaire is administered every year that collects detailed information on and household composition. Supplementary questions are also asked either on a biennial Derived household income variables are created prior to the release of the survey.

Processes Very little available.

Neighbourhood Data Initially clustered by postcode sector and subsequently geocoded.

Strengths

- (i) Detailed income and income dynamics data;
- (ii) Rapid release of data.

Weaknesses

- (i) Not explicitly focused on children;
- (ii) Little process data on links between low income and outcomes.

STUDY A4 Mental Health of Children & Adolescents Survey

http://www.statistics.gov.uk/themes/health_care/dwb.asp

Study Design Cross-sectional survey in England and Wales based on a probability sample of postcode

to 15. Some data were obtained for about 10K children. There has been a subsequent full interview follow-up planned for 2002.

Child Outcomes The focus of this study is on children's mental health, especially conduct disorders,

is a small amount of data on educational outcomes.

Income Income data were collected (in bands).

Processes There is little information about intervening variables.

Neighbourhood Data Initial sample was clustered by postcode with an average of 25 respondents in each

Strengths

- (i) health outcome data;
- (ii) potential for looking at neighbourhood effects.

Weaknesses

- (i) only cross-sectional data available at present;
- (ii) income data not strong.

STUDY A5 MCS: Millennium Cohort Study

<http://www.cls.ioe.ac.uk/Mcs/mcsmain.htm>

Study Design A longitudinal study of births in the UK over a 15 month period from September 2000,

interviewed when the child is 9 months old.

Child Outcomes All relevant outcomes will, eventually, be covered.

Income To be collected in some detail at each wave.

Processes Wide range to be collected.

Neighbourhood Data Initially clustered, focus on social capital, and external data to be linked

Strengths

(i) Will cover all the parts of Fig. 2.1. and so likely to be relevant to policy in the future.

Weaknesses

(i) Longitudinal data not available for several years.

STUDY A6 NCDS: National Child Development Study

<http://www.cls.ioe.ac.uk/Ncnds/nhome.htm>

Study Design A longitudinal study of all GB births early in March 1958 - originally about 17K - followed

sample of children of cohort members was surveyed when the parents were 33.

Child Outcomes Nearly all outcomes covered.

Income Income data were collected at age 16 and, to some extent, at birth.

Some income proxies are available.

Processes Wide range.

Neighbourhood Data This study is not clustered and was not geocoded until later waves, after the cohort

Strengths

- (i) Strong on outcomes and on processes;
- (ii) Good response rates over time;
- (iii) Children of cohort relevant to current policy.

Weaknesses

- (i) Refers to a previous generation of children;
- (ii) Income data not strong;
- (iii) No neighbourhood data.

STUDY A7 PRILIF: Lone Parents Cohort

<http://www.psi.org.uk/>

Study Design Longitudinal study of GB lone parents, selected from a probability sample of postcode

sample of over 900 and annual/biennial since.

Child Outcomes This study has only a very limited set of child outcomes - for education and health

2001 onwards.

Income Extensive income and benefits data are available, enabling detailed measures of income a relatively small sample size.

Processes Limited at present to housing quality and parental smoking.

Neighbourhood Data Initially clustered but with substantial movement over time.

Strengths

- (i) detailed income and benefits data over a long period;
- (ii) potential to link to child outcomes and processes;
- (iii) relevant to policies for lone parents.

Weaknesses

- (i) small initial sample;
- (ii) restricted to lone parents in 1991;
- (iii) opportunities for analysing neighbourhood effects very limited.

STUDY A8 SoLIF/SoF: Survey of Low Income Families/Families

<http://www.psi.org.uk/>

Study Design Longitudinal survey, starting in 1999 and annual since, of over 5K low income families

of postcode sectors, extended in 2001 to cover all families with children.

Child Outcomes This study has only a very limited set of child outcomes - for education and health

2001 onwards.

Income Extensive income and benefits data are available, enabling detailed measures of income

Processes Limited at present to housing quality and parental smoking.

Neighbourhood Data The initial sample was clustered by postcode with an average of 30 respondents in

Strengths

- (i) detailed income and benefits data;
- (ii) potential to link to child outcomes and processes;
- (iii) relevant to family policy.

Weaknesses

- (i) only a short income series at present;
- (ii) due to the restricted nature of the sample - to low income families in waves is problematic.

(ii) Relevant Evaluation Studies

STUDY A9 EPPE: Effective Provision of Preschool Education

<http://www.ioe.ac.uk/cdl/epe/>

Study Design Longitudinal evaluation of preschool effectiveness for a sample of 2857 children aged areas of England

Child Outcomes Battery of cognitive and social/behavioural measures applied at the beginning of the

Key Stage and other data

Income No direct measures though parental occupation and educational qualifications/leaving household interview planned.

Processes Extensive observational studies of preschool environments; information from parents

Neighbourhood Data None at this stage. Proposal to link in ID2000 using home postcode.

Strengths

- (i) Extensive outcome and process data;
- (ii) Service quality data.
- (iii) Relevant to current policy concerns

Weaknesses

- (i) Not a probability sample of children;
- (ii) No income data at present
- (iii) No data beyond age seven currently proposed.

STUDY A10 Sure Start Evaluation

<http://www.surestart.gov.uk/text/info.cfm>

Study Design Not yet known in detail

Child Outcomes "

Income "

Processes "

Neighbourhood Data The impact study will be clustered by local Sure Start project area.

Although it has

areas will be included, it is unlikely to be less than 100.

Strengths

- (i) Highly relevant to current policies
- (ii) Linked to MCS

Weaknesses

- (i) Restricted to disadvantaged areas.

STUDY A11 Education Maintenance Allowance (EMA) Pilots

http://www.namss.org.uk/funds_ema.htm

<http://www.lboro.ac.uk/departments/ss/centres/crsp/>

Study Design Random sample of 10K 16/17 yr olds carried out in 10 pilot and 11 matched control

payments.

Child Outcomes Staying on at school

Income Household composition and income data

Processes None

Neighbourhood Data Information on staying-on rates and other characteristics of the area used to select

Strengths

- (i) Example of a *planned* change in income and its effects on a key child outcome;
- (ii) Highly relevant to policy

Weaknesses

- (i) No outcomes before age 16;
- (ii) Not a probability sample;
- (iii) No process data.

(iii) Aggregate datasets/databases of relevant neighbourhood data

STUDY A12 Neighbourhood Statistics

<http://www.statistics.gov.uk/neighbourhood/catalogue>.

Study Design n.a.

Child Outcomes KS2 data; University admissions by place of residence.

Income Family Credit, Income Support, Job Seeker's Allowance data.

Processes na

Neighbourhood Data Yes.

Strengths

(i) The best available source for up to date neighbourhood data in a consistent form

Weaknesses

(i) Limited availability at present;

(ii) Not available below ward level.

STUDY A13 English Indices of Deprivation 2000 (ID 2000)

<http://www.statistics.gov.uk/neighbourhood/catalogue>.

Study Design n.a.

Child Outcomes KS2 data; staying on rates using child benefit; absenteeism; EAL; entry to HE, all at

Income Ward level income deprivation domain. Ward level child poverty domain.

Processes None

Neighbourhood Data Cross-sectional ward level data for all 8414 wards in England for six 'domains' of deprivation.

Strengths (i) Up to date;

(ii) Available for the whole of England.

Weaknesses (i) Not available at individual level;

(ii) Scope is limited to quantifying the presence of deprivation rather than,

STUDY A14 Welsh Index of Multiple Deprivation 2000 (IMD 2000)
<http://www.statistics.gov.uk/neighbourhood/catalogue>.

Study Design n.a.

Child Outcomes KS2 data; staying on rates using child benefit; absenteeism; entry to HE at ward level.

Income Electoral Division level income deprivation domain. Electoral Division level child poverty

Processes None

Neighbourhood Data Cross-sectional Electoral Division level data for all 865 Electoral Divisions in Wales

Strengths

- (i) Up to date;
- (ii) Available for the whole of Wales.

Weaknesses

- (i) Not available at individual level;
- (ii) Scope is limited to quantifying the presence of deprivation rather than, for example,

STUDY A15 Northern Ireland Measures of Deprivation 2001

<http://www.nisra.gov.uk>

Study Design n.a.

Child Outcomes GCSE/GNVQ points score at ward level; secondary absenteeism, staying on rates,

school, all at ward level.

Income Ward level income deprivation domain. Ward level child poverty domain.

Processes None

Neighbourhood Data Cross-sectional ward level data for all 566 wards in Northern Ireland for seven 'domains'

and 'economic deprivation' measures are available at Enumeration District level.

Strengths

- (i) Up to date;
- (ii) Available for the whole of Northern Ireland.

Weaknesses

- (i) Not available at individual level;
- (ii) Scope is limited to quantifying the presence of deprivation rather than, for example,

STUDY A16 2001 Census

<http://www.statistics.gov.uk/census2001/default>.

Study Design Released only at aggregate level. Output areas is the lowest level with target of 100-

Child Outcomes Qualifications; principal activity for age group 16-24.

Income None directly.

Car ownership and housing tenure are possible proxies.

Processes None directly

Neighbourhood Data Effectively the census is small area neighbourhood data

Strengths

(i) Universal and uniform coverage.

Weaknesses

(i) Only available in aggregate format;

(ii) No measures of income and quickly becomes out of date;

(iii) Problems in linking data from 1991 Census at small area level

STUDY A17 OFSTED EIS System

<http://www.ofsted.gov.uk/public/index.htm>

Study Design Database of OFSTED inspections at school and preschool level. Additionally data added.

Child Outcomes School aggregate results only.

Income None

Processes School quality assessment based on inspection reports.

Neighbourhood Data Contains neighbourhood information on the school in the PICS report.

Strengths

- (i) Virtually universal record of maintained schools in England; and from 2002
- (ii) Increasingly includes performance and value added assessments.

Weaknesses

- (i) School based;
- (ii) Based on professional judgments which may be quantified but not formally

STUDY A18 LLMD Database (DWP)

Study Design Aim of building up lifetime labour market database drawing on samples of national estimations of pension requirements etc.

Child Outcomes None

Income National Insurance annual returns contain information that relates to income

Processes Data linked in from JUVOS system on unemployment will provide some information

Neighbourhood Data None

Strengths

(i) Now covers a 1% national sample from 1978 with growing amount of linked data

Weaknesses

(i) Focus is on individual labour market participation not on children or child poverty, administrative child database

STUDY A19 New Deal Databases

Study Design Several separate databases covering various New Deals and other initiatives. Building data from the Labour Market System (LMS), JUVOS, other benefit data and other relevant 100% level.

Child Outcomes Limited. New Deal for Lone Parents contains information on youngest child only. New information on 'outcomes' to supplement JUVOS data on unemployment.

Income Benefit data.

Processes Some information relevant to progress on the New Deal programme

Neighbourhood Data None: postcode level data held but aggregation normally to local authority/constituency

Strengths 100% coverage of key groups relevant to child poverty such as lone parents. Longitudinal

Weaknesses

- (i) Limited to groups participating in the New Deal programme
- (ii) Limited information to link child poverty to child outcomes.

B. Surveys and Other Studies of Possible Use

STUDY B1

Longitudinal Survey of Young People's Transitions

National survey of children aged 14+, funded by DfES, to include a substantial
(*unconfirmed at time of writing*)

STUDY B2

Family Resources Survey

http://www.statistics.gov.uk/themes/social_finances/surveys/survey_of_frs.asp

National survey, using stratified clustered sample of addresses in 1680 postcode the next year. Current sample size is 34600 households with a 67% response interviews. Focus is predominantly on household income and resources, including calculation of equivalised household income and income before and after housing Strengths: most extensive example of household income data collection. Includes Weakness: limited amount of other information. But could be used as a launch of its very high quality income data. Plans to explore linking in other data to ways of modelling small area income data.

STUDY B3

ECHP

http://europa.eu.int/comm/eurostat/Public/datashop/print-catalogue/EN?catalogue=Eurostat&theme=3-Population%20and%20Social%20Conditions&product=CA-22-99-765-__-N-EN

A household panel study, covering most of the countries in the EU, from 1994 by the BHPS but the first three waves were a separate study. The ECHP is outcomes for children under 16 and very little process data. The study could first three waves of data have so far been released.

STUDY B4

New Deal for Communities Evaluation

<http://www.neighbourhood.dtlr.gov.uk/newdeal/index.htm>

Study not yet finally commissioned by DLTR

The impact of the NDC is likely to be clustered by the 39 NDC areas and their Evaluation may include some use of admin data of a longitudinal type.

STUDY B5

Youth Lifestyles Survey

<http://www.homeoffice.gov.uk/rds/pdfs/hors209.pdf>

The first YLS took place in 1992/3 and the second between October 1998 and representative and consists of 4,848 young people aged 12 to 30 living in private Inner city areas and high crime areas were intentionally over-sampled. group, sex and social class. Face to face interview lifestyle questions included schooling/work/training/unemployment; income and expenditure; family life; victimisation; contact with the police. The self completion questionnaire asked attitudes towards illegal drugs, and offending. Twenty-seven types of offence about. Written permission was obtained from a parent/guardian for those aged

STUDY B6

Youth Cohort Studies

http://www.natcen.ac.uk/research/surveys/research_surveys_ycs.htm

Repeated short cohort studies from minimum age school leaving to age 18/19, with from 14K to 25K. Sampling is clustered by school.

No data on household of origin income though parental occupation/whether parent recorded.

Strong on qualifications and aspirations; and early labour market entry details

Limited information on processes or neighbourhood factors

STUDY B7

Survey of Poverty and Social Exclusion

http://www.statistics.gov.uk/themes/social_finances/surveys/survey_of_pse.asp

Cross Sectional survey based on GHS. Follows earlier approach developed by Mack establishing consensus on social necessities and then measuring whether households

Strong alternative to income based assessments of poverty. Child focused element necessary for children.

One in a series of three studies allowing broad comparisons over time.

STUDY B8

Family Trust Fund Database

<http://www.familyfundtrust.org.uk/experience.htm>

Since its formation in 1973 the trust has maintained a database of applicants from

This now includes records on over 200,000 families. The database includes data on difficulties, and information on families such as location, family composition, economic ethnicity. The income threshold for applicants is currently £20K pa.

Families are clearly self selecting and records are at one point in time and not updated. base are routed through;

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Email: bab3@york.ac.uk

STUDY B9

DFES survey of parents' of children aged 0-14 use of childcare

Survey of about 5,000 households containing children 0-14 every 2 years.

Clustered sample using Child Benefit as screen. Report by National Study likely to be repeated at regular intervals.

STUDY B10

DFES survey of parents' with children aged 3-4 use of early years services

http://www.dfee.gov.uk/research/re_paper/RR247.pdf

Clustered sample survey using child benefit as the screen for parents with 3-4 year Fifth survey in this series to be published in late 2001.

STUDY B11 ONS

Individual wealth and assets study

ONS is carrying out feasibility work into the possibility of conducting a Wealth and been undertaken using the Omnibus Survey, no further details are available at this

STUDY B12 EHCS

<http://www.housing.dtlr.gov.uk/research/ehcs/index.htm>

The English House Condition Survey is undertaken every 5 years by the DTLR, most in January. A full Interview, Physical and Market Value survey for 20,000 addresses in 1996, to enable better analysis below national level. Findings should come on stream range of topics: housing stock; stock condition; housing quality; household characteristics; neighbourhood; disability; local environment quality; property values. Questions are circumstances. Households are postcoded and grid referenced, allowing aggregation EHCS team state that it is possible to link the data with other geographically referenced sets across Government.

STUDY B13

The Children's Fund

<http://www.dfes.gov.uk/cypu/index.shtml>

The Children's Fund has been established to tackle child poverty and social exclusion. Children and Young Persons' Unit (CYPU) located in the DfES. The Fund will support people who are showing early signs of disturbance and provide them and their families on track. Its aim is to prevent children falling into drug abuse, truancy, exclusion, unemployment worth £450m over three years. Programme elements include preventative work with parents, and support for voluntary and community groups working to help those aged Wave 1 and more will follow in Waves 2 and 3 in autumn 2001. Each local area will be expected to collect baseline data and more qualitative information for its own

C. Datasets considered but not of direct use

C 1

British Crime Survey

<http://www.homeoffice.gov.uk/rds/bcs1.html>

Reasons

- (i) Over 16s only
- (ii) Cross-sectional
- (iii) The BCS is predominantly concerned with crimes
Offending behaviour is therefore covered only
Sample size is being raised from 20K to 40K with additional
3K.

Data is currently recorded by ACORN neighbourhood classification
neighbourhood data through e.g. postcode of respondent;
(NCSR) but survey now transferred to new contractor.

C 2

General Household Survey

http://www.statistics.gov.uk/themes/compendia_reference/surveys/survey_of_ghs.asp

Reasons

- (i) Over 16+ only
 - (ii) Cross-sectional survey
- Potential use as a screening sample for more focused studies

C 3

Labour Force Survey

http://www.statistics.gov.uk/themes/labour_market/surveys/labour_force_text.asp

Reasons

- (i) Over 16s only
- (ii) Mainly cross-sectional but with a short longitudinal
sample design.
- (iii) The LFS LA contains a local authority district code
size, it is possible to create estimations at district
together.

APPENDIX 3 - MODELLING NEIGHBOURHOOD EFFECTS

In this Appendix, we extend the discussion on estimating neighbourhood effects that was started in Chapter 4. We do this by considering the strengths and weaknesses of different research designs - and hence different statistical models.

Let us assume a simple model for the population, simpler than Fig. 2.1. In other words, we consider a model that is a convenient simplification of real world processes but we do not, at this stage, concern ourselves with the constraints placed on estimating this model by the demands for a practical research design.

Assume we have a measure of income for all families (or households), an outcome measure for all children, and a measure that represents the social and economic characteristics of the neighbourhood for all these children and families.

Suppose there is a simple model that links these three measures:

$$\text{OUTCOME}_{ij} = b_{0j} + b_{1j} \text{INCOME}_{ij} + e_{ij} \quad (1)$$

Here j ($j = 1, 2, \dots, J$) represents the population of neighbourhoods and i ($i = 1, 2, \dots, N_j$) represents the population of children within neighbourhoods. (We will ignore the fact that some families have more than one child, and the clustering that this implies.) In other words, OUTCOME is affected by INCOME (together with other variables represented by e_{ij}). In addition, mean outcomes vary from neighbourhood to neighbourhood after allowing for the effects of income (represented by b_{0j}). Also, the relation between OUTCOME and INCOME can, in principle, vary across neighbourhoods (b_{1j}).

We also write:

$$b_{0j} = b_{00} + b_{01} \text{N_HOOD}_j + u_{0j} \quad (2)$$

In other words, variability in mean neighbourhood OUTCOME can, at least in part, be explained by one or more characteristics of the neighbourhood (N_HOOD). We will assume these characteristics can be represented by scales such as ID2000 (see Section 4.2.1) or mean income for the neighbourhood, INCOME_j . These measures vary from area to area but take the same value for all individuals in an area.

To complete the model, we write:

$$b_{1j} = b_{10} + u_{1j} \quad (3)$$

In other words, any variability between neighbourhoods in the relation (or slope) between OUTCOME and INCOME is, from our point of view, essentially random.

We want to learn more about the influence of neighbourhoods on child outcomes, represented by the size of b_{01} . There are, however, potential problems with this model even with population data. The problem arises essentially because families choose where they live (even though the choice may be very constrained for some) and these choice factors could well be related to OUTCOME. Consequently, it is always difficult to

know whether effects apparently due to neighbourhood are actually reflecting unobserved characteristics of individuals that happen to be correlated with neighbourhood variables.

For example, families choosing to live in (or move to) the catchment area of a school with a good local reputation are likely also to be families that put a high value on educational success for their children and so spend time and money on other educational activities. In other words, N_HOOD or, more generally, u_{0j} are endogeneous variables that need to be explained, rather than exogeneous variables that do the explaining. The best way of eliminating the endogeneity from the model is to include relevant family-level explanatory variables – sometimes known as instruments – in equation (1). So, to eliminate (or at least to reduce) the endogeneity arising from neighbourhood choices linked to schooling, we could include a measure of the family's attitudes about education. We do, however, have to be careful when using instruments, or control variables in this way because they imply that neighbourhood effects are just residual effects that cannot be eliminated by individual effects. Consider, for example, levels of air pollution. This is an area variable that is likely to affect health outcomes for children. If we include a measure of parental health in the model, we might eliminate the pollution effect. We could, however, be throwing the baby out with the bathwater by doing so if parents' health were poor *because of* air pollution.

It is not, of course, possible to estimate any of these models for the population. Instead, we must make do with sample data and the question then arises as to how useful different kinds of sample data might be.

A useful design is one that selects a sample of neighbourhoods and then selects families (or children) from each sampled neighbourhood, sampling being random at each stage. Then, with appropriate measures, the above model, which becomes a simple multilevel (here two level) model, can be estimated. A particular strength of this design is that different indicators of neighbourhood characteristics can be used - those that are generated by aggregating measures obtained from individuals (for example, perceptions of local crime); those that are measured at the neighbourhood level (for example, evidence of vandalism); and those that come from administrative statistics and other surveys (proportion receiving Housing Benefit, for example). One possible disadvantage of this design is that, to get accurate estimates of the neighbourhood effects (which, in turn, require reliable measures of the neighbourhood variables), a large sample of both neighbourhoods and individuals is needed.

When written down, the model looks just the same as the population model in equations (1) to (3) except that $j = 1, 2, \dots, J^s$ where J^s is the number of neighbourhoods in the sample, and $i = 1, 2, \dots, n_j$ where n_j is the size of sample of children in neighbourhood j . It is possible to extend the model in at least two ways:

- (1) if we know which services are being used by the family then we can add a further level to the model to represent services – most commonly schools – nested within neighbourhoods as not all children in a neighbourhood will necessarily attend the same school. Quality measures for these services can also be incorporated in the model. (Schools are nested within neighbourhoods in most sample designs but they are cross-classified with neighbourhoods in the population.)

- (2) if we know about all the neighbourhoods the child has lived in over time, or we know about changes in the same neighbourhoods, we can represent this in a dynamic model.

There is now an extensive technical and applied literature about multilevel modelling – see Plewis (1997) for an introduction and Goldstein (1995) for more advanced material.

Another design that has been used to estimate neighbourhood effects is as follows:

$$\text{OUTCOME}_i = b_0 + b_1 \text{INCOME}_i + b_2 \text{N_HOOD}_i + e_i \quad (4)$$

This is the model that has been used for studies that are not clustered (e.g. NCDS) and, sometimes, for surveys that are clustered but where the clustering is ignored in the analysis. The N_HOOD variable is often one that comes from an outside source - administrative data at the aggregate level, Census data, or, in principle, from another survey. Model (4) is the same as model (1) *except that*, using the notation of equation (1), $i = 1$ for all j so that, in (4), the sample size and the number of areas are the same (except for chance overlap).

A disadvantage of this model is that variability within neighbourhoods cannot be separated from variability between neighbourhoods. Consequently, we do not know whether, and to what extent, there is between neighbourhood variability in mean outcome to explain. A further disadvantage is that variables constructed as aggregates of individual responses cannot be used. Moreover, it is not possible to allow the relation between OUTCOME and INCOME to vary across neighbourhoods (the b_{1j} in (1)). All these disadvantages mean that it is difficult properly to specify the model and therefore any estimates obtained, both in terms of their size and their precision, are unlikely to be reliable.

On the other hand, it is now a relatively straightforward task to link aggregate data to postcoded survey data and so this design could throw up some clues about neighbourhood effects, especially if the variables used account for a substantial proportion of the between neighbourhood variability. But, as before, the proper specification of the model at the individual level is crucial.

Model (4) could be extended to include the interaction between INCOME and N_HOOD and, if this were important, it would indicate that the relation between OUTCOME and INCOME varies across neighbourhoods. However, a proper analysis of this kind of variation can only be obtained from a multilevel design, as in equations (1) to (3).

Sometimes inferences about area effects are made solely on the basis of aggregate data. The model is then:

$$\text{OUTCOME}_j = b_0 + b_1 \text{INCOME}_j + b_2 \text{N_HOOD}_j + e_j \quad (5)$$

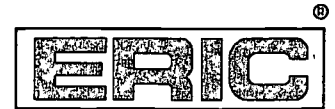
with j representing area and OUTCOME and INCOME measured, for example, as area means.

In a variant of this model aggregate data for INCOME (and N_HOOD) are linked to individual data for OUTCOME.

These models are attractive if only because they are often the only ones that can be estimated, given the availability of data. Estimates from them are, however, generally misleading because they seek to estimate processes which operate at the individual level by using data that applies only to aggregates. In other words, between individual (and between individual within area) variations are ignored. This leads to a set of problems, known collectively as the 'ecological fallacy' (and discussed by, for example, Freedman et al., 1991 and, less pessimistically, by Steel et al., 1996). We are not especially interested in the possibility that mean outcomes are better in high income areas. What we really want to know is whether child outcomes improve as family income rises and whether location makes a further difference, and we cannot infer anything about these processes from an association between mean income and mean outcome.



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