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Deprivation indicators

Introduction

This article outlines the work on the deprivation indicators prepared for the *Index of Deprivation 2000* (ID 2000) and the *Welsh Index of Multiple Deprivation* (Welsh IMD)[1]. These indices moved away from using census data to provide indicators and, instead, exploited new sources of information, such as administrative data and schools data. The indices are underpinned by a clear conceptualisation of multiple deprivation and use robust statistical techniques to prepare the data. The stages of choosing indicators, preparing the indicators and constructing the indices are outlined below. The use of such indicators serves to substantially enhance the measurement of deprivation at a small area level. ■

Poverty and multiple deprivation

Indices of Deprivation 2000 and the *Welsh Index of Multiple Deprivation* follow a series of deprivation studies that measure 'multiple deprivation' at the local level. The examination of multiple deprivation in contrast to the focus on individual issues of concern, such as poor health or education inequalities, is part of a wider debate on the nature of deprivation. Though 'poverty' and 'deprivation' have often been used interchangeably, many have argued that a clear distinction should be made between them. Both Atkinson and Townsend have conceived of a difference between the lack of resources which constitutes poverty and the lack of the social and other goods which constitute deprivation.[2] Townsend also lays down the foundation for articulating multiple deprivation as an accumulation of single deprivations. Recent indices have developed this concept, and included income deprivation, conceived of as a deprivation in its own right, as well as a proxy for the lack of material goods and as a driver of multiple deprivation.

This conceptualisation builds on the idea of 'domains' of deprivation, first presented in the 1991 Index of Local Conditions (1991 ILC). The new indices advanced this notion, by measuring each 'domain' independently using the best indicators available to generate a score or domain index for each aspect of deprivation. The availability of new data has allowed these 'domains' to be described with more precision, and in a more robust and consistent way than has been possible before. ■

Area level deprivation

In looking at the spatial distribution of multiple deprivation the ID 2000 and Welsh IMD are in line with most other area based approaches which accommodate the reality of varying combinations of deprivation and disadvantage in different types of areas.[3] Measuring different aspects of deprivation and combining these into an overall index raises a number of questions about the links between different forms of deprivation at the individual, household and area level. Presenting the deprivation findings at an aggregate area level will in any situation combine deprivations experienced by many different groups within that area. ■

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Domains of deprivation

The domains must aim to capture each of the dimensions of multiple deprivation, as far as these dimensions can be agreed. In the ID 2000 and the Welsh IMD the domains were:

- income deprivation
- employment deprivation
- health deprivation and disability
- education, skills and training deprivation
- housing deprivation
- geographical access to services.

Ideally, the domains of 'crime and social disorder' and 'physical environment' would also be captured but sufficient robust data was not available for either domain in England or Wales.

Each domain provides information about particular aspects of deprivation as well as contributing to the composite measure of the main index. Thus the employment domain captures exclusion from the world of work and conditions of work – not the low income that may flow from it. This approach avoids the need to make any judgments about the complex links between different types of deprivation (for example the links between poor health and unemployment), and enables clear decisions to be made about the contribution that each domain should make to the overall index of multiple deprivation. While the domains represent distinct dimensions of deprivation, it is perfectly possible, indeed likely, that the same person could be captured in more than one domain. ■

Criteria for indicators

Each domain index contains a number of indicators. The criteria for these indicators were that they should be:

- 'domain specific' and appropriate for the purpose (as direct as possible measures for that form of deprivation)
- measuring major features of that deprivation (not conditions just experienced by a very small number of people or areas)
- up to date
- capable of being updated on a regular basis
- statistically robust
- available at a small area level for the whole of the study area (England or Wales).

There is no 'perfect number' of indicators to include within an index, but the intention was to include a collection of indicators to comprehensively capture the deprivation for each domain, given the constraints of data availability. ■

Data

The ID 2000 and Welsh IMD are based on up to date indicators derived from a variety of sources. This contrasts with previous indices which were largely census based. The 1991 Census data is nearly ten years old and cannot be considered to be the most up to date or appropriate information at a local level. The new indices have pioneered the use of small area administrative data for measuring deprivation. As well as being out of date, census data does not measure directly many aspects of deprivation. Previous indices have thus used 'no access to a car' as a proxy for low income. Using administrative data to measure, for example, income deprivation, overcomes the problem of the use of 'proxy' indicators from the census, such as car ownership. The latter is a poor measure because it does not take into account for example, the greater need for a car in areas with poor public transport. Similarly, proxies for educational deprivation, such as 'free school meals', have been supplanted by data which more directly measure educational disadvantage by examining the outcomes, educational results, rather than confusing a measure of education deprivation and low income. Children in families in receipt of means tested benefits (who are eligible for free school meals) are more directly measured in the income domain using administrative data.

Administrative data also has the considerable advantage that it can be frequently updated. In contrast, the next census data will not be available until 2003. By using administrative data each index can become 'dynamic' and updateable, which will greatly improve the measurement of

changing spatial patterns of deprivation over time.

The indicators that were included in the ID 2000 and Welsh IMD were constructed using a range of techniques. Some of the data was obtained at individual level and aggregated to ward level (to Electoral Division (EDiv) level in Wales); some was obtained at other levels (for example, school level data) and then reliably 'modelled down' to ward or EDiv level.

The first stage in the production of figures that would allow a fair comparison between areas and an appropriate combination with other indicators, was the conversion of indicators on to a common metric. This allows risks that apply to different groups within an area, for example, the number of economically active people receiving Incapacity Benefit, to be compared without their relative magnitudes being purely a function of the size of their population at risk. Generally, the indicators for the ID 2000 and the Welsh IMD were converted into rates that are a standard form of measurement which allow areas of widely different size to be compared. This avoids the problems of the 'signed chi squared' technique used in the 1998 ILD, which has been much criticised for its use in this context because it conflates population size with levels of deprivation, thereby unfairly disadvantaging smaller areas.[4] ■

Denominators

An important implication of basing indicators on rates is the need for appropriate denominators. This is a crucial issue because even where small area data are available to form the numerator for a rate (for example, the number of people receiving particular benefits) it is a significant task to derive the appropriate denominator. In the inter-censal period there is no 'gold standard' for sub-local authority population estimates. As part of the ID 2000 project, a set of population estimates were generated at ward level for the whole of England, using innovative techniques and involving extensive consultation with local authorities. In Wales, the NHSAR (National Health Service Administrative Registers) counts were used for the EDivs. ■

Creating robust indicators

As well as having to meet the criteria listed above, it was also important to ensure that the indicators were robust when producing ward/EDiv level scores. A statistical technique called 'shrinkage estimation' is designed to deal with the problems associated with small numbers in a ward/EDiv which would otherwise cause the score to be statistically unreliable. This makes the unreliable ward/EDiv scores more robust by 'borrowing strengthí'from the district mean (which may be more or less deprived). In practice, shrinkage only has a measurable impact where the population at risk is small. This is because the standard errors are more likely to be large in areas with small populations. This technique was applied to those domains where the standard errors of the indicators were large enough to warrant using the procedure. The ward/EDiv scores produced by using this technique could be more deprived or less deprived than the 'unshrunk' score. ■

Combining indicators

In the employment and income domains it was possible to identify individuals who are deprived in terms of the domain definition. The number of deprived people were simply summed and divided by a suitable denominator to create an area rate. Where it was not possible to construct a simple rate, a statistical procedure – factor analysis – was applied to the domains. Factor analysis was used to identify the weights for each indicator. Weighting always takes place when elements are combined together. Thus, if items are simply summed together to create a domain this means they are given equal weight. It would be incorrect to assume that items can be combined without weighting. The domain score is therefore a combination of the component indicators weighted according to the factor analysis results. ■

Using administrative data to measure, for example, income deprivation, overcomes the problem of the use of 'proxy' indicators from the census, such as car ownership. The latter is a poor measure because it does not take into account for example, the greater need for a car in areas with poor public transport.

Footnotes

1. See M. Noble, B. Penhale, G. Smith, G. Wright, C. Dibben, T. Owen and M. Lloyd Indices of Deprivation 2000 Regeneration Research Summary no.31 (DETR 2000), and M. Noble, G. Smith, G. Wright, C. Dibben, M. Lloyd and B. Penhale Welsh Index of Multiple Deprivation (National Assembly for Wales, 2000)

2. See P. Townsend, 'Deprivation', Journal of Social Policy, 1987, vol. 16, part 2, pp. 125-146, and A. B. Atkinson 'Social Exclusion, Poverty and Unemployment', in A. B. Atkinson and J. Hills (eds.) Exclusion, Employment and Opportunity (1998, London School of Economics Centre for Analysis of Social Exclusion), pp 1-20

3. See the pioneering work of Richard Webber in Liverpool in the 1970s – Webber, R. J. (1975) Liverpool social area study 1971 data: final report, London: Centre for Environment Studies

4. See C. Connolly and M. Chisholm, 'The use of indicators for targeting public expenditure: the Index of Local Deprivation', Environment and Planning C: Government and Policy (1999) vol. 17, pp 463-482

Combining domain indices into an overall index of multiple deprivation

Once the domain scores for every ward/EDiv were calculated, these were then combined into an overall index of multiple deprivation. As with the indicators, the domains cannot be simply added because they are not all on the same scale and, to combine the domains, they were converted or standardised to a uniform metric. This was achieved by ranking the domain scores. The distributions can now be said to be on the same metric or 'standardised'. Having standardised the domains, they were 'transformed' to ensure that each domain is transformed to a common distribution. This is necessary because, if domains with different distributions are combined, this would result in misleading results, with some domains having unanticipated disproportionate effects on the overall index score. Transformation is also necessary so that a desired degree of 'cancellation' can be introduced when combining the domains. This means that when combining domains, the deprivation in one domain is not fully 'cancelled out' by lack of deprivation in another domain. Having considered other options, it was decided that the exponential transformation of the ranks was most suitable for this purpose.

The exponential transformation method has the advantages that every domain is converted to an identical distribution with the same maximum and minimum values, while emphasising the most deprived 'tail' of the distribution. ■

Domain weights

Combining domains to form an overall ward/EDiv level index of multiple deprivation involved selecting weights for the domains. It was considered important to ensure that weights for each domain were explicit. From the outset, it was proposed that the income and employment domains should carry more weight than the other domains, a position supported by academic literature and by respondents to the consultations. It was therefore inappropriate to simply sum the domain indices because this would have given each domain index equal weight in the procedure. It was also proposed that the most robust domains should carry the most weight. This means that the contribution of each domain to the overall index of multiple deprivation varies. ■

Index geography

The ID 2000 and Welsh IMD are both constructed at the smallest local authority level for which there are appropriate and robust denominators; that is wards in England and Electoral Divisions in Wales. The index could not be generated at a smaller geographic level, such as Enumeration Districts in England, because of the lack of up to date denominators below ward/EDiv level. Though the population of wards/EDivs is very variable, the differences are much smaller (in absolute terms) than between local authorities. The focus on wards/EDivs therefore strengthens the case for measures of the intensity of deprivation which are independent of population size (such as percentages) since there is less need to take account of gross differences in the population size of areas.

Each of the X indices can be presented at other spatial levels, as long as these are made up of whole wards. In the ID 2000 six district level summaries of the ward level Index were presented. Other useful summaries could focus on parliamentary constituencies, health authorities or regions. It is important to note that there is no one way of presenting the ward/EDiv level information at these levels, and that each summary measure adds to the understanding of the complex geography of deprivation. The ward/EDiv level indices as they stand present a substantial improvement in the measurement and analysis of the spatial distribution of multiple deprivation, based on robust and up to date indicators. ■