

SECTION 5

AN INTRODUCTION TO THE USE OF INDEXES TO MEASURE DEPRIVATION

5.1 Background

Although there is not a great deal of consensus on the meaning of deprivation, there is rather more agreement that it is a multi-dimensional phenomenon. Two problems ensue:

- ◆ The measurement problem: how to represent these different dimensions with a single measure.
- ◆ The problem of data availability: are there sufficient data sources for all the key dimensions.

Both problems are covered by this section, together with methods for evaluating indexes. This section focuses on measuring deprivation, [Section 7](#) gives a more general description of the structure and testing of indexes. More details of the indexes themselves are provided in [Section 6](#).

5.1.1 *Measuring a Multi-dimensional Phenomenon*

An *index* of deprivation will typically have several *domains* (or dimensions) covering topics such as income, health and housing. Within each of these domains there may be several *indicators* (or components), such as different types of claimant counts in the income domain. These indicators are combined, often by weighted addition, to produce domain scores; then the domain scores are summed to give an overall index score. The values of the weights are critical as they control the contribution each indicator makes to the overall score. There are various statistical methods for both determining the weights and for selecting suitable indicators, but such choices are often made by researchers and

policy advisors without recourse to statistics. More details can be found in [Sections 7 and 10.3](#).

Depending on the context, it may be desirable to present the domain scores as well as the overall scores, thus preserving an element of multi-dimensionality. Traditional indexes of deprivation mainly provide a single score, but separate domain scores are published for more recent indexes such as the Index of Multiple Deprivation-2000 and 2004.

5.1.2 Presenting the Results from an Index

Results from indexes are presented in many different ways. The options are discussed in more detail in [Section 10](#), but here are some of the main possibilities:

Raw scores. To say that an electoral ward has a score of – 25 on the Jarman Index is fairly meaningless, though the use of raw scores may be appropriate if the values are to be used in some sort of statistical analysis or modelling.

Percentiles and probabilities are more commonly used than raw scores. These results are often concerned with whether the score for a particular area lies within, say, the 10% highest or lowest groups. When making this type of judgement it is helpful if the index produces scores with a known statistical distribution as this can be used to estimate the probability of being in a certain range.

Rankings are a popular form of presentation. Areas are ranked to reach conclusions on, for example, what are the 10% most deprived areas. For this, one needs to know nothing of the overall distribution of all potential scores on the measure.

Abstract or interpreted? For most indexes the values have no direct or simple meaning, and differences between values cannot be given substantive interpretation. We cannot say that one area is twice as deprived as another because one has double the deprivation score of the other. There are a few exceptions when, because of their method of derivation, the values of an index can be directly interpreted. For example, the index described by Gordon and Forrest [190] are predictions of the proportion of people in a locality who meet the Breadline Britain criterion of poverty. The disadvantage with such interpretations is that they may be misleading and without periodic revalidation, one cannot be sure that they will remain correct over time.

5.1.3 What to Put in an Indicator of Deprivation

To understand what comprises an indicator of deprivation, one needs to address three basic questions:

- ◆ What is the nature of deprivation? Is it a state of ‘want’ – a predominantly ‘natural’ condition; or the result of a process in which something is withheld, or wherein people are excluded.
- ◆ What is the ‘content’ of deprivation, what do people lack, from what are they excluded, or what is being withheld? Classically, this is some form of income or wealth, but most contemporary approaches to deprivation cover a wider range of contents.
- ◆ Who or what is deprived? Is the focus of attention the individual; the social group (in some sense different from their constituent individuals); other social or quasi-social configurations, such as people of a certain ethnicity, religion or nationality; or, as is the case in some current social policy applications, a geographical area? The decision as to who or what may be deprived will influence the choice of components to be measured.

The extensive academic literature on theories of deprivation ([Section 11](#)) may help in making these decisions. There are also several empirical routes for defining deprivation, three of which are summarised below.

The *relative deprivation approach*: is survey based. Respondents are asked to specify which of a list of items they believe are essentials, and then asked whether or not they themselves have access to them. This approach, first used in Britain by Mack and Lansley [\[191\]](#), has been used in a number of industrialised countries and in at least one developing country [\[192\]](#).

The *attitudinal approach*: is also survey based, in which respondents are asked to estimate income levels which they consider ‘just enough to make ends meet’, ‘insufficient’, or on which they could only ‘manage with some difficulty’.

The *budget standard approach*: uses data about society’s current standards and patterns of behaviour and combines them into a detailed costing of the components of a minimally adequate level of living. All the budgets distinguish between what are called ‘budget standard costs’ which comprise food, clothing, personal care, household goods and services and leisure; and ‘variable costs’, which include housing, council tax, fuel, transport, NHS charges, insurance, debts/fines/maintenance orders, job-related costs, seeking-work costs, pets, alcohol, tobacco and charitable donations ([Box 19](#)).

5.1.4 Types of Data Source to Use in an Index

Until the mid-1990s, the lack of any official data set on income, wealth or means-tested benefits meant that it was impossible to analyse poverty or financial deprivation in the U.K. without either conducting special surveys or using proxies for poverty, such as car ownership, overcrowding and

Box 19**Two main versions of the budget approach**

- ◆ The first method was used by Seebohm Rowntree and, more recently, by the Family Budget Unit (FBU). *It endeavours to include and cost a family's whole purchase given the prevailing patterns of consumption amongst the poor. The FBU has attempted to cost all the components of a typical family budget in the 1990s, first at a 'modest but adequate' (MBA) level, then at a lower level, 'low cost but acceptable' (LCA). For LCA budgets, the FBU distinguishes between variable costs (like housing, fuel, transport and children) and standard costs over which the families have more control (like food and clothing).*
- ◆ The second method is used by the U.S. National Research Council Panel on Poverty and Family Assistance. *It restricts the budget to core items like food, clothing, utilities; the costs of which are rounded up by a multiplier.*

lack of amenities. Most attempts to measure deprivation made extensive use of proxy measures and the main source of data was the Decennial Census.

Many of the better known U.K. indexes of deprivation use Census data. However, non-Census data sources are increasingly available, especially data from the benefits system, such as claimant counts. These have the advantage of being regularly updated, and of measuring income (at least for the poorest groups) more satisfactorily than the Census proxies. A new generation of indexes are being developed that use combinations of Census and administrative data, or in a few cases, entirely administrative data. The pressure to include administrative data that can be regularly updated is particularly strong as indexes are increasingly used for resource allocation. Indexes that use census variables rely on data that can be a decade old.

There is a perennial problem of finding and acquiring data that address certain aspects of deprivation, especially crime, housing and the environment. Often these data are only publicly available at high levels of aggregation. Lower level data may be difficult to access in order to protect individual or commercial confidentiality and may be costly. Much data from national surveys are simply not available for small areas because the values are based on too few cases to be reliable. In fact, many interesting aspects of deprivation cannot be investigated at a sub-local authority level because of the lack of reliable small area data.

One of the main advantages of the Decennial Census is the capacity to deliver small area data. Data from the 1991 Census data for England and

Wales are available to both ward and ED level with two exceptions: certain tables are only included in the Local Base Statistics (LBS) set and not the Small Area Statistics (SAS) set (the LBS tables are only available down to ward level); and very small cell counts are 'Barnardised' in both series – in that -1 , 0 , or $+1$ are added randomly to cell counts in order to avoid any possibility of individuals or households being identified.

Results for the 2001 Census have been generated for local authority areas and wards, but a new lower level set of building blocks has been produced. These output areas (OAs) are constructed from contiguous postcodes to create areas with a target of 100–125 households. Their boundaries are drawn in order to maximise the homogeneity of populations within the OAs.

Much of the non-Census data being incorporated in deprivation indexes has not been collected with full postcodes (benefits data are an exception), and is only reported for larger areas than those to which most indexes refer. Some of the indicators in the Index of Multiple Deprivation-2004 (ODPM) suffer from this problem. Although ward level values are published for this index, not all of its components are based on data that are genuinely available at ward level. Various modelling or apportioning procedures have had to be used to estimate ward level values for these components.

5.2 Selecting an Index of Deprivation

There are a number of questions to bear in mind when choosing or developing indexes of deprivation:

- ◆ Does the indicator cover a suitable range of topics for its intended purpose?
- ◆ Do its component indicators and the associated data sources refer to the correct period in time?
- ◆ Are the components suitably transformed and what is the justification for any weights that are used to produce domain or overall scores?
- ◆ Have the properties of the instrument been tested statistically and are the results helpful in deciding on the appropriateness of the index for its intended purpose?
- ◆ Are there suitable data to compute index values for the intended application? If so, is it important that these are regularly updated?

5.3 The Properties of Deprivation Indexes

Methods for testing and evaluating indicators are discussed in detail in [Section 7](#). Reliability and validity are the two most often used in relation to indexes of deprivation, but neither are particularly easy to apply to these measures. Moreover, it is important to remember that passing various

statistical tests is no guarantee of the suitability of an index for a given application.

5.3.1 Reliability

Lee et al. [193] tested the reliability of a batch of Census-based deprivation indexes using the sample of anonymised records which provides a set of individual level data from the 1991 Census. As expected, they found that the instruments with the narrowest range of questions had the most statistical reliability. Four of the indexes had values of Chronbach's alpha of between 0.4 and 0.5 – the index with the widest range of content (the Jarman Index) returned a value of 0.05. The suggested optimum values are between 0.7 and 0.9 (the meaning of these tests are discussed in [Section 7](#)) [194]. For additional reading on statistical tests for reliability we recommend Streiner and Norman [195] and Nunnally [196].

Although such tests of reliability are helpful, it is unclear whether they should be used as the major criteria for comparing and choosing measures. Different applications address different notions of deprivation, thus measures may need to have different statistical properties. Questions to ask prior to statistical testing that will influence the interpretation of those tests, include: do we think that deprivation (for the purpose of the intended application) is uni- or multi-dimensional, and how far do we want the measuring instrument to reflect any multi-dimensionality? Having distinct dimensions within an instrument may increase the likelihood that values of the overall score will be sensitive to changes in values of the individual components, which not only increase statistical unreliability (the same measures score differently on two occasions) but may result in an overall volatility, undesirable for applications such as resource allocation.

5.3.2 Validity

Tests of validity try to judge whether an instrument measures what it should be measuring. Such tests therefore require a prior view of what should be measured. Typically, this will require decisions on which aspects of deprivation should be covered, what principle of deprivation is most relevant and whether the measures should apply to all people and places or only certain groups and areas. Having drawn up a specification for the measure, the tests for validity might then involve questions as:

- ◆ Does an index concentrate on social as well as, or instead of material dimensions?
- ◆ Is an index more appropriate to urban rather than rural areas? ([Box 20](#))
- ◆ Is an index biased towards certain age groups? ([Box 21](#))

Box 20**Rural or urban bias in an index?**

Most measures of deprivation focus on urban rather than rural phenomena. In the most extreme instances they include circumstances that are irrelevant to rural conditions, such as the proportion of children living in flats. The problems of deprivation in rural areas have been widely discussed and it has been argued that indexes for rural use should include categories such as transport costs and poverty amongst those in low paid employment. Also circumstances such as multiple car ownership have a very different meaning in rural and urban areas. The Oxford Group (Social Disadvantage Research Centre) have tried to include categories that relate to rural deprivation in their Index of Multiple Deprivation-2004 and the Welsh IMD. Items of particular interest are: access to a post office, large food shops, a GP, and a primary school.

Box 21**Youth or older age**

Several authors have noted that that some indexes tend to be less valid or reliable as measures of deprivation amongst older people. O'Reilly [197] notes that "the Acheson report acknowledged that there is a lack of routinely collected reliable data on social class or other markers of social economic status in people after the age of retirement". The dependence of most Census-based indexes of deprivation on measures such as class and unemployment partially masks the circumstances of older people. This is especially unhelpful when the indexes are being related to health or healthcare utilisation as to poverty and deprivation amongst older people, who have poorer health and higher healthcare use.

O'Reilly concludes that "many of the commonly used indicators of deprivation are poorly suited to studying inequalities in health in older people," and that the "uptake of income support offers many conceptual and pragmatic advantages over conventional indicators and demonstrates steeper social gradients at older ages than previously thought". Jones and Cameron [198]

So far we have mainly considered qualitative tests for validity. However, there are also statistical approaches, mostly of two types: those that test the index against an accepted measure of the phenomenon (criterion validity) and those that compute correlations between the index and phenomenon the index is intended to measure (construct validity).

Although there is considerable difficulty applying tests for criterion validity, two main U.K. indexes of deprivation, the Breadline and Jarman Indexes have been validated in this way. Lee et al. note that few of the other deprivation indexes used in the U.K. actually claim to have any systematic theoretical basis or to be explicitly validated against a theoretical model of poverty or deprivation [193].

They also explore construct validity by computing correlations between the 10 indexes they review and three factors – estimated mean earnings (based on the Census results for the distribution of occupations and the 1991 New Earnings Survey); under 64 SMRs; and standardised illness ratios (from the Census question on Limiting Long-term Illness (LLTI)). Based on largely statistical assessments, their main conclusions on reliability and validity were two-fold [193]:

- ◆ “Socdep, Breadline and Scotdep are, on average the most valid. Scotdep is the most accurate (in respect of the validating criteria), but is also the most unreliable”.
- ◆ “If the research demands the highest possible levels of accuracy, such as when to measure how many poor wards there are in a region then Scotdep is the best index. However, if a problem requires both a valid and reliable result, such as when trying to rank the poorest wards in a region, then Breadline is clearly the best index. If the research problem is just to look at a specific aspect of deprivation, then in this specialised case Socdep would be the best index to use”.

These are helpful judgements, but they need to be treated cautiously. As previously noted, reliability is not an unambiguously good property for an index of deprivation. Moreover, tests for validity, such as those used by Lee et al. only show that ‘valid’ indexes are highly (linearly) correlated with premature death, self-report illness and an indirect measure of income amongst the employed.

5.3.3 *The Index Becomes the Phenomenon*

As administrative data sources are becoming more widely available, they are encouraging a trend towards more extensive and complicated measures. As the differences between measures increase, the meaning of what they measure becomes increasingly important. Although they are ‘measures of deprivation’ it is unclear that they all address the same phenomenon, and it may be the differences are becoming more important than the similarities. Results can differ markedly when different measures are used for the same application – clearly a cause for concern if the application is resource allocation. Increasingly, it is important to understand why an index produces certain results. This is not always easy, given the

complexity of some indexes ([Sections 10 and 11](#) address the ways in which choice of indicators and study design can influence the results).

Although a proliferation of indexes may cause confusion, the domination by a single index may be equally undesirable if its definition starts to substitute for the meaning of the concept for which it is only an imperfect estimate. This tendency for a measure to appropriate the meaning of the construct is sometimes known as 'reification'. This tendency is common place, for example it is more common to say 'the ten most deprived local authorities', rather than 'the authorities with the top ten scores on the Index of Multiple Deprivation-2004'. Reification can have undesirable consequences – not least that users may forget to ask what the measurements mean and become less alert to the possibility of alternatives. This lack of conceptual scrutiny may encourage the assumption that the phenomenon being measured has some of the properties of the index. For example, if the devisors have decided to give a particularly heavy weighting to the housing components of the index, it may subsequently be assumed, from the results of using the index, that housing conditions are a key part of deprivation; or if an index includes a measure of the proportion in an ethnic minority population, that ethnicity and deprivation are inextricably linked. Several of these dangers are discussed in [Section 7](#).

5.4 Sources of Further Information – Reviews of Indexes and Their Properties

There are relatively few attempts to compare and contrast the various indexes. One of the more thorough exceptions is the previously mentioned study by Lee Murie and Gordon [\[199\]](#). It compares 10 indexes, considering their theoretical bases, their components, their methods of combination and the reasons why they may produce different results. It is an excellent source for anyone wanting more detail. Another useful reference prepared for the Policy Action Team (PAT18) is available from the Cabinet Office website and the South West Public Health Observatory site. A third paper by Carstairs and Morris [\[6\]](#) compares the properties of Scotdep with several other Census-based indicators.

The guide to the ONS Classification of Local and Health Authorities of Great Britain is another excellent source of material on methods of area classification. It is available from the National Statistics website.

5.5 Conclusion and Summary of Key Issues Concerning Indexes of Deprivation

Measurements of inequality are often based on indexes of deprivation, but using indexes is not as easy or straightforward as many would like to believe. There are a number of key issues surrounding their use:

- ◆ Different indexes of deprivation may not be measuring the same thing.
- ◆ Although there are different theoretical definitions of 'deprivation', few of these have been used as the basis for specific indicators.
- ◆ Indicators tend to be built from patchy components, because they are limited to what data are actually available.
- ◆ There is a risk of 'reification' when an indicator is widely used, especially when it becomes the standard.
- ◆ Some existing indicators are biased towards urban conditions, and may discriminate against elderly people.
- ◆ Indexes cannot always all be computed for small area bases.
- ◆ There is a tendency to reduce reliance on data from Decennial Censuses in favour of data from administrative sources and more frequent surveys, making historical comparison difficult.