# UK Townsend Deprivation Scores from 2011 census data

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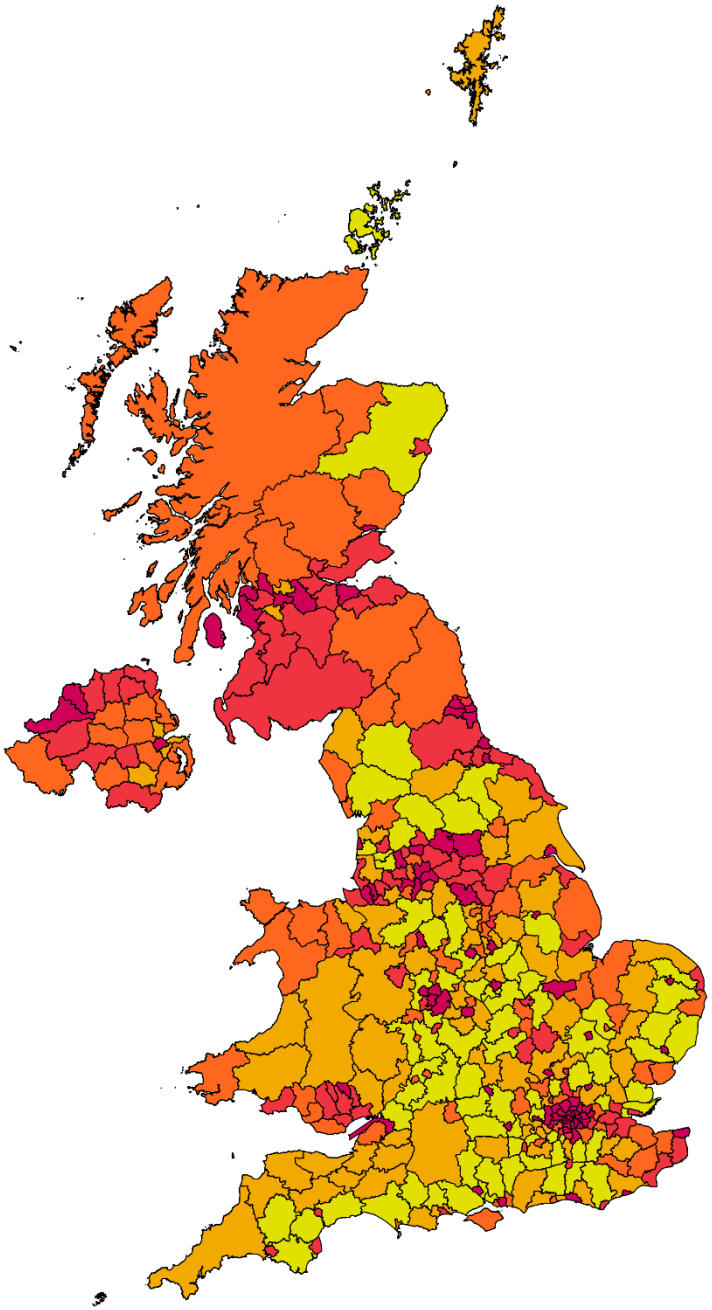
# Contents





# Introduction

The Townsend deprivation index is a measure of material deprivation first introduced by Peter Townsend in 1987. A Townsend score can be calculated using a combination of four census variables for any geographical area provided census data is available for that area. The measure has been widely used in research for health, education and crime to establish whether relationships exist with deprivation.[1] The following report will describe how Townsend scores were calculated for the UK based on data from the 2011 Census and include a discussion with geographical visualisations of the findings.

# About the research

There has been significant academic debate concerning the definition of deprivation. As a result, this has led to different measures of deprivation being developed.[2] In the UK, the composite measures of deprivation that have been developed are the Carstairs Index[3], the Department of Environment Index[4], the Jarman Underprivileged Area Index[5] , The Index of Multiple Deprivation and the Townsend Material Deprivation Index[6]. The importance of having an accurate and representative measure of deprivation is highlighted when considering that deprivation measures have influenced the allocation of public resources.[7]

The focus of this report will be on the Townsend deprivation index, which measures material deprivation of an area, first developed in 1987[8]. It is a composite measure of deprivation which uses four variables that can be derived from census data.

The report will include the methodology used to calculate Townsend scores for the UK based on data from the 2011 Census, discuss the choice of variables used from the census and alternative variables that were considered. In addition, the geographical levels at which the Townsend scores were calculated will be explained. The results will then be presented. Following will be a discussion of how the Townsend scores were divided into quintiles for the purposes of mapping deprivation. Lastly, the scores were investigated further to establish patterns in deprivation from previous census data and there will be comparisons of scores between different areas in the UK.

# Choosing the Townsend Deprivation Index and census variables

How the Townsend Deprivation Index was chosen as the measure of deprivation and how this helped us in selecting the appropriate census variables.

# Deprivation Indices

As previously mentioned, there are a range of composite deprivation indices that have been developed. In choosing a measure of deprivation, consideration was given to the data source that was to be used. Knowing that the 2011 census data was to be used, this automatically discarded the option of using Indices of Multiple Deprivation (IMD) because the data for the indicators is derived from administrative data.[9]

IMD was also unsuitable because it is a measure of relative deprivation used only for England.[10] This did not fit with the purpose of the project to produce deprivation scores that were comparable across the UK.

As the focus was on census data, the remaining options were Townsend Material Deprivation Index and Carstairs Index. As the aim of the project was also to make comparisons with previous census data, the indicators for both deprivation indices were analysed. Both deprivation indices had similarities with using unemployment, overcrowding and car ownership as indicators of deprivation.

Although, unemployment for Carstairs differed as its focus is upon the unemployment of males aged 16 and over as a proportion of all economically active males aged 16 and over. The fourth indicator for Townsend was home ownership and for Carstairs, low social class.

The first issue with choosing Carstairs as a measure of deprivation related to social class as an indicator. The complexities with social class are not a new phenomenon. In the 1980's, the Black report commented upon the development of social class, which meant the measure was dependent upon occupational classification alone as still being problematic.[11] Furthermore, the indicator has been described as ambiguous.[12] This was further verified by the definitions of social class being changed between censuses, making comparisons difficult.

The second issue related to the unemployment indicator used by Carstairs. The Townsend unemployment indicator is inclusive of all economically active unemployed 16 to 74-year olds whereas the Carstairs unemployment indicator is confined to economically active unemployed males.

This demonstrates that the unemployment indicator for Townsend is more representative than Carstairs.

This is supported by the fact that it has been recognised that male occupational status is not as powerful an indicator of a family's economic position or living standards as more women have been in employment and contribute to household income.[13] Recent trends also demonstrate more women becoming the main household income providers.[14]

Consequently, the measure of deprivation chosen was the Townsend Material Deprivation Index as the indicators created scores that were comparable with previous census data and were comparable across the UK. Table 1 briefly defines what each of the indicators measure.

# Choosing variables

The indicators used to calculate Townsend Deprivation Scores were already defined by Townsend. It was still important however, to determine which census variables best measure each of these indicators.[15]

**Unemployment**

This indicator measures the percentage of economically active residents who are unemployed. The census variable that was chosen was economic activity because it was available for all the countries in the UK and provided both aspects of the necessary calculation which are the economically active residents who are unemployed and the total number of economically active residents, aged 16 to 74.

Consideration was also provided to 'economic status' and 'economic activity of household reference persons' as potential variables to measure this indicator. Census data for 'economic status' was not available for Scotland and previous studies illustrated that this variable was not used.

Census data for 'economic activity of household reference persons' was available for the UK but due to complexity with definition, it was not used.

The 'household reference person' concept was introduced in 2001 which would create difficulties when making comparisons with previous census data.

**Non-car ownership**

Non-car ownership is measured by one census variable that simply asks respondents if they have a car and if they do, how many. This reveals those households that do not have a car.

**Non-home ownership**

The tenure variable was the most suitable measure to use for non-home ownership. This measures whether a household rents or owns the accommodation that it occupies.

# Choosing variables (continued)

**Overcrowding**

This indicator should measure whether a household is overcrowded, that is, whether the house is suitable in size for the occupants. There are four possible census variables that would be relevant to measure this: Persons per room, Occupancy rating by rooms, Persons per bedroom and Occupancy by bedrooms.

'Persons per room' is a measure of how many people are in the house per room, any number over 1 is classed as overcrowded as that would mean there is more than one person per room. '

Occupancy rating' is a measure of the ages and relationships between people in a household to determine how many rooms they require.

'Persons per bedroom' is a new measurement introduced in the 2011 census but is currently only available for England and Wales. It measures how many people are in the house per bedroom rather than all rooms.

'Occupancy rating by bedroom' is measured in the same way as occupancy rating but with bedrooms instead of all rooms which like persons per bedroom is currently only available for England and Wales.

For this project, the 'Person per room' variable was chosen for two reasons. Firstly, the two variables that measure by bedroom are only available for England and Wales and so these scores wouldn't be comparable to Scotland and Northern Ireland. Secondly, past research[16] has found that measures of occupancy rating are highly skewed which would affect the scores. For these reasons, persons per room was the more suitable measure.

Table 1: Townsend deprivation index indicators and census variables

| Unemployment | Overcrowding | Non-car ownership | Non-home ownership |
|---|---|---|---|
| Percentage of all people who are economically active who are unemployed.<br><br>Census variable:<br>Economic Activity | Percentage of households that are overcrowded, i.e. more occupants than there are rooms.<br><br>Census variable: Persons per room | Percentage of households that do not own a car or van.<br><br>Census variable:<br>Car or van availability | Percentage of households that are not owner-occupied, i.e. rented or living rent free.<br><br>Census variable:<br>Tenure |

# Calculating Townsend Deprivation Scores

How the scores were calculated including information on the use of R.

# The Townsend Deprivation Index calculation

The Townsend Deprivation Scores were calculated using the percentages of the four indicators defined in Table 1. These were weighted equally in the calculation. The unemployment and overcrowding indicators were log transformed to normalise the skewed results from these variables. A standard Z score was calculated from each of the indicators.

**Z scores**

Creating Z scores standardised each variable so extreme values didn't affect the Townsend Deprivation score too greatly, further ensuring that each variable was equally weighted. This is because it centred all the scores for each variable around a mean of zero. The Z scores were then added resulting in a Townsend Deprivation score. Due to the Z scores being centred around a mean of zero, any areas with a score above zero were above the mean and therefore deprived whereas areas with scores below zero were more affluent.[19]

The scores in this project were calculated using the 2011 census data across the UK at varying output levels: Local Authority, Ward, LSOA and OA. The data used was published and so can be accessed via InFuse[17] through the UK Data Service. For 2001, 1991 and 1981, the data was taken from CasWeb[18] which can also be accessed. Table 2 below indicates where the data was accessed from for each year for clarity and also specifies at which output levels the Townsend deprivation scores were calculated.

Figure 1 provides the method used to calculate the Townsend deprivation scores.

Table 2: Output levels that Townsend deprivation scores were calculated for by year.

| 2011: InFuse | 2001: CasWeb | 1991: CasWeb | 1981: CasWeb | 1971: Casweb |
|---|---|---|---|---|
| Local Authority<br>Ward (CAS)<br>LSOA<br>Output Areas | Local Authority<br>Ward<br>Output Areas | Districts | Districts (Great Britain only) | Districts (Great Britain only) |

# The Townsend Deprivation Index calculation

Figure 1: Townsend Deprivation Index calculation method

1

Percentage non-car ownership: Households with no car/ Total of households x 100

Percentage non- home ownership: Households that are not occupant owned (rented)/ Total of households x 100

Percentage unemployment: People who are unemployed/ Total people economically active x 100

Percentage overcrowding: Households that are overcrowded/ Total of households x 100

2

Logged punemployed= ln(unemployment +1)

Logged povercrowd= ln(overcrowding +1)

3

Z score no car= (percentage no car- mean percentage no car)/SD percentage no car

Z score non homeowner= (percentage non homeowner- mean percentage non homeowner)/SD percentage no homeowner

Z score unemployed= (logged punemployed- mean logged punemployed)/SD logged punemployed

Z score overcrowd= (logged povercrowd- mean logged povercrowd)/SD logged povercrowd

4

Z score no car + Z score non homeowner + Z score unemployed + Z score overcrowd= TDS

# Using R and R scripts

To make the process of calculating Townsend scores more efficient, an R script was created which requires the import of a dataset with the relevant variables to calculate the Townsend scores.

The commands in the R script make the necessary calculations to provide the Townsend scores. This was convenient as the same R script could be used to calculate Townsend scores for census data from previous years with a few adjustments.

The R script can be accessed here, along with the datasets that include the relevant variables to produce Townsend scores. A blog post was also written, discussing the different resources that were used to create the R script.

Differences in the datasets between each year and each output level made it necessary to have small changes in the R scripts for each year and output area calculated.

R scripts were produced for each year and level of geography where changes were made. Below is an outline of the changes that were made and why.

**Variable names**

The variables needed are in different census tables from year to year meaning that they have different variable names in the dataset. An example of this was the 'total economically active' variable which in 2011 was called 'F244' but in 2001 was called 'cs0210010'.

There was also a difference in the variable names for the geography names and codes. For example, what 2011 called the 'GEO_CODE', 2011 called the 'Zone. Code'. For these reasons the script was altered to adapt to these changes. It was a small change but a necessary one and was the reason for different scripts from one year to the next.

**Data preparation**

There were additional R scripts for 1991 and 2001, as they both required data preparation. The extra scripts were created for two reasons.

For 1991 and 2001, datasets have to be extracted separately from CasWeb for each of the countries as there was no option to select data from all the countries at once. The prep script firstly changes the variable names so they all match due to the fact that in Northern Ireland, some of the variables come from different tables and therefore have different names to the Great Britain variables.

Secondly, the script is used to merge the separate datasets for each country these into one UK dataset. It was necessary for the separate countries to have matching variable names for this merge to be possible, which explains the need for the first function of the prep script.

The datasets provided are already prepped, so these prep scripts are only necessary if you go to CasWeb to collect the data for yourself.

# Using R and R scripts (continued)

**Output area names**

Output areas, the smallest census areas, do not have names, only area codes. At the end of each R script a new data frame was produced including the area name, area code, the Townsend Deprivation score and the quintiles they fall into. For output areas, it was important to remove the area name variable from this line of script as R would not understand the inclusion of a variable that doesn't exist. For this reason there is a different script for 2001 output areas.

**Calculating non-home ownership**

For 2011 and 2001 non-home ownership was calculated as specified in Figure 1. However, in the census questions regarding home ownership for earlier years there were many possible variables indicating non-home ownership. To avoid the confusion of excessive answers that indicate non-home ownership the calculation was changed to the following:
(total households- occupant owned households) / total households*100

This is essentially the same calculation except to get the figure of those who don't own their home the calculation takes those homes that are owned by the occupants from the total households. This change was therefore applied for the 1991, 1981 and 1971 R scripts.

For clarity, Table 3 provides a breakdown of which scripts should be used on which years and areas:

Table 3: R Scripts

| R scripts | Use to… |
|---|---|
| Data prep 1991 | Prepare the 1991 data |
| Data prep 2001 | Prepare the 2001 data |
| R script 1971 | Calculate 1971 scores (District) |
| R script 1981 | Calculate 1981 scores (District) |
| R script 1991 | Calculate 1991 scores (District) |
| R script 2001 OA | Calculate 2001 scores (Output Areas) |
| R script 2001 | Calculate 2001 scores (Local Authority and Ward) |
| R script 2011 | Calculate 2011 scores (Local Authority, Ward, LSOA and Output Areas) |

# Census boundaries and quintiles

The output levels used to calculate the scores including how and why they were chosen. The areas that were calculated are also ranked in quintiles by their score.

# Census boundaries

As shown by Table 2, scores were calculated for areas ranging from local authorities to districts, wards, lower super output areas and output areas. These are the areas at which the census data was available for. For earlier years, only larger areas were suitable to calculate scores, as many of the smaller areas had missing data.

The scores can't necessarily be compared from one census to the next as the boundaries that define these areas change. This is demonstrated by the fact that there were 405 Local Authorities in the UK in 2011 compared to 389 in 2001. This shows that some areas were merged to adjust to changing populations.

**Local Authorities/ Districts**

Scores have been calculated at Local Authority/ District level for all census' from 1971-2011. From 1971 to 1991, these areas were called Districts or District Councils but by 2011 were called Local Authorities. Each country varied with what they named these types of areas however they measure similar size areas. For example, in 2001 these areas were called districts in England, unitary authorities in Wales, council areas in Scotland and district councils in Northern Ireland.

These areas do differ from year to year, however, they are useful to see a change in deprivation right back from 1971 to 2011, as the areas are a similar size and because districts were the only output level that 1971-1991 were measured at.

**Wards**

When calculating scores for 2001 there were two options. We chose CAS wards over ST wards as these had less areas merged. CAS wards included some merged wards to reach the minimum population threshold of 100 residents or 40 households required for CAS tables. ST wards, however, had even more areas merged as these areas were used in the production of standard tables statistics which require an even higher minimum population threshold of 1000 residents or 400 households.[20]

# Census boundaries (continued)

We wanted the scores for 2011 to be comparable to 2001. However, in 2011 there was no output level that is comparable to CAS wards as the policy to best-fit from output areas made this unnecessary. 2011 Merged wards were equivalent to 2011 ST wards however, for the purpose of this project we didn't want to use merged wards as this would prevent us from seeing the differences in deprivation between the group of wards that were merged. For example, if three wards were merged and one was particularly more deprived than the others, it would make the score for that merged ward look more deprived. This therefore wouldn't show the distinction in deprivation level in those three original wards, which would be misleading.

Therefore when analysing the scores for 2011 and 2001 wards, it should be considered that the two years will not be directly comparable but separately will provide the best representation for deprivation at ward level for that year.

**Output Areas and LSOAs**

Output areas are the smallest geography level at which it is possible to produce census data. Between 2001 and 2011 only 2.6% of output areas were changed making them highly comparable.[21] Lower super output areas are created from output areas meaning these have had very little change too. However, LSOA scores were not calculated for 2001 as these were not available for Scotland.

For this project, scores and visualisations have been produced for all census' between 1971 and 2011. However, the scores for 1971-1991 were only calculated at district level as there was missing data for some of the variables needed for the calculation at more detailed levels. For 2001 and 2011 the equivalent to district areas are local authority areas. Although these are defined differently, they give a similar level of detail in that there are a similar number of areas within each of these output levels.

# Quintiles

Once the Townsend Deprivation Scores were calculated they were split into quintiles. These were used when creating map visualisations which allowed us to see the spread of deprivation across the chosen output area split into 5. This means that one fifth of all the areas were allocated to one of the 5 quintiles equally. The first quintiles represent the fifth of the country that was least deprived whilst the fifth quintile represents the most deprived.

When analysing the data looking at the what quintile each area falls into can give an initial idea of how deprived that area is in relation to the rest of the UK.

Quintiles are also useful when plotting map visualisations as it gives a geographical perspective of the spread of deprivation across the UK.

It should be noted that the quintiles in this project are based on area meaning that 20% of all areas fall into each quintile. However, it is possible to split quintiles by population which considers that some areas have higher population than others.

Therefore, the latter method of producing quintiles is more accurate, although the results that are produced are similar and do not have an effect on the actual Townsend scores produced. Using the latter method will mean that some of the areas will be allocated to different quintiles with a different range of scores in each quintiles. An example is provided below in Table 3.

Table 3: The range of scores in each quintile when split by area and population

| Quintiles | Area (Minimum) | Area (Maximum) | Population (Minimum) | Population (Maximum) |
|---|---|---|---|---|
| 1 | -6.3627 | -3.0900 | -6.3627 | -2.4167 |
| 2 | -3.0891 | -1.6852 | -2.4135 | -0.4373 |
| 3 | -1.6846 | 0.1709 | -0.4367 | 1.7861 |
| 4 | 0.1727 | 2.8689 | 1.7879 | 4.7426 |
| 5 | 2.8696 | 13.5881 | 4.7456 | 13.5881 |

# Results

The results of the calculations including maps and other visualisations. The focus of this project was initially to calculate Townsend Deprivation Scores for 2011. For this reason, most of the results reported here are based on 2011. However, results and visualisations have been published for all years from 1971 to 2011 and so further analysis on past years can be done from the resources provided.

# Results I: Townsend Deprivation Scores

Townsend deprivation scores and quintiles have been published for all the years and output levels listed in table 2. For further details and exact scores for all the areas in the UK, you can access those files. Here are a few key results from each of these calculations.

Table 5: 1971-1991 most and least deprived districts

| Year | Most deprived | Least deprived |
|---|---|---|
| 1971 | Barra: 10.08 | Cumbrae: -5.2 |
| 1981 | Glasgow City: 10.92 | Wokingham: -6.35 |
| 1991 | Tower Hamlets: 11.71 | Wokingham: -5.71 |

Table 6:2001 most and least deprived areas

| Output level | Most deprived | Least deprived |
|---|---|---|
| Local Authority | Tower Hamlets: 15.02 | Hart: -5.59 |
| Ward | Falls: 13.86543 | G62 8 (Forth and Endrink) : -8.76 |
| Output Area | 60QR002274 (Buckhaven) : 11.74 | Several areas: -5.49 |

Table 7:2011 most and least deprived areas

| Output level | Most deprived | Least deprived |
|---|---|---|
| Local Authority | Tower Hamlets: 14.01 | South Northamptonshire: -5.46 |
| Ward | Church Street: 13.59 | Chaldon: -6.36 |
| LSOA | Petershill: 13.31 | Siverknowes and Davidson's Mains: -7.03 |
| Output Area | E00004139 (Central London): 12.45 | Several areas: -6.49 |

A first look at these results shows that Tower Hamlets has consistently been very deprived from at least 1991. This is as well as other areas in central London like Church Street and the output area specified as the most deprived in 2011. Wokingham also showed some consistency as being the least deprived district in 1981 and 1991. For output areas, many areas had the same Townsend Deprivation score so no one area could be identified as the least deprived.

# Results I: Comparison

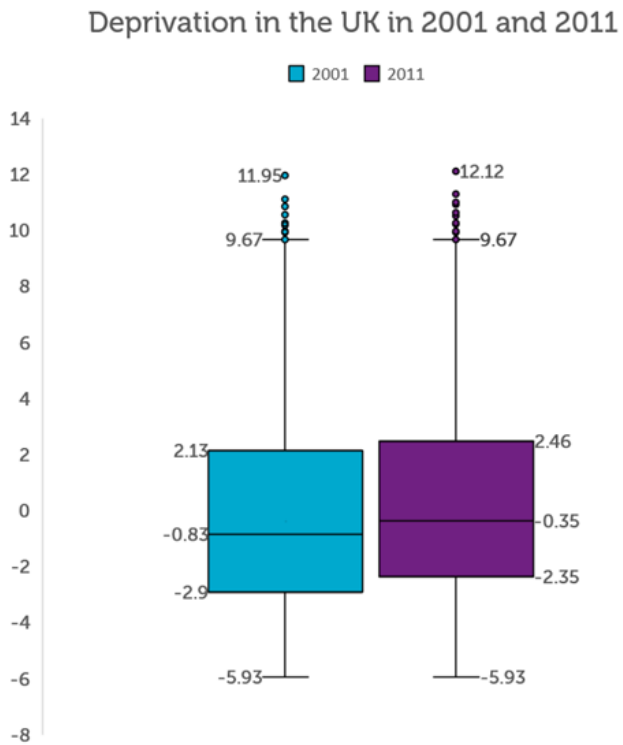
Our results are published for each year and area separately which due to the nature of z score makes them incomparable. To understand how to understand Townsend Deprivation Scores, it is important to first understand what a Z score is, which are the components that make up the score. A Z score is a measure of how many standard deviations a value is from the mean of all the values in that variable.

In terms of Townsend deprivation scores, this means that any scores around 0 are very close to the mean deprivation for the area within the dataset. This causes a problem when comparing one year to the next. As a hypothetical example, if in 2001 deprivation was generally worse across the UK than in 2011, this wouldn't show in the Z scores. In 2001, the mean deprivation would be 0 as well as in 2011, even though deprivation has improved.

To ensure comparability across two or more years, the scores must be calculated with all the relevant census variables for each of the years merged into one dataset. This would mean putting all 2001 wards and all 2011 wards in one dataset before calculating the scores. Z scores are based around means and standard deviations so these would be taken from the areas for both years together instead of separately.[21]

Essentially, instead of the scores being around two separate means, they would be around a common mean so the relative mean indicates where there is improvement or decline in deprivation. To show and example of this, we have compared the 2001 and 2011 output areas in this way. The datasets published will allow you to repeat this across further datasets.

Figure 3




These results showed that when the data is merged so they have a relative mean, the most deprived area in 2011 is actually slightly less deprived when compared with 2001 than when analysing 2011 alone. However, the most affluent area doesn't appear as affluent when comparing to 2001.

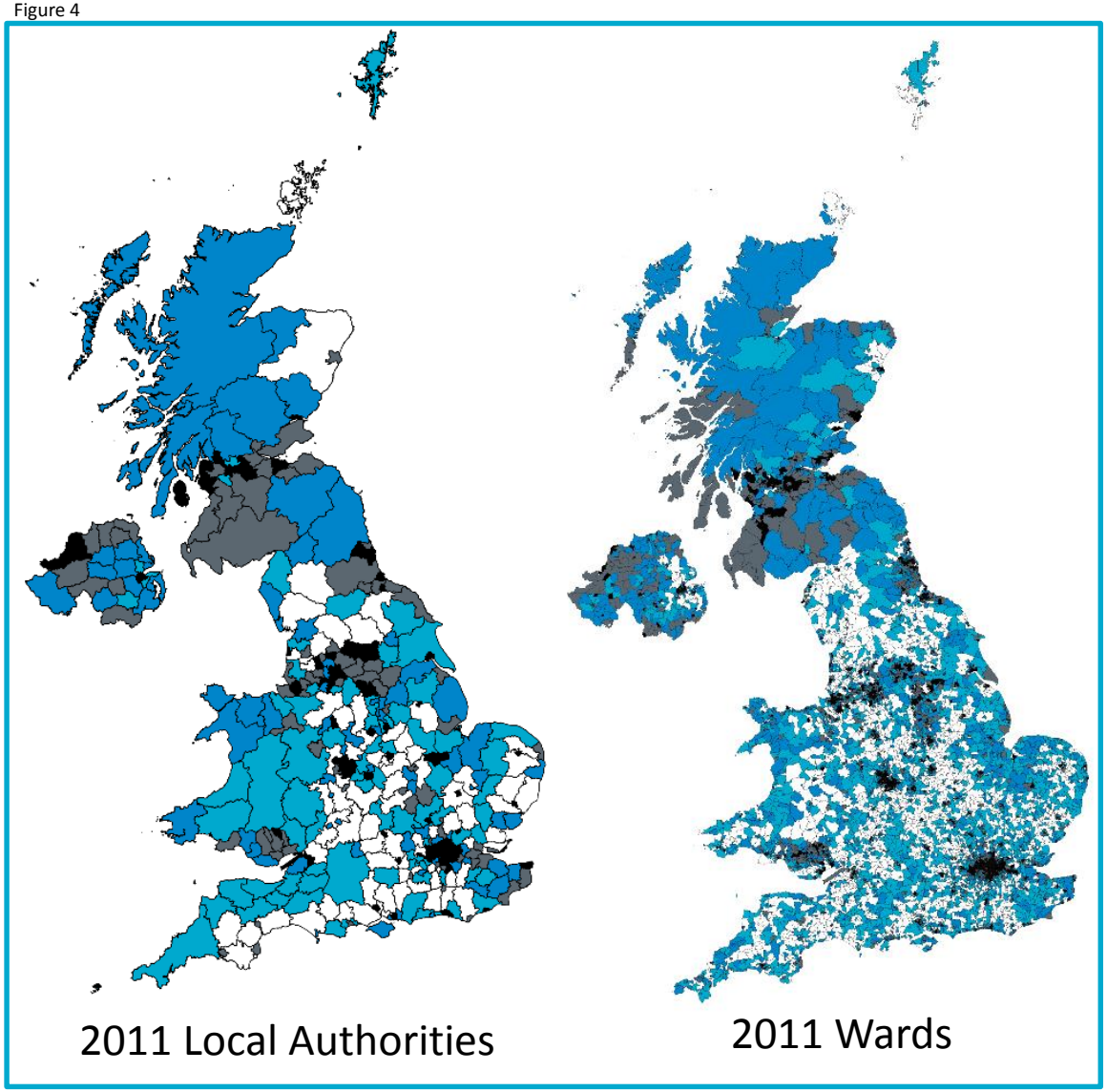
Figure 3 provides a boxplot that directly compares 2001 and 2011 which shows that the UK became more deprived in this time. The most deprived area in 2001 was more affluent than the most deprived in 2011. The median score in 2011 was also higher, and therefore more deprived (-0.35) than in 2001 (-0.83). This further indicates more deprivation in 2011. The most affluent areas in both 2001 and 2011 had the same scores. This is because in both years there were areas that had 0% of households that indicate any deprivation whatsoever, so it is harder to see when there was the greatest affluence. There is a greater range of scores in 2011 than 2001, however, 2001 has a greater inter-quartile range. This shows that 2011 has a greater number of areas with more extremely high deprivation scores but has less variation in the values around the median score.

# Results II: Map visualisations

For all years, other than 1971, map visualisations are available for the different output levels. Boundary data was unavailable for 1971 and so it wasn't possible to produce the map.

The primary aim of this project was to create Townsend Deprivation Scores for 2011 and so these first maps are for 2011 at the varying output levels.

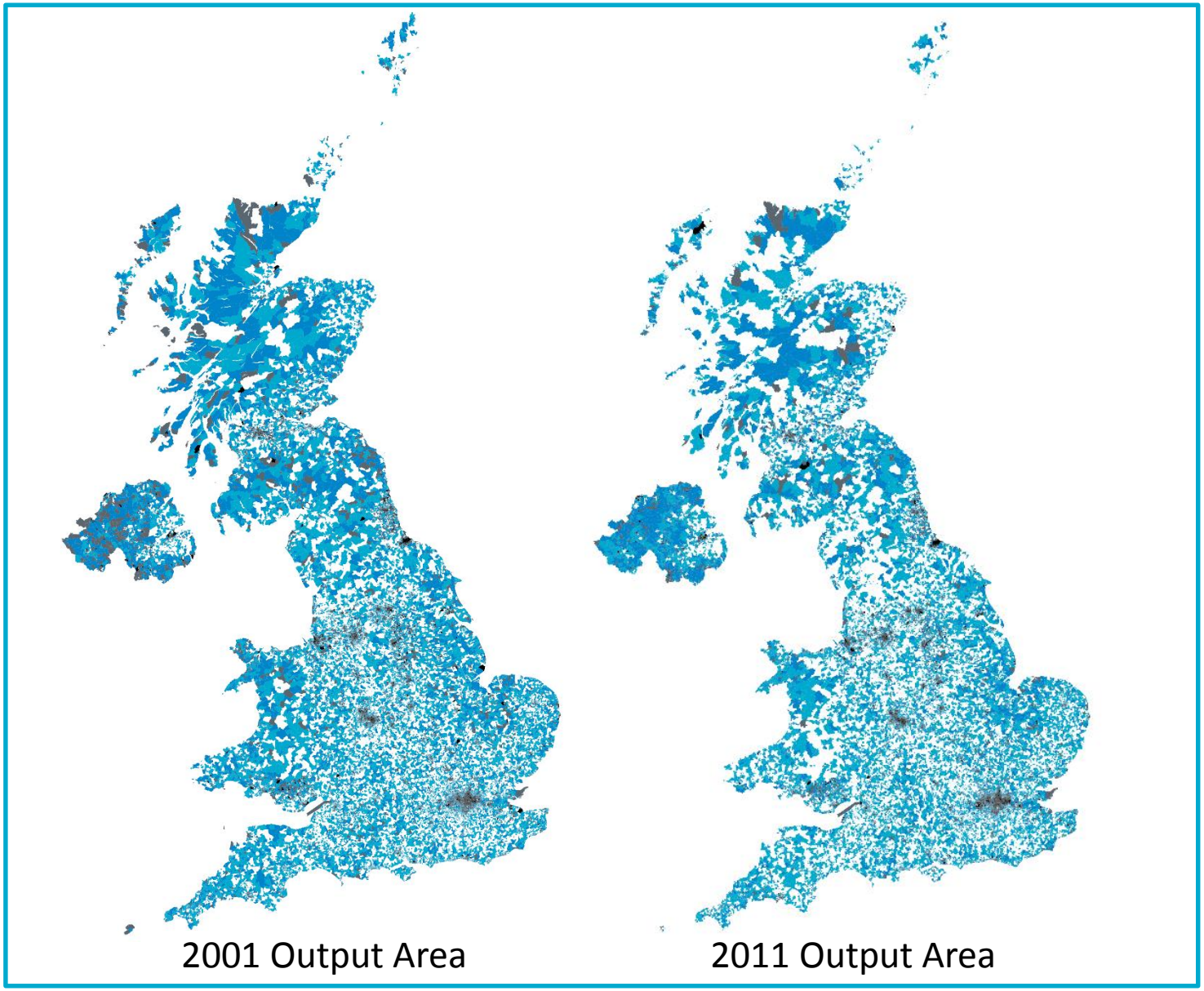
Figure 4




2011 deprivation scores were calculated at local authority level, wards, LSOA and output areas. As scores are calculated at lower levels they should give a better indication of the spread of deprivation as it will show where there is contrast in smaller areas rather than assuming that all areas within a larger boundary are all the same. This is well represented by the maps above showing that at ward level you can see where there may be deprived areas surrounded by less deprived areas and vice versa. Figure 4 also shows where deprivation is most concentrated. These include London, South-West Scotland, North-West of Northern Ireland, Birmingham, North-West of England and North-East of England.

# Results: Map visualisations continued

Figure 5




As mentioned earlier, between 2001 and 2011 there was only a 2.6% change in output areas making these sets of calculations the most comparable. Figure 5 show that there has been a shift in deprivation from Northern Ireland and South-West Scotland in particular and has become more concentrated in English cities such as London and Birmingham. Rural areas have also become more affluent. Overall the map gives the impression that deprivation is decreasing. However, this cannot be concluded from these maps as these show quintiles so there are in fact an equal number of areas in each quintile in both of these maps.

# Results III: Deprivation trends

## Introduction

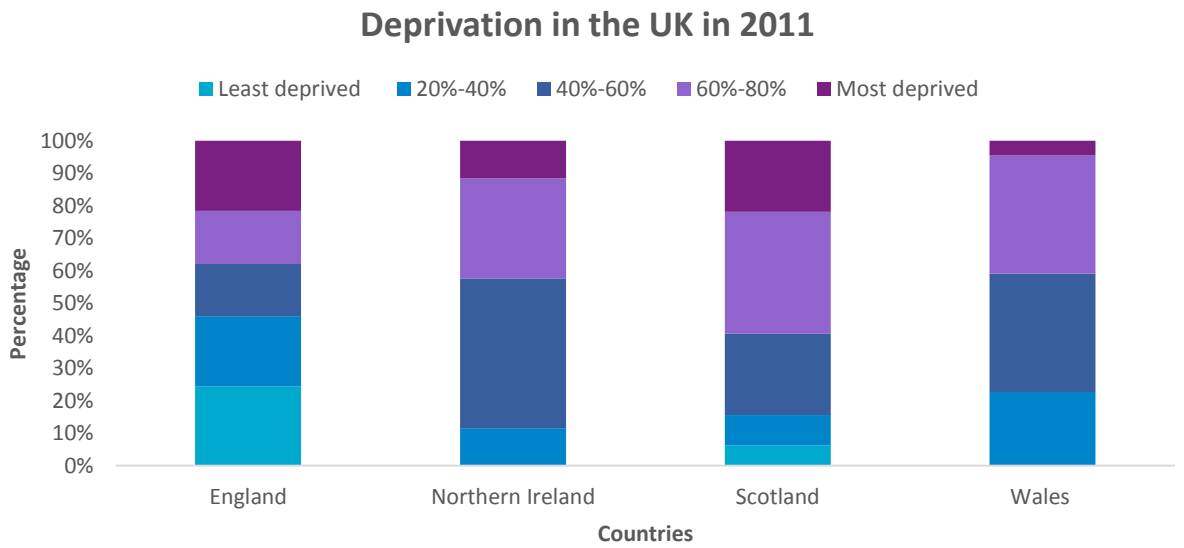
To find deprivation trends across the UK, the Townsend scores that were calculated for 2011 were subset into individual countries at local authority level using R. Local authority level was chosen for all countries as this made visual representations of the data simpler and avoided cluttering.

The purpose of this section is to elaborate upon the Townsend scores and what they mean in the context of the UK and also provide a broad insight to levels of deprivation in the UK. It is envisaged that this will help to prompt further inquiry into deprivation in the UK.

This results section will begin by analysing the UK based Townsend scores and the quintiles for each of the countries and how they compare. Next, each of the countries will be looked at individually. Northern Ireland, Scotland and Wales will be analysed at local authority level and highlight the most deprived and least deprived local authorities within each of the countries. Due to the volume of local authorities within England, making visual representations was difficult, therefore the analysis will be at a regional level. As a result of the significant finding of high levels of deprivation present in London, the local authorities of London were investigated. Levels of deprivation in UK cities was also considered to see how the cities of each country compared.

# Results III: Deprivation in the UK (continued)

Graph 2: Deprivation in the UK in 2011 by allocating the Townsend scores calculated for each of the countries local authorities into five quintiles.




Graph 2 demonstrates that of all the countries, England had the highest percentage of local authorities in the least deprived quintile (24%). Northern Ireland had no local authorities in the least deprived quintile and a small percentage in the most deprived quintile (12%) which was equal to the amount of local authorities in the 20%-40% deprived quintile (12%). Most of Northern Ireland local authorities were in the third quintile (46%).

Scotland had a couple of its local authorities in the least deprived quintile (6%). However, Scotland had a higher percentage of its local authorities in the most deprived quintile (22%), equal to England (22%). Wales had the lowest percentage of local authorities in the most deprived quintile in contrast to the other countries (5%). Scotland had a couple of its local authorities in the least deprived quintile (6%). However, Scotland had a higher percentage of its local authorities in the most deprived quintile (22%), equal to England (22%).

Wales had the lowest percentage of local authorities in the most deprived quintile in contrast to the other countries (5%). However, none of Wales or Northern Ireland's local authorities were in the least deprived quintile. Table 9 provides the frequencies of local authorities per country by quintile.

Table 9: Frequency of local authorities per country by quintile

| Country | Least deprived | 20-40% | 40-60% | 60-80% | Most deprived | Total local authorities |
|---|---|---|---|---|---|---|
| **England** | 79 | 70 | 52 | 53 | 70 | 324 |
| **Northern Ireland** | 0 | 3 | 12 | 8 | 3 | 26 |
| **Scotland** | 2 | 3 | 8 | 12 | 7 | 32 |
| **Wales** | 0 | 5 | 8 | 8 | 1 | 22 |

# Results III: Deprivation in the UK in 2011

Table 8: Summary statistics for 2011 UK Townsend deprivation scores by quintile

| Quintile | Mean | Median | Standard deviation | Lowest | Highest | Range |
|---|---|---|---|---|---|---|
| **1** | -3.798 | -3.724 | 0.626 | -5.464 | -2.938 | 2.526 |
| **2** | -2.217 | -2.140 | 0.445 | -2.928 | -1.531 | 1.397 |
| **3** | -0.606 | -0.557 | 0.481 | -1.509 | 0.170 | 1.679 |
| **4** | 1.146 | 1.107 | 0.636 | 0.219 | 2.448 | 2.229 |
| **5** | 5.468 | 4.217 | 2.940 | 2.516 | 14.013 | 11.497 |

This section begins by looking at the summary statistics for the UK 2011 Townsend scores (table 1). Following that will be a discussion of the levels of deprivation of each of the countries by quintile and how they compared to each other.

**Distribution of the data**

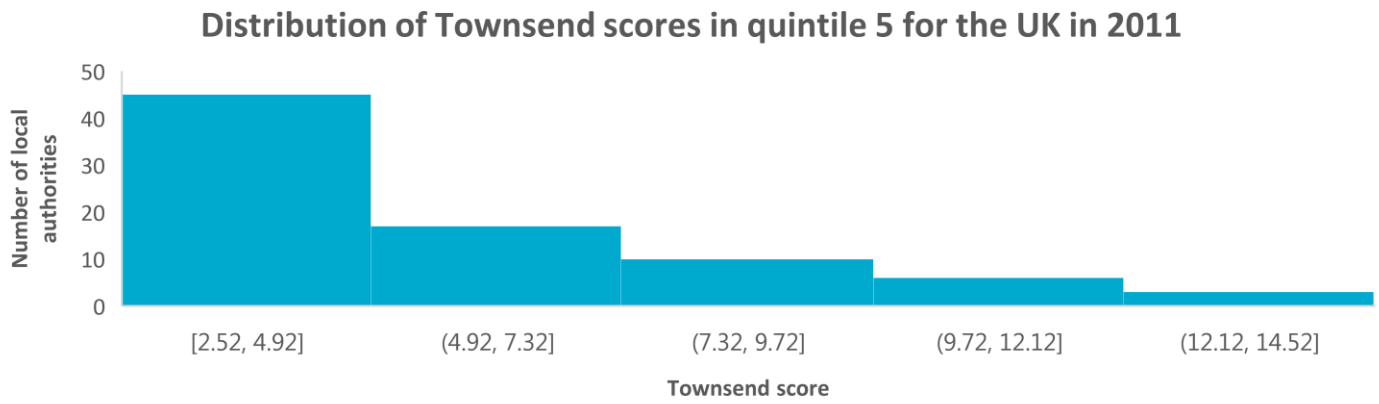
Table 1 provides the summary statistics of the scores by quintile. For example, the mean for UK local authorities in quintile 1 was -3.798 and the standard deviation 0.626. The mean from quintile 1 to quintile 4 gradually increases but the difference between quintile 4 (1.146) and quintile 5 (5.468) is not consistent with this.

This is explained by the range of quintile 5 (11.497) which is significantly larger than the range of the other quintiles. The range for quintile 5 demonstrates that the Townsend scores within that quintile vary more than any other quintile. Burnley has the lowest Townsend score (2.516) within quintile 5 and Tower Hamlets has the highest (14.013). Graph 1 provides further insight into the distribution of quintile 5.

There is a positively skewed distribution for quintile 5. Most of the Townsend scores for local authorities in the UK in quintile 5 fall in the first bin, between 2.52 and 4.43.

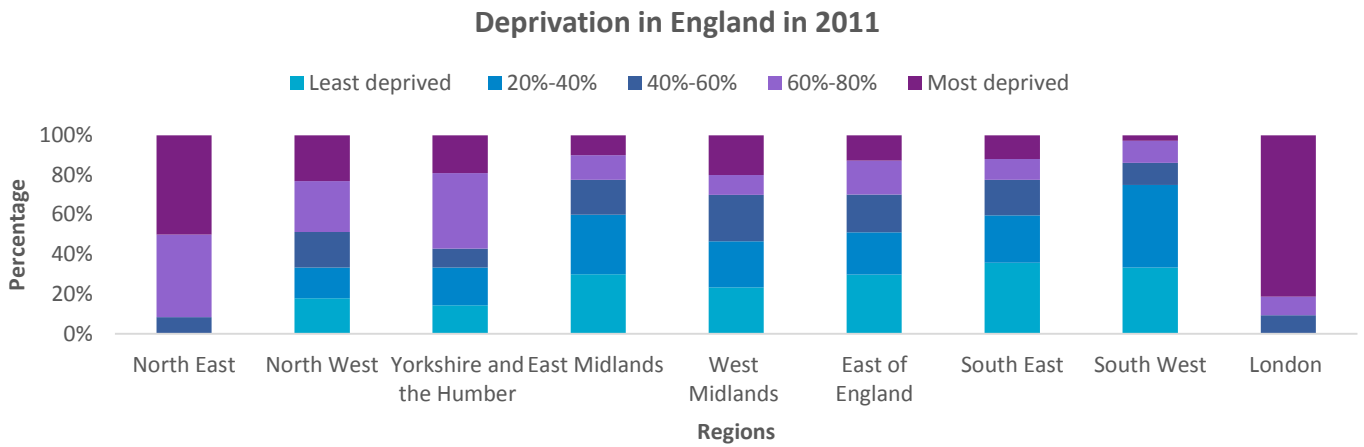
Consequently, the mean of 5.468 for quintile 5 is influenced by the Townsend scores that fall within the last bin. The Townsend scores that fall within the last bin (12.12 – 14.52) are 13.04 (Newham), 13.65 (Hackney) and 14.01 (Tower Hamlets). These are not considered outliers as they fall within an acceptable range of the other Townsend scores in quintile 5. Furthermore, the number of local authorities with high Townsend scores reduces but progressively as demonstrated by graph 1. These scores demonstrate that levels of deprivation for those local authorities are very high.

Graph 1: The distribution of Townsend scores within quintile 5 for the UK in 2011



# Results III: Deprivation in England

Graph 3: Deprivation in England's regions in 2011 by allocating the Townsend scores for each of the countries local authorities into five quintiles.



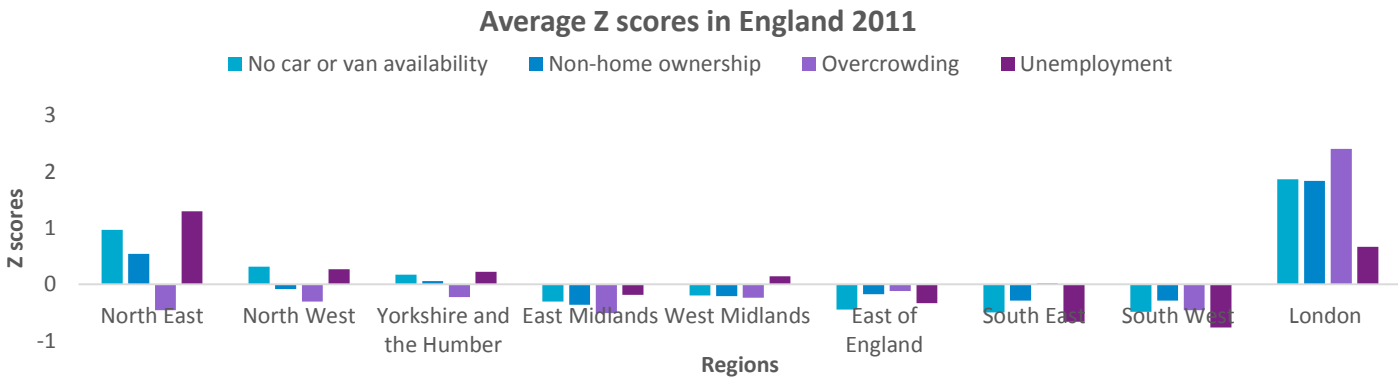

Graph 3 provides deprivation in England based on the UK Townsend scores in 2011 by region. All the regions had local authorities within the most deprived quintile. London had the highest percentage of local authorities in the most deprived quintile (81%) and the South West had the least (3%). The South East had the highest percentage of local authorities in the least deprived quintile (36%) and the region with the lowest was the North East (0%).

The finding in relation to London prompted further investigation into which indicator of the Townsend Deprivation Index was driving deprivation scores per region. To do this, average Z scores for each of the Townsend Deprivation Index indicators were calculated for each region. These are represented in graph 4.

To produce graph 4, the Z scores of each Townsend Deprivation Index indicator at local authority level in England (based on the UK Townsend scores) was taken to produce an average Z score for each of the indicators per region.

London's average Z scores were above the average for the UK for all Townsend Deprivation Index indicators. On average, the indicator that contributed the most to high Townsend scores in London was overcrowding. For the North East, unemployment contributed the most, on average, to high Townsend scores, followed by no car or van availability and then non-home ownership. This trend was matched in Yorkshire and the Humber. In the North West, no car or van availability contributed the most. The East Midlands, East of England and South West had Z scores for each of the indicators that were below the UK average.

Graph 4: Average Z scores in England, 2011, by region.



# Results III: Deprivation in England (continued)

**London**

Acknowledging that 81% of local authorities in London were in the most deprived quintile and that overcrowding on average, was the indicator significantly contributing to high Townsend scores, the next step was to look at the local authorities in London by their Z scores and Townsend scores. Graph 5 presents this.

The bars in graph 5 represent the Townsend scores in each of the local authorities by way of height and the segments within each bar represent the Z scores and how the values of each Z score contributed to the overall Townsend score.

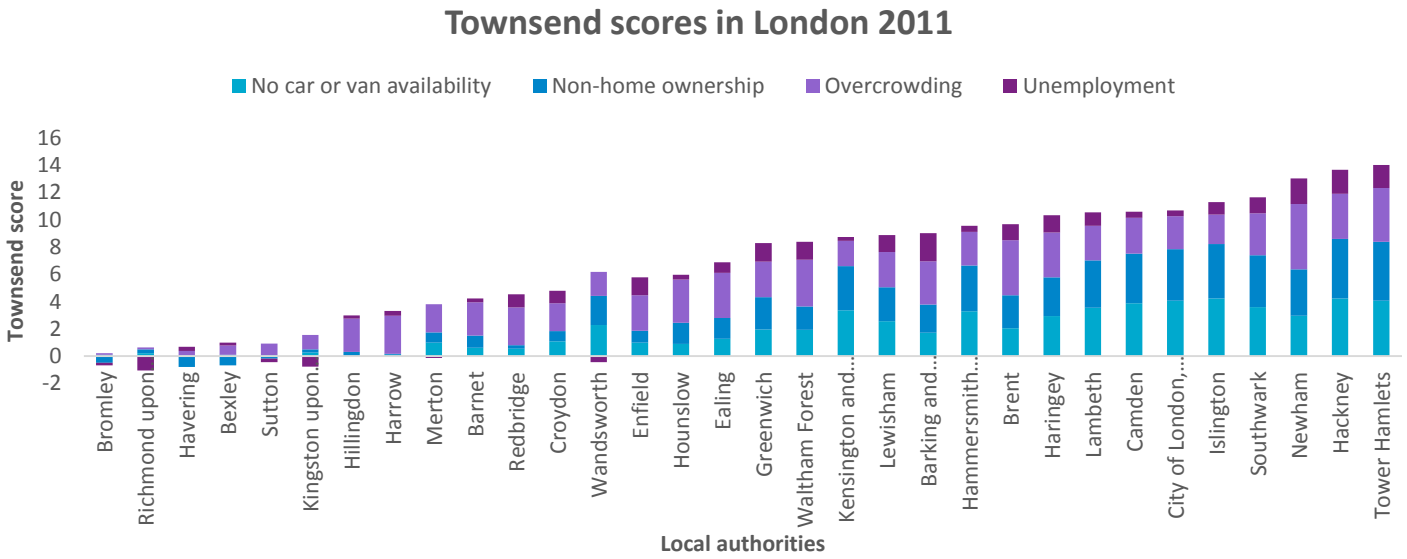
For example, Tower Hamlets had the highest Townsend score of all local authorities in London and non-home ownership contributed the most to the Townsend score.

As mentioned previously, the most deprived local authority area in London was Tower Hamlets (14.013) and the least deprived local authority area was Bromley (-0.474). The Townsend scores for London at local authority level demonstrate that there were wide ranging differences in the levels of deprivation. Furthermore, across the local authorities, there is not an indicator that consistently contributes highly to the Townsend scores.

On average, the indicator that contributed the most to levels of deprivation in London's local authorities was overcrowding.

Although, that finding would not be accurate for the more deprived local authorities in London as they demonstrate that non-home ownership or no car or van availability contributed equally if not more. Hence, the causes of deprivation amongst the local authorities in London also differ. An example is provided by graph 6a and graph 6b.

Graph 5: Townsend scores and Z scores for London's local authorities in 2011.



# Results III: Deprivation in England (continued)

Table 10: Townsend scores and Z scores of London's local authorities in 2011

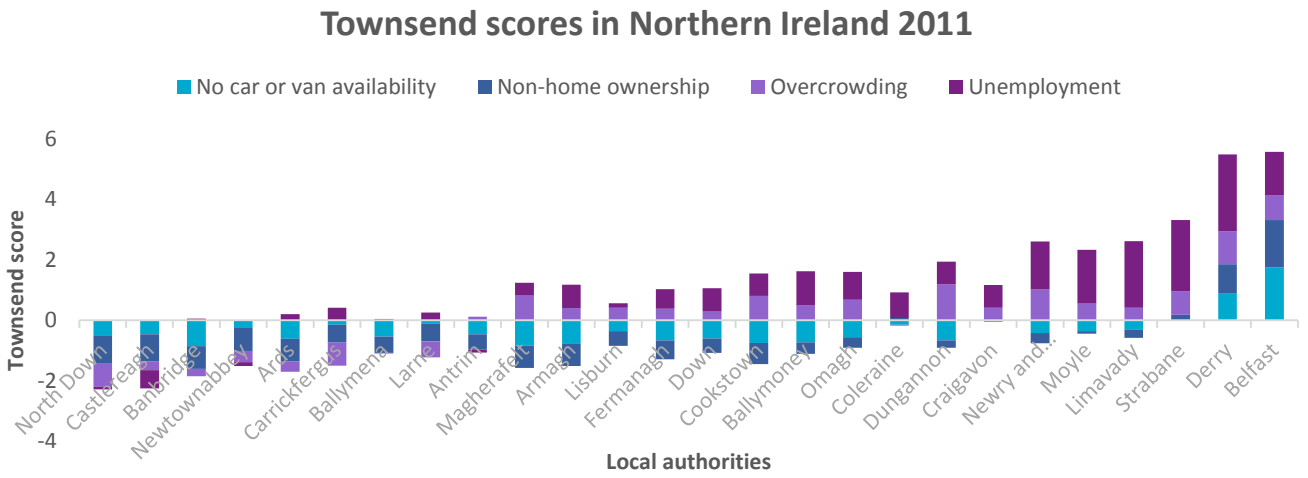
| Local authority | No car or van | Non-home ownership | Overcrowding | Unemployment | Townsend score |
|---|---|---|---|---|---|
| **Bromley** | 0.080 | -0.508 | 0.129 | -0.175 | -0.474 |
| **Richmond upon Thames** | 0.207 | 0.282 | 0.148 | -1.065 | -0.429 |
| **Havering** | 0.033 | -0.794 | 0.348 | 0.303 | -0.110 |
| **Bexley** | 0.099 | -0.683 | 0.664 | 0.214 | 0.294 |
| **Sutton** | 0.073 | -0.195 | 0.831 | -0.264 | 0.446 |
| **Kingston upon Thames** | 0.247 | 0.237 | 1.070 | -0.773 | 0.781 |
| **Hillingdon** | -0.001 | 0.300 | 2.446 | 0.238 | 2.983 |
| **Harrow** | 0.083 | 0.076 | 2.785 | 0.352 | 3.296 |
| **Merton** | 0.992 | 0.730 | 2.074 | -0.149 | 3.646 |
| **Barnet** | 0.606 | 0.902 | 2.431 | 0.278 | 4.217 |
| **Redbridge** | 0.529 | 0.256 | 2.787 | 0.950 | 4.521 |
| **Croydon** | 1.083 | 0.738 | 2.046 | 0.924 | 4.792 |
| **Wandsworth** | 2.274 | 2.138 | 1.768 | -0.453 | 5.727 |
| **Enfield** | 0.983 | 0.869 | 2.596 | 1.315 | 5.762 |
| **Hounslow** | 0.895 | 1.549 | 3.151 | 0.364 | 5.959 |
| **Ealing** | 1.271 | 1.508 | 3.327 | 0.778 | 6.885 |
| **Greenwich** | 1.942 | 2.368 | 2.605 | 1.359 | 8.274 |
| **Waltham Forest** | 1.930 | 1.710 | 3.419 | 1.326 | 8.385 |
| **Kensington and Chelsea** | 3.346 | 3.254 | 1.848 | 0.272 | 8.721 |
| **Lewisham** | 2.557 | 2.495 | 2.564 | 1.244 | 8.860 |
| **Barking and Dagenham** | 1.703 | 2.062 | 3.172 | 2.076 | 9.013 |
| **Hammersmith and Fulham** | 3.271 | 3.361 | 2.477 | 0.441 | 9.550 |
| **Brent** | 2.040 | 2.415 | 4.030 | 1.180 | 9.665 |
| **Haringey** | 2.928 | 2.848 | 3.281 | 1.271 | 10.328 |
| **Lambeth** | 3.532 | 3.473 | 2.542 | 0.990 | 10.536 |
| **Camden** | 3.859 | 3.650 | 2.637 | 0.440 | 10.586 |
| **City of London, Westminster** | 4.065 | 3.762 | 2.434 | 0.407 | 10.668 |
| **Islington** | 4.215 | 3.990 | 2.165 | 0.925 | 11.295 |
| **Southwark** | 3.586 | 3.808 | 3.076 | 1.170 | 11.641 |
| **Newham** | 2.950 | 3.410 | 4.791 | 1.885 | 13.036 |
| **Hackney** | 4.213 | 4.372 | 3.304 | 1.763 | 13.653 |
| **Tower Hamlets** | 4.050 | 4.320 | 3.949 | 1.695 | 14.013 |

# Results III: Deprivation in England (continued)

Graph 6a and 6b: Tower Hamlets and City of London, Westminster with their respective Z scores and the proportion by which each indicator contributes to their Townsend scores.

# Results III: Deprivation in Northern Ireland

Graph 7: Townsend scores and Z scores for Northern Ireland's local authorities, in 2011.



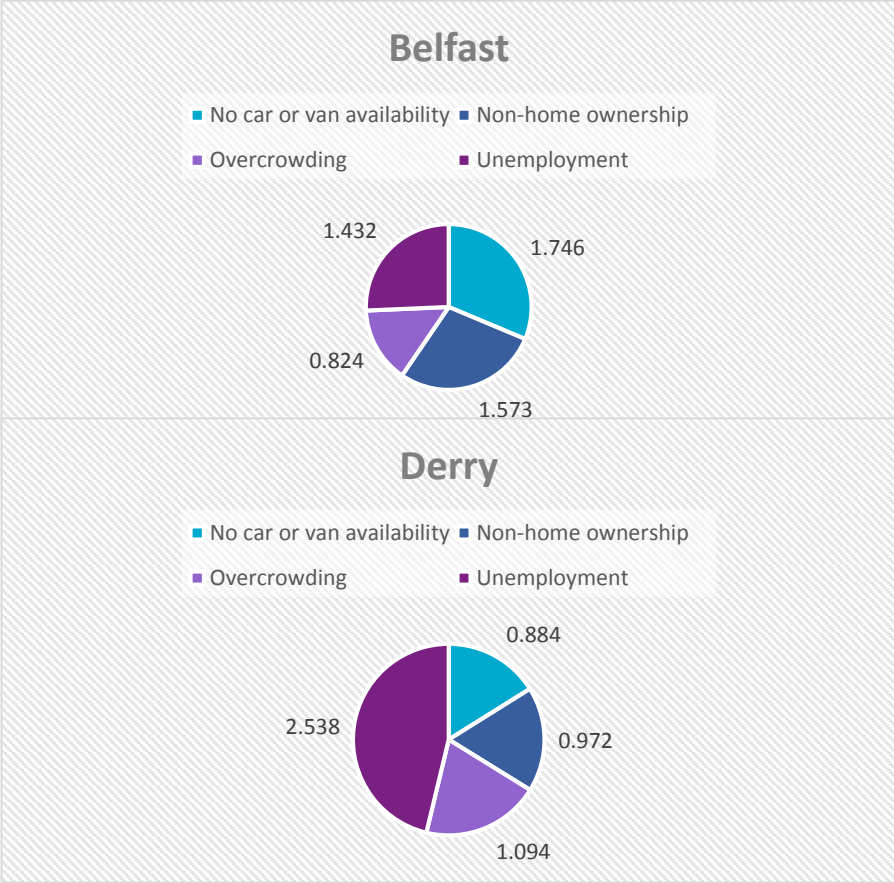

The most deprived local authority in Northern Ireland was Belfast (5.58), with Derry following very closely behind (5.49). The highest Z score for Belfast was no car or van availability and for Derry, the highest Z score was unemployment. Non-of the local authorities in Northern Ireland exceeded the Townsend score of Tower Hamlets in London. The least deprived local authority area was North Down (-2.28).

In fact, both Belfast and Derry have scores that are less than half of the score of Tower Hamlets, which suggests that levels of deprivation in Northern Ireland are not as high as that found in London.

Generally, the more deprived local authorities in Northern Ireland highlight that unemployment contributes more than any other indicator to deprivation scores. This is verified by the fact that unemployment produced the highest average z score for Northern Ireland's local authorities (0.765).

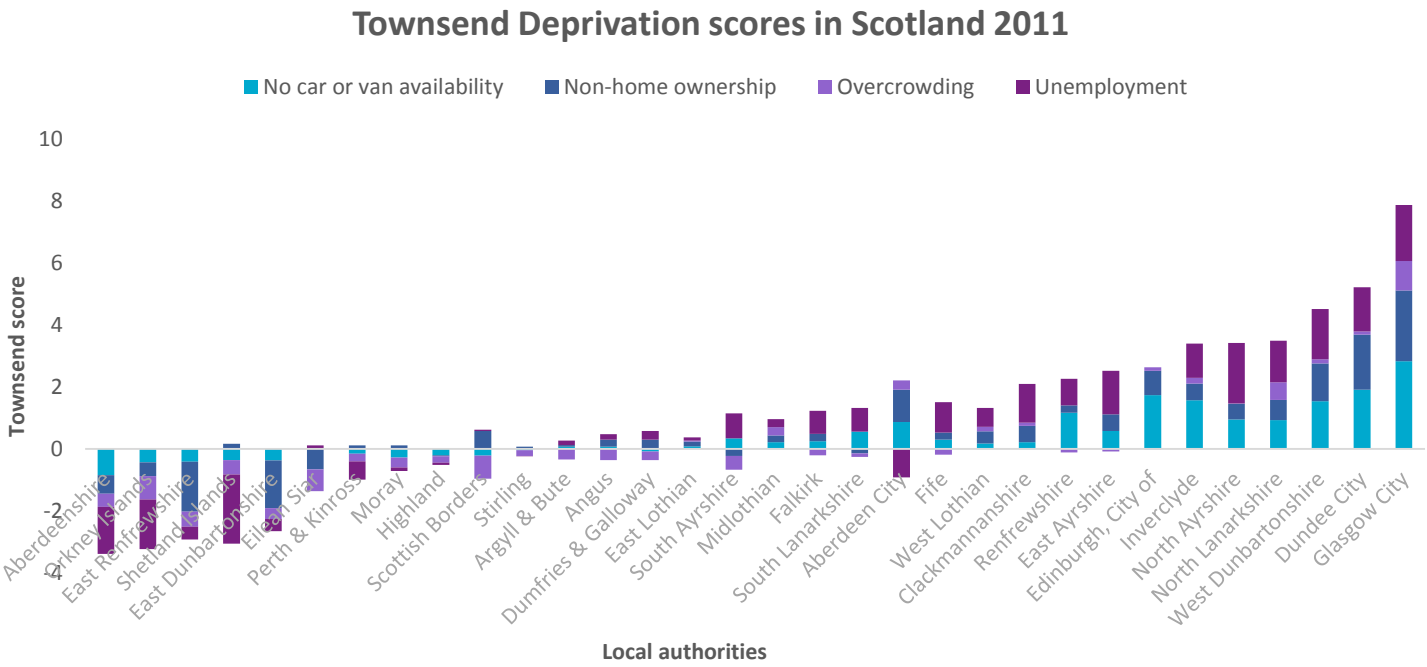
Graphs 8a and 8b represent the Z scores of the most deprived areas in Northern Ireland.

Graph 8a and 8b : Z scores for Belfast and Derry in 2011.



# Results III: Deprivation in Scotland

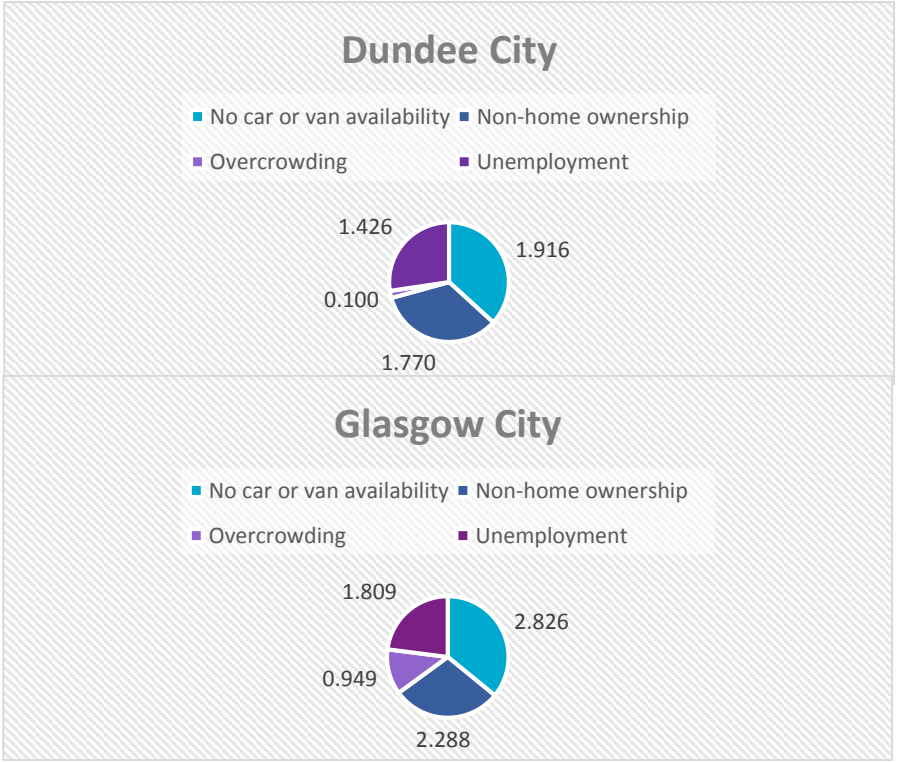
Graph 9: Townsend scores and Z scores for Scotland's local authorities in 2011.




The most deprived local authority in Scotland is Glasgow city and the least deprived is Aberdeenshire. No car or van availability produced the highest Z score for Glasgow city. Again, like the most deprived local authorities in Northern Ireland, Scotland's most deprived local authority does not exceed the levels of deprivation that are present in London's most deprived local authority, Tower Hamlets. There is, however, a trend emerging, with cities consistently being the most deprived local authority areas.

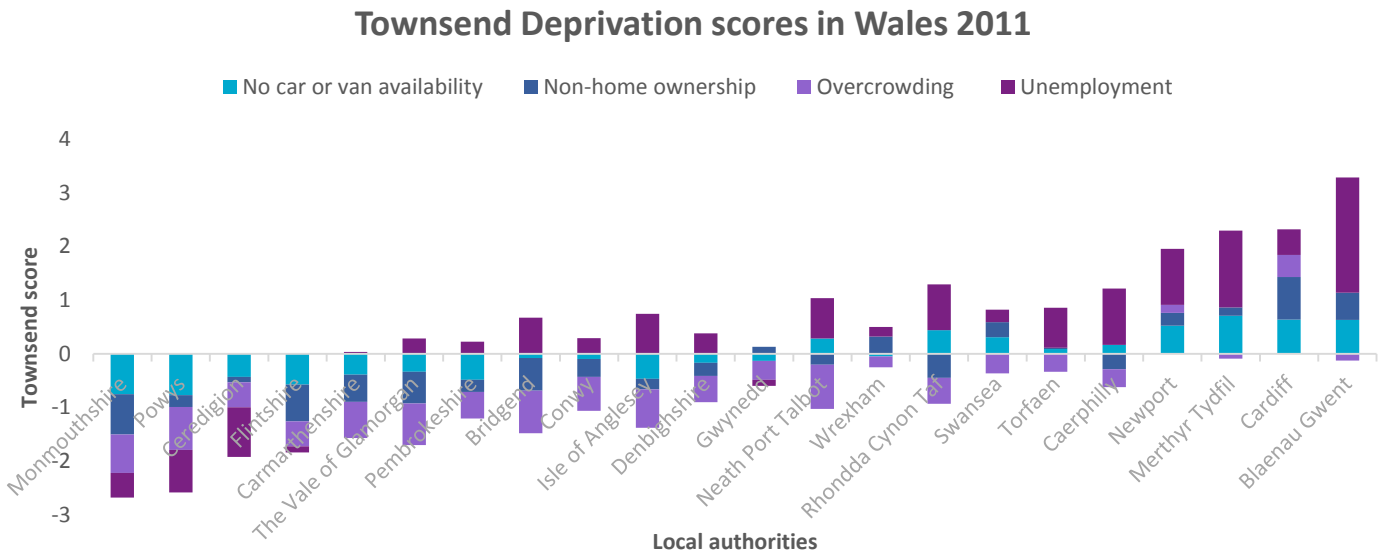
Graphs 10a and 10b provide the make up of the Townsend scores for the two most deprived local authority areas in Scotland.

Graph 10a and 10b: Z scores for Dundee city and Glasgow city in 2011.



# Results III: Deprivation in Wales

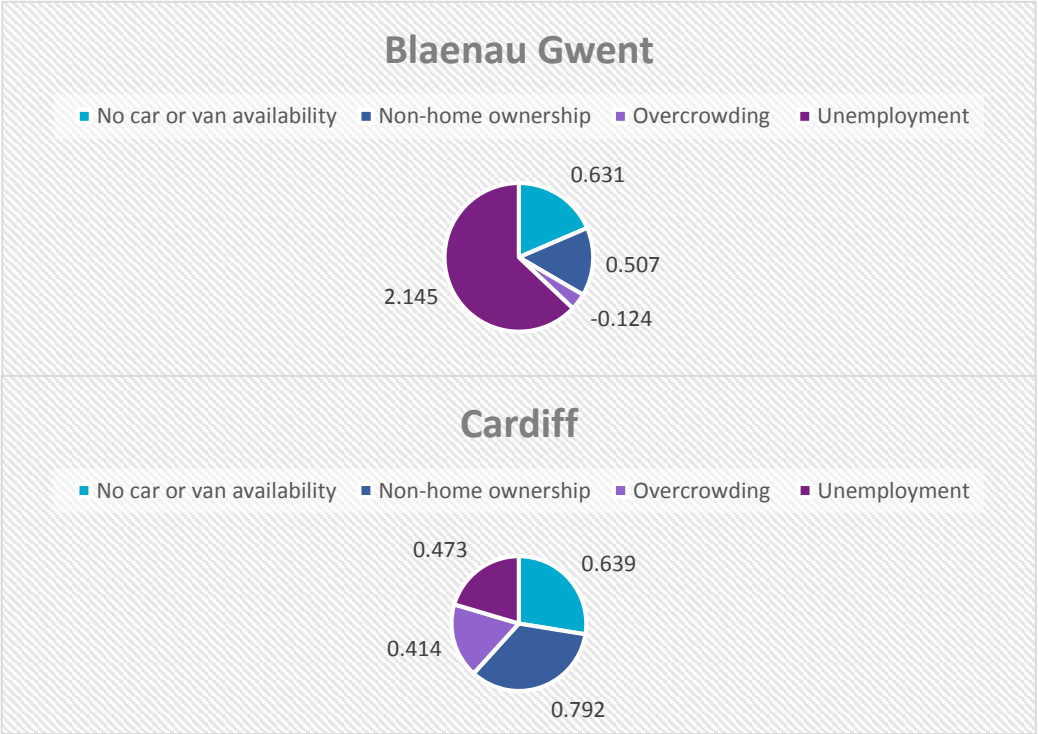
Graph 11: Townsend scores and Z scores for Wales local authorities in 2011.




Surprisingly, the most deprived local authority area in Wales is not a city. It is Blaenau Gwent which is a county borough in South Wales. Cardiff is the second most deprived local authority in Wales which fits in with the trend of cities containing higher levels of deprivation. The highest Z score for Blaenau Gwent was for the unemployment deprivation indicator. Blaenau Gwent is significantly less deprived than the most deprived local authorities in Scotland, England and Northern Ireland, with a Townsend score of 3.159.

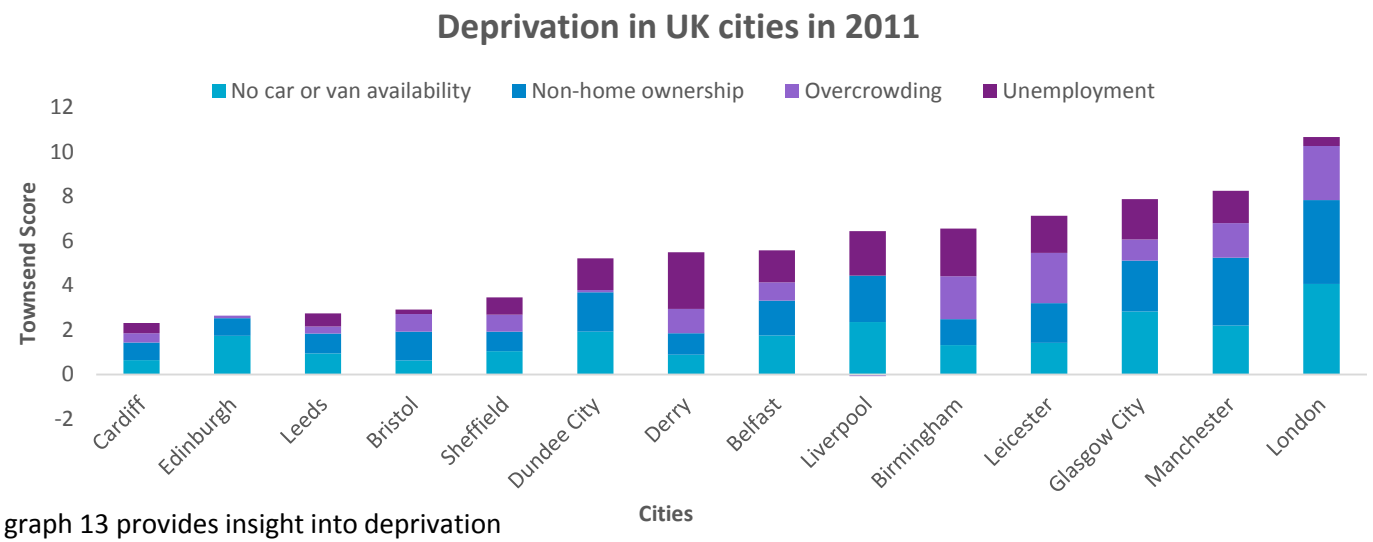
Graphs 12a and 12b provide the make up of the Townsend scores for the two most deprived local authority areas in Wales.

Graph 12a and 12b: Z scores for Blaenau Gwent and Cardiff



# Results III: Deprivation in UK cities

Graph 13: Townsend scores and Z scores for Wales UK cities in 2011.




The graph 13 provides insight into deprivation levels in UK cities. For London, the local authority 'City of London, Westminster' was used, so that all the cities in the graph were represented by local authority area. English cities were generally more deprived than cities in other parts of the UK. For example, levels of deprivation in Manchester and London were higher than Glasgow City. Similarly, Liverpool, Birmingham and Leicester had higher levels of deprivation than Northern Ireland's cities. Cardiff had the lowest levels of deprivation amongst UK cities.

Graph 14 provides a clearer illustration of the Townsend indicators and how they contributed to Townsend scores for each of the cities local authority areas. What's interesting is that for 8 out of the 14 cities, no car or van availability contributed the most to the overall Townsend score. It begs the question of whether no car or van availability in the context of cities is a viable indicator of deprivation.

Graph 14: Z scores for UK cities in 2011.

# Results III: Conclusion

Levels of deprivation varied across the UK, by local authority area and by country. In England, the levels of deprivation varied more than any of the other countries. This is because the difference between the Townsend scores of the most deprived and least deprived local authority areas was large. The most deprived local authority was Tower Hamlets in London, England. The least deprived local authority was South Northamptonshire, also an English local authority.

A general trend of high levels of deprivation being prominent in cities was established. Z scores provided insight into which indicators were causing most deprivation within local authority areas.

No consistent and viable patterns emerged in relation to this at local authority level. Perhaps investigating for trends at a geography such as electoral wards or output areas would provide better insight into what the causing of deprivation is within the UK as a whole and the individual countries.

However, for Northern Ireland at local authority level, unemployment was consistently present amongst the most deprived local authority areas. This was especially the case in Derry.

Unemployment also seemed to be the issue in Wales, with the local authority areas of Blaenau Gwent (2.15) and Northern Ireland's local authority area of Derry (2.54) having high levels of unemployment, illustrated by their respective Z scores.

For Scotland, no car or van availability often contributed to Townsend scores for the most deprived local authorities. Graph 14 demonstrates this as the Z scores for no car or van availability for the Scottish cities of Edinburgh (1.73), Dundee (1.92) and Glasgow (2.83) were the highest of all other indicators. Again, the suggestion of the viability of no car or van availability can be questioned in relation to the Scottish cities to establish why people within the cities do not have car or van availability. This would require further research.

The difficulty with making direct comparisons between the countries arose due to volume of local authorities within England. As mentioned, this made visualising the data difficult and therefore it was only suitable to illustrate levels of deprivation within England at regional level. After finding that London had high levels of deprivation, it was considered suitable to use the local authorities of London to make comparisons with the local authorities of the other countries. This is further supported by the fact as London is the capital city in England and the UK and also consisted of the most deprived local authority area in the UK.

For London, it was more difficult to establish an indicator that contributed consistently, although from graph 5, it was clear to see that unemployment did not contribute as significantly as the other indicators. The average of the Z scores for London's local authorities demonstrated that overcrowding contributed to Townsend scores more than any other indicator (2.403).

These findings illustrate that the Townsend score alone is useful in identifying levels of deprivation between different parts of the UK. However, when analysing levels of deprivation in terms of the different indicators that make up the Townsend score (the Z scores), a better indication as to why a particular area is deprived can be established.

# Discussion

Overview of the study and the results.

# Discussion

This report has used the Townsend deprivation index to demonstrate levels of deprivation across the different areas of the UK. The main focus was upon the scores of 2011 but additional reflections to previous years were also included. Therefore, levels of deprivation were demonstrated for the UK at different points in time and different geographical levels.

There are a few limitations that are worth considering when interpreting the results that have been reported.

**Time comparisons**

As explained in the 'Results I: Comparisons' section making comparisons of the levels of deprivation between the different years would not be provide for accurate comparisons. A single mean measure and a single standard deviation measure need to be present as the basis for producing z scores across the years, which can then be added to produce the Townsend scores.

Therefore, the visualisations produced for this project should only be interpreted by the classified year as opposed to compared with other.

**Quintile methods**

In the section 'Census boundaries and quintiles' and subsection 'quintiles' reference was made to the method used to produce quintiles based on the Townsend scores that were produced.

As explained, quintiles can be produced using population estimates or on the number of areas. For this project, quintiles were produced on the latter method. Both methods are equally valid and have been used in previous deprivation studies.[2]

The difference between both methods is that the Townsend scores for the relevant areas will be evenly allocated to each calculated with the latter method. This would mean that some areas may be allocated to different quintiles based on the method used.

**Choosing variables**

The section 'Choosing the Townsend Deprivation Index and census variables' highlighted some of alternative variables that could have been used to calculate the scores.

A specific variable that was deemed appropriate but was not suitable for use for the purposes of comparability was using the census variable 'persons per bedroom' as a measure for the indicator overcrowding. This was only available for England and Wales and was introduced in the most recent census. Future research could make use of this measure and determine which measure for overcrowding is deemed more appropriate.

**Townsend Deprivation Index**

As mentioned at the start of the report, no measure of deprivation has been immune from criticism.

The Townsend Deprivation Index was chosen because it best suited the purposes of the project and has widely been used.

The results in relation to cities illustrated that no car and van availability was a significant contributor to deprivation within the local authorities. In the context of modern society and issues such as air pollution and advanced public transport links which were not present when the deprivation measure was introduced, it is important to consider the viability of the indicator to measure deprivation. Furthermore, the indicator has been criticised as car ownership in rural areas may be considered a vital requirement rather than an indicator of wealth.[23] This would require further research.

A similar question can be posed of the census variable used to determine overcrowding. Is 'persons per room' an accurate variable to establish overcrowding? The introduction of the new census variable 'persons per bedroom' may address any accuracy issues that may exist for the former census variable.

Lastly, there are long-established indicators of deprivation that the Townsend deprivation index does not consider that other measures of deprivation do. For example, social class. This provides that no measure of deprivation will provide a truly wholesome picture of the levels of deprivation that exist. The best that measures of deprivation can do is provide some insight into the levels of deprivation that exist.

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