



## Technical Guide

# Assigning Deprivation Categories

## Assigning areas to deprivation categories (quantiles)

Rather than producing outputs for large numbers of individual areas, we often want to group these small areas into categories for analytical purposes, such as into **deprivation quintiles or deciles**. This document defines a standard approach for assigning small areas to deprivation categories to ensure that a consistent method is applied across PHE.

## Defining the categorisation geographies

It is important to understand that there are always two levels of geography to consider when assigning areas to deprivation categories:

- the small area '**base**' geography for which deprivation scores are available – these are the areas that will be grouped up into deprivation categories
- the '**higher**' geographical area or areas within which separate deprivation categories are required.

## Base geography:

Deprivation categories are most commonly assigned using IMD2015<sup>1</sup> scores. These are published at LSOA level so it is possible to group LSOAs into deprivation categories based on IMD2015 scores. Similarly, IMD2015 scores are calculated and published at local authority level using average population-weighted LSOA scores, making it also possible to group Local Authorities into deprivation categories based on IMD2015 scores.

<sup>1</sup> Indices of Multiple Deprivation 2015

## Higher geography:

**National deprivation categories** are produced when all of the base geography areas across England are grouped into a single deprivation classification. In this case the higher geography is England. A national deprivation category assigned to any small area indicates how deprived that area is **relative to England** as a whole. At a national level, there will be an equal number of base geography areas in each deprivation category, but the distribution of deprivation categories within any sub-national geography is likely to be skewed.

**Local deprivation categories** are produced when all of the base geography areas across England are grouped into separate deprivation classifications for each sub-national area, eg Local Authorities. In this case the higher geography is the sub-national geographical level. These are often referred to as 'within-area' deprivation categories. A local deprivation category assigned to any small area indicates how deprived that area is **relative to other small areas within the same local area**. At the local level there will be an equal number of base geography areas in each deprivation category, but the deprivation score thresholds that divide the deprivation categories will differ between local areas. As a result, **comparisons of the deprivation categories are only viable within local areas and not between different local areas**. For example, 20% of small areas within any local authority will fall into the most deprived within-LA deprivation quintile irrespective of whether that local authority is more or less deprived than the England average (see Figure 1).

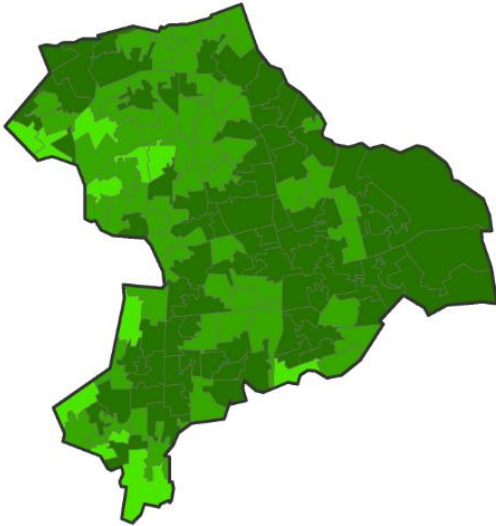
## Demonstrating the difference between national and local categories

Figure 1 shows how the assignment of national and local deprivation categories to LSOAs can produce very similar or very different results for a specific area. The overall level of deprivation in Bury local authority is similar to the England average, with LSOAs spread evenly across all five national deprivation quintiles. As a result, the assignment of its LSOAs to national and local deprivation quintiles is almost identical.

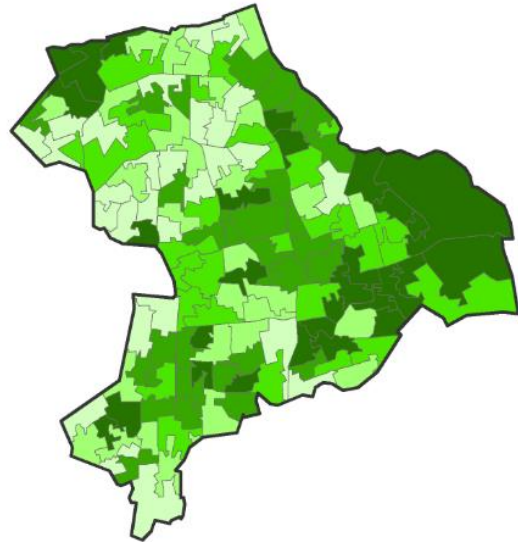
In contrast, over 50% of LSOAs in the relatively deprived local authority of Hackney fall into the most deprived national deprivation quintile and there are no LSOAs in the two least deprived quintiles. However, Hackney still has an even spread of LSOAs across local deprivation quintiles as these ignore the rest of England and simply show the spread of deprivation within this local authority.

**Figure 1**

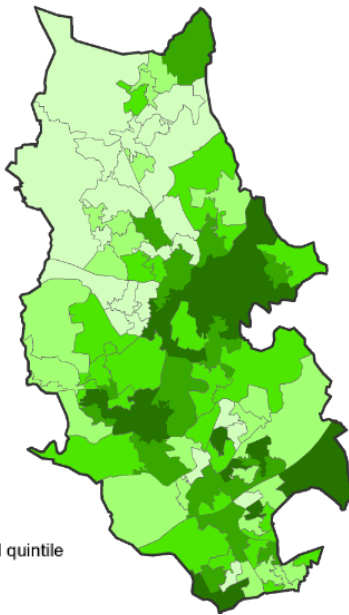
**Hackney LSOAs by National IMD2015 Quintile**



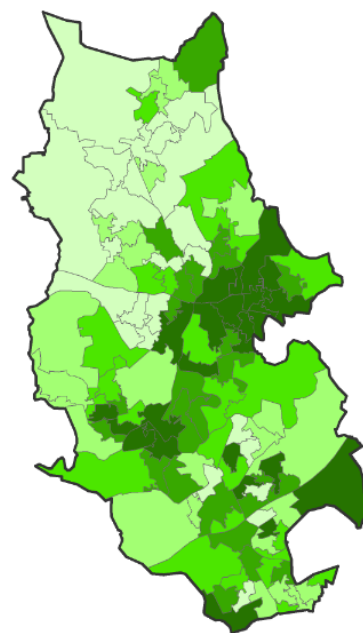
**Hackney LSOAs by Local IMD2015 Quintile**



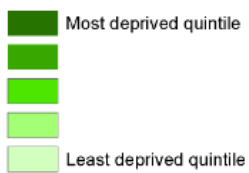
**Bury LSOAs by National IMD2015 Quintile**



**Bury LSOAs by Local IMD2015 Quintile**



**Legend**



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## Appropriate use of national and local deprivation categories

There are advantages and disadvantages in the use of both national and local deprivation categories. Local categories can provide a robust means of measuring inequalities within areas, but they limit how comparisons can be made between local areas because the most deprived quintile within a local authority in the south east of England is unlikely to have a similar level of deprivation to the most deprived quintile within a local authority in the north.

If national deprivation categories are assigned then categories in different areas will have similar levels of deprivation, facilitating comparisons between areas. This method does however often result in unequal distributions of populations between the deprivation categories within areas. Many local authorities, for example, have none of their population living in either the least or the most deprived national quintile of LSOAs, and in some areas, the majority of the population is found in just one quintile.

## Use of deprivation categories in PHE products

Table 1 shows the methods used to calculate the deprivation categories used in some of PHEs key products and online tools.

**Table 1**

Source	Method	Example
PHOF Indicators 0.2i – 0.2vii	Local & national	The PHOF Slope Index of Inequality indicators use local deprivation deciles to measure within-area inequalities, and national deciles to measure inequalities across England.
Health Profiles >> Deprivation: a national view	National	This section of the Health Profiles uses national deprivation quintiles to show how deprived a local area is relative to the England average. The visualisations clearly show how a local area's population may not be evenly distributed between the 5 national deprivation quintiles.
Health Profiles >> Life expectancy: inequalities in this local authority	Local	This section of the Health Profiles uses local deprivation quintiles to show local inequality in life expectancy.
Health Profiles >> Health inequalities: changes over time	Local	This section of the Health Profiles uses local deprivation quintiles to show local inequality in early deaths from all causes, heart disease & stroke and cancer.

## Procedure for assigning small areas to local deprivation categories

The method below used within PHE is based on dividing small areas into categories so that there are equal numbers of small areas in each deprivation decile/quintile.

**Step 1** – Arrange data so that each small area is assigned both a deprivation score and a higher geography for which deprivation categories are needed (for example, local authority, CCG, county). If assigning national deprivation categories then the higher geography will be the same (England) for all small areas.

**Step 2** – Sort small areas by higher geography and then by deprivation score from most to least deprived.

**Step 3** – Divide small areas into deprivation categories within each higher geography area with **category 1 representing the most deprived areas**. Use the following method to calculate how many small areas should be assigned to each deprivation category.

For each higher geography:

- divide the number of small areas within the higher geography by the number of deprivation categories required (up to a maximum of 10)
- the integer-part of this number represents the minimum number of small areas that will be assigned to every deprivation category
- Table 2 then shows which deprivation categories should be assigned additional small areas based on the fractional-part of this number
- the algorithm is such that allocation of additional small areas is weighted slightly in favour of more deprived categories

### Worked example:

If assigning 163 small areas to deprivation deciles within a local authority then divide 163 by 10 to give the result 16.3. In this case 7 of the deciles will each contain 16 small areas and 3 of the deciles (the 1<sup>st</sup>, 4<sup>th</sup> and 7<sup>th</sup> deciles) will contain 17 small areas.

**Table 2 – deprivation categories receiving additional small areas**

Deciles		Quintiles		Quartiles	
Number after decimal point	Deciles receiving an extra area	Number after decimal point	Quintiles receiving an extra area	Number after decimal point	Quartiles receiving an extra area
.0	None	.0	None	.0	None
.1	1	.2	1	.25	1
.2	1,6	.4	1,3	.5	1,3
.3	1,4,7	.6	1,2,4	.75	1,2,3
.4	1,3,6,8	.8	1,2,3,4		
.5	1,3,5,7,9				
.6	1,2,4,6,7,9				
.7	1,2,3,5,6,8,9				
.8	1,2,3,4,6,7,8,9				
.9	1,2,3,4,5,6,7,8,9				

The method used for determining the allocation of SOAs to deprivation categories and a tool for applying this method are illustrated in an accompanying Excel workbook which is available on the Fingertips Technical Guidance site via the following link:

<https://fingertips.phe.org.uk/profile/guidance>

### Population weighted deprivation categories

Assigning LSOAs or MSOAs to deprivation categories using the ‘equal number’ method described above produces deprivation categories with relatively similar populations, since LSOAs and MSOAs were designed to have similar populations.

However, assigning geographies with varied populations, such as local authorities, to deprivation categories using the ‘equal number’ method can produce categories with very varied populations. In these cases it may appear more appropriate to assign geographies to deciles using an ‘equal population’ method – this method is not used routinely within PHE and is not described here due to some of the complexities that the method introduces, not least that the same geographical area may be assigned to different deprivation categories depending on the indicator, since different indicators use different denominator populations.

## Note about Upper Tier Local Authority IMD2015 deprivation categories

Upper Tier Local Authority (UTLA) level deprivation categories based on both IMD2010 and IMD2015 have been published by PHE and used within PHE products. As there are 152 UTLAs in England, there are 8 deciles containing 15 UTLAs each and 2 deciles containing 16 UTLAs each. The methods applied in determining which two deciles would receive the additional UTLAs were inconsistent, with neither being in line with the recommendations outlined in this document. These UTLA deprivation assignments have not been altered as the implications are too significant relative to the negligible difference in the outcomes of the methods used. The methods used in each case are documented below:

### UTLA-level deprivation deciles based on IMD2010

Deciles were initially defined for the Longer Lives project, which excluded Isles of Scilly and City of London because of their small populations. The remaining 150 UTLAs were ranked and 15 were assigned to each decile. When it was required to add Isles of Scilly and City of London for other projects, they were assigned to the deciles which contained other UTLAs with similar IMD2015 scores – deciles 7 and 10 respectively – in order not to change the established decile allocations.

### UTLA-level deprivation deciles based on IMD2015

All 152 UTLAs were ranked and assigned to deciles with deciles 1 and 10 receiving an additional UTLA each. This was an error which came to light only after data had been published.

## PHE Technical Guides

This document forms part of a suite of PHE technical guides that are available on the Fingertips website: <https://fingertips.phe.org.uk/profile/guidance>