

# The Department of Environment's Index of Local Conditions: Don't touch it

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Government departments, academic researchers and local authorities regularly create summary measures by which to compare local areas' social conditions. These are usually a combination of single variables which each purport to measure something about an underlying social characteristic which the user is interested in but has not measured directly.

The Index of Local Conditions (ILC) is one such summary measure that applies to local areas within England. It was commissioned for a particular purpose - the targeting of resources to local organisations in line with government regional policy. It has however become more widely used and is often quoted as *the* government index of deprivation. The commissioning Department of the Environment (DoE) has done nothing to dissuade users of this general status.

This article argues that the technical construction of the ILC is in one way, that of using the chi-squared statistics, particularly suited for its original purpose, that of *targeting areas* to resource. But as a result of this and other reasons it is quite unsuitable for setting *the amount of resources* each area should receive, or for acting as a *surrogate for social conditions* in analyses of health, policy or other outcomes.

## How is the ILC calculated ?

As applied to local authority district areas, the index is the sum of 13 transformed percentages, each being the logarithm of the chi-square statistic for a percentage of people having a characteristic associated with deprivation. More precisely, the score for an area is:

$$\sum_{i=1}^{13} (\text{sign of } (p_i - \pi_i)) \ln \left[ \frac{(p_i - \pi_i)^2 n_i}{\pi_i (100 - \pi_i)} + 1 \right]$$

where *i* indexes the thirteen indicators:

Unemployed adults; overcrowded households; people lacking amenities (sharing toilet or a bath or shower with other households); children in flats; children in low-earning households; households without a car; 17 year olds not in education; standardised mortality; insurance area weightings; derelict land; low GCSE attain-

ment; income support; long-term unemployed.  $p_i$  is the area value on indicator *i* expressed as a percentage.  $\pi_i$  is the England value on indicator *i*.  $n_i$  is the area denominator on indicator *i*.

The ILC was commissioned by the DoE from Manchester University Geography Department. The authors Brian Robson, Michael Bradford and Rachel Tye provided the DoE with indices for Districts, wards and Enumeration Districts within each District, and further indices of different geographical measures of the extent and intensity of deprivation (DoE, 1995). But the main 'degree of deprivation' was disseminated first and has been used most widely. It is this index for each local authority District that is referred to as the ILC in this article.

## Three applications of the ILC in practice

These three applications will be reviewed again later, to see whether their needs are properly met by the construction of the ILC.

### (a) To distribute the Single Regeneration Budget

The ILC was created to update the targeting of Urban Programme monies from central to local government, but the Urban Programme was abolished while the ILC was being created. After a name change from the Index of Urban Conditions to the Index of Local Conditions, it was used to target the new government Single Regeneration Budget which amalgamated 15 previous budgets with varying purposes from land reclamation to estate refurbishment to social community projects. The new fund is competitive and open to bids from outside local authorities, but a low rank on the ILC is a stated criterion for successful bids.

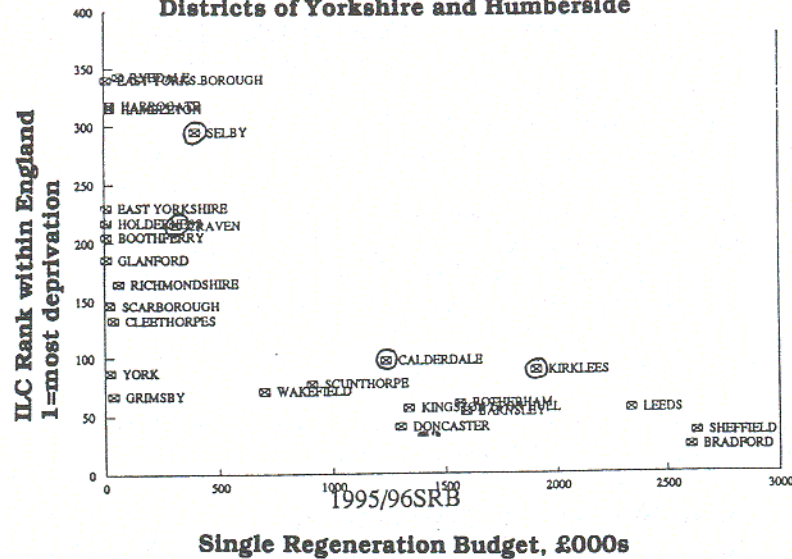
The strong relationship between the ILC and successful bids in the Yorkshire and Humberside region is shown in Figure 1. Only Selby, Craven, Calderdale and Kirklees, all Districts with hung Councils at the time that the successful bids were announced, did significantly better than their ILC rank would indicate.

The ILC is now being used by the Lottery Board, the Sports Council, and many others as a screening device to target other limited funds that projects compete for. European Community funds are also restricted to areas prioritised in England, on the basis of the ward version of the ILC.

### (b) As a contextual variable to explain the geography of mortality

Frances Drever and Margaret Whitehead have recently published in *Population Trends* 82 an article that shows how mortality levels are closely related to deprivation as measured by the ILC. They show this relationship for different age groups, for males and females separately, and identify Districts whose ILC score and mortality do not conform. A linear relationship was not found: mortality penalties are greater in the highest half of the deprivation rankings.

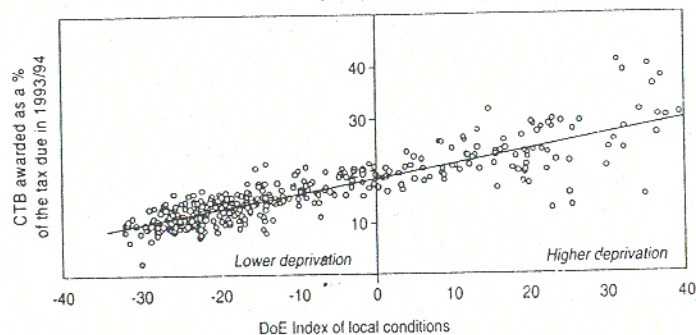
**Figure 1 Deprivation Index rank and SRB Budget Districts of Yorkshire and Humberside**



**Figure 2**



**THE TAKE-UP OF COUNCIL TAX BENEFIT**  
In England, even for like authorities, take-up varies by +/-5%



Source: Audit Commission analysis of DoE data; position as at year end, tax due is net of Transitional Relief

(c) As a contextual variable to measure the performance of local authorities

In 1994 the Audit Commission published its report on the first year's operation of the Council Tax Benefit. It includes a plot of the total Council Tax Benefit awarded as a percentage of the Tax due in each District, against the ILC score (reproduced as Figure 2). The plot shows that, in general, the benefit awarded increases with deprivation as measured by the ILC.

The report went on to list key questions for local authorities, on the assumption that benefit awarded *ought* to be in line with the ILC score. The second and third questions were:

“2. Is the value of benefit awarded as a percentage of the tax due less than might be expected given the area's circumstances ie is it less than:  $18.6\% + (0.3 \times \text{index of local conditions})\%$ ?” [the regression line from the figure]

“3. Is benefit take up low? If so, check for:

- measure to encourage take-up
- speed of processing compared to the statutory 14-day target backlogs of correspondence.”

So the auditors will be checking to see that appropriate investigative action has been taken if the ILC score indicates the authority as a poorly performing one. Their focus is on the residuals from a predictive regression, with the ILC the only explanatory factor. All residual variation is laid at the door of the local authority to investigate.

**Three purposes of deprivation indices**

(a) To identify priority areas of concentrated need in order to target limited resources

This is the purpose for which the ILC was created.

(b) To distribute funds according to the need within each identified area

As we shall see, this should lead to a differently constructed index of deprivation from that which identifies the areas.

(c) To describe social characteristics of areas that will account for variation in other variables

This is the purpose of the second and third examples above.

**How should the construction of an index of deprivation be appropriate to its purpose?**

This is a rather important question, but not well addressed in the literature. A recent, worthwhile comparison of existing indices searches for a single best index of deprivation, regardless of purpose (Lee, Murie, and Gordon).

There are three ways, at least, in which the construction of an index should reflect its purpose:

*Choice of variables, and their weighting.* The index should be composed of variables that really do measure the aspect of deprivation that the user is interested in. The choice may be validated by a survey of interested parties, or by factor analysis whose dubious relevance is not explored this time. The choice of variables more usually resembles a concoction of those that are both available and are thought by the index-makers to be relevant on face value. The ILC can be strongly criticised for the inclusion of some variables, such as the percentage of children in a District who live in flats, which seem to have less to do with deprivation than with ensuring that London boroughs and coastal resorts gained a more deprived score than they otherwise would have achieved.

*Transformation and standardisation.* Before combining the component variables, extreme values may be reduced or all variables brought to the same scale. The extreme method of achieving this is to use the District's rank on each variable instead of its value, after which the distribution of each variable can be made exactly normal. It is not clear to me, nor to some others (Martin et al, 1995) why component variables should be transformed at all, at least not when distributing resources between a fixed set of areas: then large numbers and extreme values should be rewarded with appropriately large resources.

For the ILC, the logarithm of each variable was taken. This much reduces the variation at the extreme ends of each variable, which were originally very skewed. One effect of the logarithmic transformation is to make a 1% change near the average more important to a District's ranking in the ILC than a 1% change further from the average. In other words, the 1000th extra unemployed person is less important than the 100th extra unemployed person, but there is no justification for such a bias. Chris Connolly of Durham County Council made this point and others about the arbitrary treatment of variables in the ILC. He also points out that one of the ILC variables, Standardised Mortality Ratio, is already transformed in a way that results in a low variation between areas and therefore a weight in the ILC only one third that of other variables (Connolly, Bounds and O'Sullivan, 1994, in BURISA where adjacent issues also had good discussion of the ILC).

*Choice of raw count, percentage, chi-squared or other representation of a variable.* This choice is not an obvious one, and is highlighted now because the ILC is the first government index of social conditions not to use the percentage.

The discussion here is a condensed from Simpson, 1996. The choice to be made and why it is important is best made clear with an example.

Table 1 shows the values of two of the ILC component variables, those households without a car and those residents in households lacking a toilet or bath/shower (or sharing them with at least one other household), labelled 'lacking amenities'. These two variables are commonly used in other indices of deprivation, though they may not always indicate lack of money.

The second row, labelled O, shows the number of households without a car, not expressed as a percentage but as a raw count. It is much bigger in Leeds simply because Leeds is a much bigger District than Great Grimsby. When *distributing* resources, it is sensible to consider the count of people affected. Leeds District should receive far more resources than Grimsby District, because while their social conditions may be similar, Leeds has more people in it.

**Table 1: Count, percentage and chi-squared: an illustration**

	Leeds	Great Grimsby	England
Number of households (n)	280,845	35,419	18,683,337
Numbers of households without a car (O)	116,134	15,522	6,058,602
As a percentage of all households (p)	41.4%	43.8%	32.4%
Signed chi-squared ( $\chi^2$ )	10,207	2,099	0
Number of residents in households (n)	672,769	89,389	46,337,368
Residents in households lacking amenities (O)	4,090	490	503,194
As a percentage of all residents (p)	0.61%	0.55%	1.09%
Signed chi-squared $\chi^2$ )	-1,431.0	-240.7	0

The percentage of households without a car is by contrast a little higher in Grimsby, 43.8% compared to 41.4% in Leeds. In the example of comparison with mortality rates, this percentage is relevant, because mortality rates are also standardised so that the size of population is irrelevant. Equally in explaining the percentage take-up of Council Tax Benefit, the higher percentage lacking a car in Grimsby is relevant inasmuch as it indicates a higher average level of low income.

But the purpose of the ILC originally was not to decide how much money each area should receive, nor to describe the average level of deprivation in each area, but to indicate which districts should be identified as having most concentrated deprivation within them. The absolute number does not do this, since a large number of deprived people may be spread thinly over a large District. The percentage does not do it either, because a relatively low percentage in a large area as in Leeds compared to Grimsby may mask very large pockets of deprivation. For example, there is more than one area within Leeds District that has similar population to Grimsby District but considerably higher percentage without a car: using the percentage in an index to identify concentrations of deprivation would wrongly pass over Leeds in favour of Grimsby.

What is the answer, if neither count nor percentage are good for prioritising areas for funding? The simple answer is that if you have data for smaller areas, as exists in the census, one should use those data to search explicitly for compact areas with highest level of need. But there were no data for smaller areas for some of the ILC variables, such as derelict land and income support. So the ILC uses District data, and sought to balance the count of people deprived with the percentage deprived, by computing the chi-squared statistic.

This is

$$\chi^2 = \sum_{i=1}^c \frac{(O_i - E_i)^2}{E_i}$$

which for  $c=2$  categories (deprived, not deprived) reduces to something easier to compute and comprehend

$$\chi^2 = \frac{(p - \pi)(p - \pi)n}{\pi(100 - \pi)}$$

with the notation as above. What distinguishes between areas is indeed the product of the percentage deviation from the national value,  $(p - \pi)$ , and that deviation expressed as an absolute number,  $(p - \pi)n$ . Table 1 shows that Leeds is considerably higher than Grimsby District when the chi-squared score is calculated in this way, in spite of its slightly lower percentage without a car. Districts below the national mean are given negative values (thus the 'signed chi-squared'). The chi-squared statistic is used because it provides a conven-

ient computational form for a practical problem. One needs to remember that its use here has no justification in statistical theory.

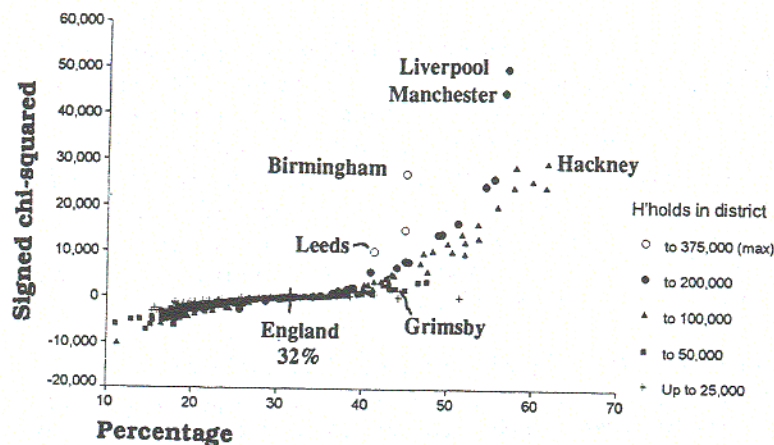
Figure 3 shows that the larger districts are pushed further from the national mean than they would be had percentages been compared. *For identifying Districts which probably have large concentrations of need, the chi-squared statistic has achieved a sensible compromise between count and percentage.*

There are two drawbacks. First, this approach is useless for distinguishing between areas of low deprivation. The larger of two areas with equally low percentage scores will be pushed further *below* zero in spite of having more people affected (as in the second half of Table 1). Second, the ranking of areas on this score is affected by the choice of reference percentage  $p$ . For example, if either Leeds or Grimsby had performed this analysis and decided that they would use themselves as the reference and compare all other Districts to their own level of car ownership, then Grimsby would have a higher signed chi-squared score than Leeds.

Neither of these drawbacks affect the initial purpose of the ILC, to identify just those Districts with the highest concentrations of deprivation, to target regeneration programmes. But the incorrect ranking of low-deprivation areas (which the authors have acknowledged in the BURISA discussion, but the DoE has not), does have big implications for other uses of the index.

**Figure 3: Percentage and signed chi-squared statistic**

**Households without access to a car  
366 Districts of England**



**Percentage: England 32.4; mean 28.9; St.Dev. 10.4; skewness 0.93**  
**Signed chi-squared: England 0; mean 475; St.Dev. 6,370; skewness 4.05**

### Three examples revisited, with specific reference to the use of the chi-squared measure in the ILC

#### (a) The Single Regeneration Budget

As far as identifying areas of concentrated need, I have argued that the balance of count and percentage in the signed chi-squared was appropriate in the ILC.

#### (b), (c) Explaining variation in mortality ratios and in percentage Council Tax Benefit take-up rates

Both these applications establish a relationship between their subject matter and deprivation: but any index of deprivation would have done this! The rub is that they go on to invite an investigation of the departures from that relationship.

In the case of the Audit Commission's report on Council Tax Benefit, Councils are asked to act on the basis that they may be failing if their benefit take-up is less than indicated by their Districts ILC value. Since the ILC value is determined partly by the size of the District which has no relation to those eligible for benefit, and since we have seen that the ILC ranks low-deprivation areas wrongly. This is downright misleading. Inasmuch as Councils and auditors have taken it seriously, it has led to complacency in some areas which are not doing as well as others where resources have now been spent on investigations into supposedly low benefit take-up.

There are many other criticisms which one could make of this use of an index as a contextualising variable for performance measurement: the irrelevance of many of the variables in the ILC to benefit take-up, the role of random variation in creating residuals, and the exclusion of other variables from the regression model that might have explained those residuals.

#### Other indices

There are in fact a plethora of social indices which could all be seen as an index of deprivation. There are six within the DoE itself! A listing of them by the Association of Metropolitan Authorities was prompted by their concern at the lack of consistency between government departments:

*Used for targeting funds:*

ILC: Index of Local Conditions (DoE)  
Welsh index of deprivation (Welsh Office)  
Scottish index of deprivation (Scottish Office)

*Used for distributing funds:*

(a) Standard Spending Assessment:  
Additional Educational Needs Index (DoE)  
Economic index (DoE)  
Social index (DoE)

(b) Housing grants:  
General Needs Index (DoE)  
Housing Needs Index (DoE)  
Welsh Housing Needs Index (DoE)

(c) Health Service:  
Jarman index

In academic research other indices of deprivation are used, for example these examined by Lee, Murie and Gordon (1995):  
Townsend  
Carstairs and Morris  
Forrest and Gordon (two)  
Breadline  
Oxford

## Conclusions

The Index of Local Conditions was designed for a specific purpose, that of identifying which local authority areas should be prioritised for receipt of government regeneration funds. Its construction is more suited to that purpose than the use of either raw counts or of percentages would have been.

However, the logarithmic transformations were harmful to its purpose; the choice of variables owes as much to a process of political manipulation as to a serious exercise in measurement of need; it ranks wrongly areas of low deprivation; and the ranking of areas is dependent on the reference area chosen.

The ILC is specifically not suited to two general classes of purpose: fixing the amount of resources to be distributed between areas, and use as a contextual variable to account for the percentage level of another variable. Its use in this way is wrong and harmful. Researchers looking for an index of deprivation should not touch the Index of Local Conditions, unless they wish to play politics to win corn for areas with which their own income is associated.

The Division of the DoE which commissioned the ILC is a policy one apparently without statistical skills. It commissioned the ILC with one policy in mind (the Urban Programme), which the government had changed (Single Regeneration Budget) by the time the commission was completed. Perhaps they are pleased with the general usage that the index has gained itself. Perhaps they are not being intentionally misleading by not giving any advice on its use.

But why use an index of deprivation at all in social analysis? This article has not addressed the use of indicators in general, which Radical Statistics has criticised in the past (1978, 1994). Perhaps others will take up that theme in future issues.

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