Medicines & Healthcare products
Regulatory Agency

CPRD

Small area level data based on patient postcode

Documentation and Data Dictionary (set 22/January 2022)

Version 3.3

Date: 19 April 2022

NIHR | National Institute for Health Research

Documentation Control Sheet

Over time, it may be necessary to issue amendments or clarifications to parts of this document. This form must be updated whenever changes are made.

Version	Affected Areas: Summary of Change	Prepared By	Reviewed By
0.9	Initial Draft	Dan Dedman	Rachael Boggon, Shivani Padmanabhan
1.0	Modified	Dan Dedman	
1.1	Modified	Dan Dedman	Rachael Williams
1.2	Formatted	Grant Lee	Sophia Amjad
1.3	Modified	Dan Dedman	Sophia Amjad
2.0	Modified	Helen Strongman	Arlene Gallagher
2.1	Modified	Helen Strongman	Shivani Padmanabhan
2.2	Modified	Rebecca Ghosh	Helen Strongman
2.3	Modified and formatted	Rebecca Ghosh	Arlene Gallagher
2.4	Modified	Rebecca Ghosh	Elizabeth Crellin
2.5	Modified	Susan Hodgson	Elizabeth Crellin
2.6	Modified	Susan Hodgson	Elizabeth Crellin
2.7	Modified	Susan Hodgson	Rebecca Ghosh
2.8	Modified	Susan Hodgson	Rebecca Ghosh
2.9	Modified	Susan Hodgson	Jessie Oyinlola
3.0	Modified	Susan Hodgson	Eleanor Axson
3.1	Modified	Susan Hodgson	
3.2	Updated	Eleanor Axson	Preveina Mahadevan Susan Hodgson
3.3	Modified	Eleanor Axson	Susan Hodgson

Summary of Changes

Version 1.0
- Release version
- Incorporated changes to ordering of deprivation quintiles\deciles (1=least deprived) and corrections to dataset description for Townsend scores
- Added section on choosing which classification to use for a single study

Version 1.1
- Updated for set 10

Version 1.2
- Formatted document with new agency branding

Version 1.3
- Updated for set 11
- Amended description of eligibility criteria, missing values, and hyperlinks

Version 2.0
- Updated for set 12
- Addition of 2015 English Index of Multiple Deprivation references and data updated

Version 2.1
- Updated for set 13
- NHS postcode directory updated to May 2016
- Linkage summary results updated

Version 2.2
- Updated for set 14
- Linkage summary results and quintile methodology updated

Version 2.3
- Updated for set 15
- Updated header and footer with new agency branding

Version 2.4
- Updated for set 16

Version 2.5
- Updated link for reference 12

Version 2.6
- Updated to include individual IMD domains
- Updated to include Carstairs 2011 Index
- Updated to include Rural Urban Classification
- Updated for set 17

Version 2.7
- Updated for set 18

Version 2.8
- Updated for set 19

Version 2.9
- Updated for set 20

Version 3.0
- Updated for set 21; DOIs added

Version 3.1
- Updated to revise reference to ISAC

Version 3.2
- Updated IMD and Townsend measures
- Updated file and variables names
- Updated references
- Removed discussion of non-English measures (as these are not available at the patient postcode level)
- Updated for set 22

Version 3.3
- Updated Townsend Deprivation Score comparability information

Background

Classifications based on the population characteristics of small areas or neighbourhoods (and the individuals who live there) have been in use for several decades. In health research they have many applications, including: as a proxy for individual level measures of socioeconomic status; for planning and targeting of health and social care services; for ecological studies of environmental effects on health; and for individual level studies where characteristics of place of residence are of particular interest. (Smith, Whitley, Dorling, & Gunnell, 2001) There are a wide range of small area data available from many sources. CPRD has linked the patient postcodes for both CPRD GOLD and CPRD Aurum to some of the most commonly requested area level data. This includes several measures of area level deprivation and a rural-urban classification.

Linkage to small area data at the patient-postcode level is available for selected patients in England. Patient-postcode linkage is not currently available for patients in Northern Ireland, Scotland, and Wales.

Census geography (Office for National Statistics, 2017)**:**

The small area data provided is based on census geography which is the main geography directly associated with the UK Census in England. The base unit of this geography is the Output Areas (OA) which are built from clusters of adjacent postcode units (Office for National Statistics, 2013). Output areas usually contain around 110-140 households and are designed to be similar in population size and social characteristics based on tenure of household and dwelling type. Output Areas can be aggregated into Super Output Areas (SOA) which can be sub-divided into lower layer super output areas (LSOA) and middle layer super output areas (MSOA) in England and Wales (Office for National Statistics, 2017).

The small area data provided by CPRD is at LSOA level which are typically built up from 4-6 OAs and have a notional minimum size of 1,000 residents and 300 households, and an average of 1,600 residents (Office of National Statistics, 2012).

Area level measures of deprivation:

There are a number of well-known area-based measures of deprivation available at the LSOA level for linkage to CPRD primary care data through the patient postcode in England. These measures are:

The English Index of Multiple Deprivation (IMD):

One of the most used measures of deprivation is the Index of Multiple Deprivation (IMD). This is a composite measure derived from of a number of indicators covering different aspects ('domains') of material deprivation: income, employment, education and skills, health, housing, crime, access to services, and living environment. Each domain index can itself be a composite score derived from two or more sub-domain indicators. The overall composite index, the Index of Multiple Deprivation (IMD), is calculated as a weighted sum of the domain indices.

The first official 'Indices of Deprivation' for England (Department for Communities and Local Government, 2015) were produced by the UK Department for Communities and Local Government in 2000, replacing the 1998 Index of Local Deprivation. Updates for 2004, 2007, 2010, 2015 and 2019 were calculated at lower layer super output area (LSOA) level (Office for National Statistics, 2011).

Note also that all the indices measure relative rather than absolute deprivation. As such it is the ranking of areas provided by the IMD score, rather than the actual score itself, which is of primary interest.

Composite IMD rank is available linked to CPRD patient postcode at the LSOA level in England for IMD 2019. CPRD can provide individual domain IMD ranks on request on a study-by-study basis with an approved protocol. Please contact CPRD Enquiries enquiries@cprd.com, before any application, to discuss.

Townsend Score: (Townsend, Phillimore, & Beattie, 1988) (Gartner & Lester, 2008)

This indicator was devised by Townsend *et al* in 1988 as an index of material deprivation and disadvantage. Originally calculated at ward level, it was based on 4 measures from the 1981 census:
- Unemployment: proportion of the economically active population aged 16-59/64 who are unemployed.
- Car ownership: proportion of households with no car.
- Home ownership: proportion of households not owning their own home.
- Household overcrowding: proportion of private households with >=1 resident per room.

The index is created as the sum of scores for each standardised measure. Townsend scores have been recalculated using data from the 1991, 2001, and 2011 censuses, and for different geographies – for example census output areas (OA) and LSOA. As with IMD scores, it is the ranking of areas provided by the Townsend score, rather than the actual score itself, which is of primary interest. The Townsend Score is comparable across UK countries, but not over time (i.e. it is inappropriate to compare an area measure from 2001 to a measure from 2011) (Yousaf & Bonsall, 2017).

The Townsend Score is available linked to CPRD patient postcode at the LSOA level in England for the 2011 census.

Carstairs Index: (Carstairs & Morris, 1989)

This indicator was devised in the 1980s by Carstairs and Morris as an index of material deprivation at the small area level. Originally developed for Scotland, and now covering England and Wales as well, it is based on four measures from the UK census:
- Male unemployment: proportion of the economically active population of males age 16-74 who are unemployed.
- Car ownership: proportion of households with no car
- Overcrowding: proportion of all persons living in private households with a density of more than one person per room.
- Social Class: proportion of persons in private households with an economically active head of household in a low social class. Social class score was originally created using the Registrar General's Social Class (Office for National Statistics, 2017), but as of 2001, this is measure is approximated from the operational categories of the National Statistics Socio-Economic Classification

The index is created from the sum of scores for each standardised measure. Carstairs scores have been recalculated using data from the 1991, 2001 and 2011 census. In England, Carstairs scores are calculated at LSOA level. As with IMD scores, it is the ranking of areas provided by the Carstairs Index, rather than the actual score itself, that is of primary interest. Carstairs 2011 scores are comparable between the different countries because the scores are calculated based on the total distribution across all LSOA with data available.

The Carstairs Index is available linked to CPRD patient postcode at the LSOA level in England for the 2011 census (Wheeler, 2014).

Rural Urban Classification:

It may be important to distinguish between rural and urban areas when investigating differences in social and economic characteristics of small areas. Populations can vary in their composition between urban and rural areas, as can access to services, employment and educational opportunities, and quality of life.

The Rural Urban classifications (RUC) for England and Wales are produced by the Office for National Statistics and are based on census population data (Office for National Statistics, n.d.). The "Urban" or "Rural" designation is given based on resident population only, and do not reflect the land use, policy, or financial characteristics of an area.

In England, the Urban/Rural classification is available at the LSOA level using the 2011 census (Bibby & Brindley, 2013). For England, the classifications are available as binary (rural/urban) variables, the full classification has up to eight categories, four urban and four rural.

The binary Rural Urban Classification is available linked to CPRD patient postcode at the LSOA level in England for the 2011 census. CPRD may be able to provide different groupings of the categories on request on a study-by-study basis with an approved protocol. Please contact CPRD Enquiries enquiries@cprd.com, before any application, to discuss.

What data are available through this linkage?

For practices in England that have consented to participate in the linkage scheme, the patient postcode of residence is mapped to the 2011 LSOA boundaries using a postcode lookup file. The LSOA of residence then allows linkage to the following LSOA-level deprivation measures (Department for Communities and Local Government, 2015):

- 2019 English Index of Multiple Deprivation (2011 LSOA boundaries) composite and individual domains

- Townsend score: calculated at LSOA level using unadjusted 2011 census data (Gartner & Lester, 2008)

- 2011 Carstairs Index (2011 LSOA boundaries)

- Binary England Rural Urban Classification (2011 LSOA boundaries)

Linkages at the practice postcode level, for all UK countries, are available separately. This uses the practice postcode, which is linked via LSOA, SOA (Northern Ireland), or datazone (DZ) (Scotland), to several measures of area level deprivation and a rural urban classification. These data are described in the documentation on small area data for practices.

Which area-based classification should I use?

Only one patient level classification will be provided for a single study (see section on disclosure control). In deciding which classification is most appropriate, there are several things to consider:

- theoretical considerations: the IMD classifications summarise a larger range of 'domains' of deprivation than Townsend or Carstairs which are intended to focus on material deprivation. It may be helpful to review the literature on the derivation of the different classifications.
- external validity: you may wish to select a classification that allows your results to be most comparable with other published work.

Aside from these issues, it is worth noting that all the available measures are very highly correlated. Spearman's rank correlation coefficients are between 0.94-0.97 for deciles of the different IMD classifications, and between 0.83-0.89 for deciles of Townsend and 0.88-0.90 for decile of Carstairs versus the IMD classifications. This means that for many applications, the choice of area-based deprivation measure is unlikely to have a significant impact on the results or interpretation.

Also note, the linkage to LSOA uses the most recent patient postcode available in the GP record, so it is not possible to assign deprivation metrics based on where a patient might have lived at some fixed time prior. As standard, the most recent deprivation scores will be provided for approved studies. It is worth noting that the available measures are very highly correlated to historic measures. For example, the Spearman's rank correlation coefficient for deciles of the IMD classifications is 0.97 between English IMD 2010 and 2015, 0.98 between Scottish IMD 2009 and 2012, 0.93 between NI 2010 and 2017 and 0.97 between Welsh IMD 2011 and 2014. This means that for many applications, the year of an area-based deprivation measure is unlikely to have a significant impact on the results or interpretation.

Linkages to older versions of the IMD, Townsend, Carstairs, and RUC may be requested on a study-by-study basis with an approved protocol. Please contact CPRD Enquiries enquiries@cprd.com, before any application, to discuss.

Disclosure control
The Rural Urban Classification and deprivation scores and rankings are in the public domain and can be used to identify individual LSOAs. Therefore, for IMD, Townsend and Carstairs, each LSOA is classified

into quintile, decile or 'twentile' groupings based on the deprivation score or rank. These quantiles are calculated by ranking all national LSOAs from least deprived to most deprived and dividing them into equal groups. This ranking is not restricted to the CPRD population, no further processing is done on the data and the quantiles are not weighted. Unless otherwise specified on the linkage request form, CPRD will provide the requested measure in quintiles as default.

Technical note: different approaches are available for assigning quantile membership (quintile, deciles etc) when the number of units to be grouped is not an exact multiple of the number of groups. The quintile, decile and 'twentile' groupings were created with the `-xtile-` command in Stata version (Statacorp, 2013), with the `-nquantile()-` option to specify the number of equal sized groups to be created (quintiles=5 groups; deciles=10 groups; 'twentiles'=20 groups).

By cross-tabulating two or more classifications it is possible to identify very small groups of lower super output areas (LSOA). In order to minimise the possibility of deductive disclosure of a patients' area of residence, CPRD will only supply one of the area-based deprivation measures for any one study. If you feel you have a compelling justification for using two or more classifications in the same study, you should contact CPRD to discuss your requirements.

Eligibility for inclusion in patient-level postcode linkage

Patients are eligible for inclusion if ALL the following criteria are satisfied:
- they are registered with a practice which has consented to participate in the CPRD patient-level linkage scheme. Currently the linkage scheme is restricted to practices in England.
- the patient has no record indicating dissent from the transmission of personal confidential data to NHS Digital, formerly known as the Health and Social Care Information Centre (HSCIC).
- a full postcode of residence is recorded for the patient in the primary care data and has a valid format.

Missing values
Where a postcode appears in a valid format but cannot be linked to an English LSOA (2011 classification), the above area-level data are set to missing. This may occur for several reasons:
- a non-geographic postcode
- a new postcode which is not included in the version of the NHS postcode directory used at the time of the linkage processing
- a postcode which is not in England
- an invalid postcode (but having the correct format)

Related files
- **Linkage eligibility file** (linkage_eligibility.txt) - this file contains a record for every patient registered with a linked practice prior to transmission of identifiers to the trusted third party, along with flags to indicate the patients' eligibility for inclusion in each of the available linkages. Note that eligibility for linkage does not necessarily mean that the patient will appear in the linked dataset. For patient level deprivation measures, the relevant columns are:
  - [patid]: the unique CPRD patient identifier
  - [lsoa_e]: this flag is set to 1 if the patient if eligible for inclusion in linkages based on patient postcode of residence (based on eligibility criteria above), and 0 otherwise.

NHS Postcode Directory (NHSPD) (NHS Digital, n.d.)
The Office for National Statistics (ONS) supplies postcode-related data to the Organisation Data Service (ODS). The Organisation Data Service (ODS) is provided by NHS Digital and is responsible for the publication of all organisation and practitioner codes and NHS data standards. NHSPD is updated on a

quarterly basis and can be downloaded from: https://digital.nhs.uk/organisation-data-service/data-downloads/national-statistics

Linkage summary results - set 22/January 2022

- *Coverage period for linkage***:** undefined. The patient postcode is available only for the last recorded address, and is valid up to the time of the data extract used for the linkage i.e. the linkage date. Historic postcodes for patients are not maintained.
- *Postcode lookup file version* (maps unit postcodes to LSOA): NHSPD, February 2021

CPRD GOLD

- Number of practices in linkage (see linkage_eligibility.txt file): 426
- Number of patients in linked practices (see linkage_eligibility.txt file): 11,067,015
- Number of patients eligible for postcode linkage (lsoa_e=1 in linkage_eligibility.txt): 10,559,388
- Number of records in each IMD/Townsend/Carstairs/Rural urban classification data file: 11,067,015
- Number of patients with valid area-based deprivation score data: 10,516,660
- Number of patients with a postcode having a valid format, but which could **not** be linked to an English LSOA based on the 2011 LSOA classifications: 42,728 (deprivation quantiles and Rural urban classification set to missing for these patients).

CPRD Aurum

- Number of practices in linkage (see linkage_eligibility.txt file): 1,478
- Number of patients in linked practices (see linkage_eligibility.txt file): 48,355,828
- Number of patients eligible for postcode linkage (lsoa_e=1 in linkage_eligibility.txt): 45,811,076
- Number of records in each IMD/Townsend/Carstairs/Rural urban classification data file: 48,355,828
- Number of patients with valid area-based deprivation score data: 45,571,176
- Number of patients with a postcode having a valid format, but which could **not** be linked to an English LSOA based on the 2011 LSOA classifications: 239,900 (deprivation quantiles and Rural urban classification set to missing for these patients).

DOI

Please cite in any publications using these data:

CPRD GOLD Small Area Data (patient) January 2022 - https://doi.org/10.48329/y101-0w14

CPRD Aurum Small Area Data (patient) January 2022 - https://doi.org/10.48329/aytt-h222

Dataset specification

Index of Multiple Deprivation[1]:

File name: patient_imdcomposite.txt

Column name	Description	Type	Format
patid	The encrypted unique key given to a patient in CPRD GOLD or CPRD Aurum [primary key]	TEXT	20
pracid	The encrypted unique key given to a practice in CPRD GOLD or CPRD Aurum	INTEGER	5
e2019_imd_5	IMD2019: quintile (1=LEAST deprived)	INTEGER	1
e2019_imd_10	IMD2019: decile (1=LEAST deprived)	INTEGER	2
e2019_imd_20	IMD2019: 'twentile' (1=LEAST deprived)	INTEGER	2

File name: patient_imddomains.txt

Column name	Description	Type	Format
patid	The encrypted unique key given to a patient in CPRD GOLD or CPRD Aurum [primary key]	TEXT	20
pracid	Encrypted unique key given to a practice in CPRD GOLD or CPRD Aurum	INTEGER	5
e2019_income_5	England: IMD2019 income domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_income_10	England: IMD2019 income domain: decile (1=LEAST deprived)	INTEGER	2
e2019_income_20	England: IMD2019 income domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_employment_5	England: IMD2019 employment domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_employment_10	England: IMD2019 employment domain: decile (1=LEAST deprived)	INTEGER	2
e2019_employment_20	England: IMD2019 employment domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_education_5	England: IMD2019 education domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_education_10	England: IMD2019 education domain: decile (1=LEAST deprived)	INTEGER	2
e2019_education_20	England: IMD2019 education domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_health_5	England: IMD2019 health domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_health_10	England: IMD2019 health domain: decile (1=LEAST deprived)	INTEGER	2
e2019_health_20	England: IMD2019 health domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_crime_5	England: IMD2019 crime domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_crime_10	England: IMD2019 crime domain: decile (1=LEAST deprived)	INTEGER	2
e2019_crime_20	England: IMD2019 crime domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_access_5	England: IMD2019 access domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_access_10	England: IMD2019 access domain: decile (1=LEAST deprived)	INTEGER	2

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[1] Please note researchers can only obtain Deprivation data in quintiles OR deciles OR twentiles i.e. e2019_XXX_5 or e2019_XXX_10 or e2019_XXX_20

e2019_access_20	England: IMD2019 access domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_living_environment_5	England: IMD2019 living environment domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_living_ environment_10	England: IMD2019 living environment domain: decile (1=LEAST deprived)	INTEGER	2
e2019_living_ environment_20	England: IMD2019 living environment domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_housing_5	England: IMD2019 housing sub-domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_housing_10	England: IMD2019 housing sub-domain: decile (1=LEAST deprived)	INTEGER	2
e2019_housing_20	England: IMD2019 housing sub-domain: 'twentile' (1=LEAST deprived)	INTEGER	2
e2019_outdoor_environment_5	England: IMD2019 outdoor environment sub-domain: quintile (1=LEAST deprived)	INTEGER	1
e2019_outdoor_environment_10	England: IMD2019 outdoor environment sub-domain: decile (1=LEAST deprived)	INTEGER	2
e2019_outdoor_environment_20	England: IMD2019 outdoor environment sub-domain: 'twentile' (1=LEAST deprived)	INTEGER	2

Townsend[1]:
File name: patient_townsend.txt

Column name	Description	Type	Format
patid	The encrypted unique key given to a patient in CPRD GOLD or CPRD Aurum [primary key]	TEXT	20
pracid	The encrypted unique key given to a practice in CPRD GOLD or CPRD Aurum	INTEGER	5
e2011_townsend_5	Townsend 2011 quintile (1=LEAST deprived)	INTEGER	1
e2011_townsend_10	Townsend 2011 decile (1=LEAST deprived)	INTEGER	2
e2011_townsend_20	Townsend 2011 'twentile' (1=LEAST deprived)	INTEGER	2

Carstairs[1]:
File name: patient_carstairs.txt

Column name	Description	Type	Format
patid	The encrypted unique key given to a patient in CPRD GOLD or CPRD Aurum [primary key]	TEXT	20
pracid	The encrypted unique key given to a practice in CPRD GOLD or CPRD Aurum	INTEGER	5
e2011_carstairs_5	Carstairs 2011: quintile (1=LEAST deprived)	INTEGER	1
e2011_carstairs_10	Carstairs 2011: decile (1=LEAST deprived)	INTEGER	2
e2011_carstairs_20	Carstairs 2011: 'twentile' (1=LEAST deprived)	INTEGER	2

[1] Please note researchers can only obtain Deprivation data in quintiles OR deciles OR twentiles i.e. e2019_XXX_5 or e2019_XXX_10 or e2019_XXX_20

Rural urban classification[1]
File name: patient_urbanrural.txt

Column name	Description	Type	Format
patid	The encrypted unique key given to a patient in CPRD GOLD or CPRD Aurum [primary key]	TEXT	20
pracid	The encrypted unique key given to a practice in CPRD GOLD or CPRD Aurum	INTEGER	5
e2011_urbanrural	England: 2011 Urban-Rural classification 1=Urban 2=Rural	INTEGER	1

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[1] Please note researchers can only obtain Deprivation data in quintiles OR deciles OR twentiles i.e. e2019_XXX_5 or e2019_XXX_10 or e2019_XXX_20

Reference List

Bibby, P., & Brindley, P. (2013). *Urban and Rural Area Definitions for Policy Purposes in England and Wales: Methodology (v1.0).* Retrieved April 2019, from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239477/RUC11methodologypaperaug_28_Aug.pdf

Carstairs, V., & Morris, R. (1989, Oct). Deprivation: explaining differences in mortality between Scotland and England and Wales. *BMJ, 299*(6704), 886–9.

Department for Communities and Local Government. (2015). The English Indices of Deprivation 2015. *Neighb. Stat. Release*, 1–20.

Gartner, A., & Lester, N. (2008). *LSOA Townsend deprivation scores calculated from unadjusted Census data.* Retrieved April 2019, from http://www.publichealthwalesobservatory.wales.nhs.uk/lsoa-townsend-deprivation-scores

NHS Digital. (n.d.). *Organisation Data Service Postcode Files.* Retrieved from https://digital.nhs.uk/organisation-data-service/data-downloads/postcode-files

Northern Ireland Statistics and Research Agency. (2010). *Northern Ireland Multiple Deprivation Measure 2010.* Retrieved from https://www.nisra.gov.uk/statistics/deprivation/northern-ireland-multiple-deprivation-measure-2010-nimdm2010

Northern Ireland Statistics and Research Agency. (2016). *Northern Ireland Urban - Rural Classification 2015.* Retrieved from https://www.nisra.gov.uk/support/geography/urban-rural-classification

Northern Ireland Statistics and Research Agency. (2017). *Northern Ireland Multiple Deprivation Measures 2017.* Retrieved from https://www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/NIMDM17- with ns.pdf

Office for National Statistics. (n.d.). *2011 rural/urban classification.* Retrieved April 2019, from https://www.ons.gov.uk/methodology/geography/geographicalproducts/ruralurbanclassifications/2011ruralurbanclassification

Office for National Statistics. (2011). *Super Output Areas (SOAs).* Retrieved from http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/super-output-areas--soas-/index.html

Office for National Statistics. (2013). *Output Areas (OAs).* Retrieved from http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/output-area--oas-/index.html

Office for National Statistics. (2017). *Census Geography - Office for National Statistics.* Retrieved from https://www.ons.gov.uk/methodology/geography/ukgeographies/censusgeography

Office for National Statistics. (2017). *The National Statistics Socio-economic classification (NS-SEC).* Retrieved from https://www.ons.gov.uk/methodology/classificationsandstandards/otherclassifications/thenationalstatisticssocioeconomicclassificationnssecrebasedonsoc2010

Office of National Statistics. (2012). *2011 Census: Population and Household Estimates for Small Areas in England and Wales, March 2011.* Retrieved from https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/2011censuspopulationandhouseholdestimatesforsmallareasinenglandandwales/2012-11-23

Scottish Government. (2017). *Scottish Index of Multiple Deprivation.* Retrieved from http://www.gov.scot/Topics/Statistics/SIMD

Scottish Government. (2018). *Scottish Government Urban Rural Classification 2016.* Retrieved from http://www.gov.scot/Publications/2018/03/6040

Smith, G. D., Whitley, E., Dorling, D., & Gunnell, D. (2001). Area based measures of social and economic circumstances: cause specific mortality patterns depend on the choice of index. *J. Epidemiol. Community Health, 55*(2), 149–50.

Statacorp. (2013). Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. *Coll. Station. TX StataCorp LP.*

Statistics for Wales. (2015). *Welsh Index of Multiple Deprivation.* Retrieved from https://gov.wales/welsh-index-multiple-deprivation

Townsend, P., Phillimore, P., & Beattie, A. (1988). *Health and deprivation: Inequality and the North.* London: Routledge.

Wheeler, B. (2014). *Carstairs Index 2011 for LSOAs.* Retrieved from http://reshare.ukdataservice.ac.uk/851497/

Yousaf, S., & Bonsall, A. (2017). *UK Townsend Deprivation Scores from 2011 census data.* UK Data Service.