

Small Area Population Estimates across the UK

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1. Introduction

Small area population estimates are produced separately for countries within the UK. There are many similarities but also some subtle differences between methods. This paper gives a broad description of the methodologies used in each country. This technical report has been collated by the Northern Ireland Statistics and Research Agency (NISRA) based on contributions from the Office for National Statistics (ONS) and National Records of Scotland (NRS).

For enquiries about the small area population estimates for each country please contact the following:

England & Wales

Office for National Statistics
Population Estimates Unit
Telephone: 01329 444664
sape@ons.gsi.gov.uk

Scotland

Statistics Customer Services
National Records of Scotland
Ladywell House
Edinburgh EH12 7TF
Telephone: 0131 314 4299
E-mail: customer@gro-scotland.gsi.gov.uk

Northern Ireland

NISRA Customer Services
Northern Ireland Statistics and Research Agency
McAuley House
2-14 Castle Street
Belfast BT1 1SA
Telephone: 028 9034 8100
E-mail: census.nisra@dfpni.gov.uk

2. Main uses of small area population estimates

In England & Wales small area population estimates are used by both central government departments and local authorities for a range of purposes including planning, monitoring of services and as denominators for the calculation of various rates and indicators. They are also included in the Neighbourhood Statistics suite of datasets.

In Scotland, small area population estimates are mainly used by local authorities for planning and resource allocation. They are also used as input to the Scottish Index of Multiple Deprivation, and form part of Scottish Neighbourhood Statistics along with other small area statistics that provide information at neighbourhood level.

The main purpose of small area population estimates for Northern Ireland was to provide the requisite population inputs to the Multiple Deprivation Measure in 2005 and 2010. However, it is recognised that there is a wider interest for these statistics; indeed, it was flagged up in the 2009/2010 NISRA User Survey. There is a user need for small area figures to amalgamate into higher geographies. The small area population estimates are also included in the Northern Ireland Neighbourhood Information System (NINIS), for example, through interactive maps.

3. Population definition

The standard mid-year population estimates are used as the population base for small area population estimates for all four UK countries. This means that usual residents away from home temporarily are included, but visitors are excluded, and that students are counted at their term-time address. Members of Her Majesty's (HM) and non-UK Armed Forces stationed in the UK are included; HM forces stationed outside the UK are excluded. This definition is identical to that used for the mid-year population estimates at country and Local Authority level.

4. Geographies

Small area geographies for which population estimates are available are summarised in the table below:

	Number of areas	Average population mid-2001
England & Wales – LSOA	34,378	1,500
England & Wales – MSOA	7,194	7,200
Scotland – Data Zones	6,505	800
Northern Ireland – SOA	890	1,900

Further information on SOAs in England & Wales, including plans to revise boundaries following the 2011 Census results can be found on the [Neighbourhood Statistics](#) website. Additional population estimates products are also available (either published or on request) for alternative small area geographies in England & Wales, such as wards and parishes.

Further information on Data Zones in Scotland can be found at: <http://www.scotland.gov.uk/Topics/Statistics/sns/SNSRef>, and <http://www.scotland.gov.uk/Topics/Statistics/sns/SNSRef/DZresponse>

Further information on Super Output Areas in Northern Ireland can be obtained from the NISRA website at:

http://www.nisra.gov.uk/deprivation/super_output_areas.htm

Additional population estimates products are also available for alternative small area geographies in Northern Ireland, such as Census Output Areas, wards and Neighbourhood Renewal Areas.

5. Methodology

ONS produce small area population estimates for England & Wales using a Ratio Change methodology. This method uses the change in populations recorded on administrative sources as an indicator of change in the true population. A 'change ratio' is calculated from the administrative sources for each small area and applied to the previous year's population estimate to obtain an updated estimate. The method relies on the assumption that the relationship between the indicator of population and the true population has remained the same for the small area since the base year or latest estimated year.

ONS identified three potential methods for producing small area population estimates for England & Wales; Ratio Change, Cohort Component and Apportionment. Both an initial evaluation of these methods and a further evaluation undertaken in 2006 (that examined test estimates produced from each method over a three-year period) identified Ratio Change as the preferred method. However it was recognised that there wasn't overwhelming evidence for this method over the Cohort Component method.

When the 2011 Census figures are available ONS will undertake a full evaluation of the published estimates and consider further methodological developments.

In Scotland, the Cohort Component methodology is used to create small area population estimates. It uses the following steps from the starting population:

- Remove Armed Forces and Prisoner populations;
- Age on the resultant population;
- Add on Births;
- Subtract Deaths;
- Adjust for Migration;
- Add in Asylum Seekers;
- Add in new Armed Forces and Prisoner populations;
- Make consistent with the Mid-Year Estimate for council areas.

This methodology is also used to create the mid-year population estimates for Scotland and its administrative areas.

Small area population estimates for Northern Ireland are created from an average of the Ratio Change and Cohort-Component methods. The two methods approach the measurement of population change from two separate but complementary perspectives (stocks versus flows). This provides a strong rationale for a combined approach that draws on the strengths of both methods. Furthermore, the complementarities between the two methods mean that the mixed approach makes maximum use of the available information.

For all UK countries, small area population estimates are constrained to the mid-year population estimates for Local Authorities, thus making them consistent both in terms of numbers and definition of usual residency.

6. Data sources

To estimate populations of small areas in England & Wales, ONS uses the following datasets:

- NHS patient registers;
- Child Benefit (from HM Revenue and Customs);
- Older Persons Datasets – persons aged 65 and over in receipt of Attendance Allowance, Disability Living Allowance, Widows Benefit, State Pension, Incapacity Benefit, Winter Fuel Payment or Minimum Income Guarantee (from Department for Work and Pensions).

Additional data sources are used to account for special populations such as armed forces and prisoners. The Older Persons Datasets has not been used from mid-2006 onwards due to issues with data availability.

The data sources used for small area population estimates in Scotland are tightly linked to the methodology. Data on births and deaths are supplied by the National Records of Scotland. To estimate migration, a combination of data sources are used, including the National Health Service Central Register, the Community Health Index, and the International Passenger Survey. Additional data sources are used to account for special populations such as armed forces, asylum seekers and prisoners.

The methodology for the small area population estimates in Northern Ireland is generally the average of estimates by the ratio change method (used for England & Wales) and the cohort component method (used for Scotland). Hence, it is a very data-hungry methodology with a high degree of overlap between data sources used by ONS and NRS respectively. For the ratio change method, indicator data sets include the Central Health Index, Child Benefit, and Older Persons' database, but also the School Census (which was not used for England & Wales). For the cohort component method, births and deaths from the General Registry Office in Northern Ireland was used, alongside with the Central Health Index to estimate migration. Additional data sources are used to account for special populations such as armed forces. NISRA also identified several other data sources such as the electoral roll, dwelling stock and persons in receipt of means-tested benefits, which did not comply with the requirements to be included as an indicator dataset, but were used in the quality assurance of population estimates.

7. Special Populations

7.1. Students

In Scotland, a student area is identified as an area whose population during the 2001 Census was made up of 20% or more students. For these areas, separate quality assurance is carried out to compare the population count and the age-sex distribution with data from the 2001 Census and other information collected by National Records of Scotland. Adjustments may be required to these areas, with counteracting adjustments to other data zones within the

same council area, sex and age group so that the aggregated data zones are consistent with the mid-year estimate council totals.

In England & Wales, students are not treated as a special population.

In Northern Ireland, four Super Output Areas were identified as student areas. For ages 16 to 39, the cohort component estimates are used in which the student population is not aged on each year and remains broadly at 2001 levels. This approach is similar to that applied for Scotland.

7.2. Armed Forces

For England & Wales, armed forces are treated as a special population. Before applying the change ratios, armed forces population counts are subtracted. After these counts are constrained to the local authority mid-year estimates minus the special population, armed forces are added again. This method also applies to foreign armed forces and their dependents.

In Scotland, armed forces are treated as a special population. Before the population is aged-on, the armed forces population for the previous year is removed. The updated armed forces population is added back in after other adjustments for births, deaths and migration have been made. The armed forces estimates at council area level are apportioned to data zones, based on the data zone distribution of the previous year. Aggregated data zones are made consistent with the age-sex distribution of armed forces at council area level.

In Northern Ireland, nine SOAs were identified as containing Army Barracks. For these areas, the ratio change method is less reliable for younger ages as there is a weak relationship between population and indicator variables. As a result, the cohort component estimates are used, in which armed forces based in Northern Ireland are subtracted in the previous year's estimates before ageing on the civilian population and then adding in the armed forces

after the ageing on is complete. The Defence Analytical Services Agency and Ministry of Defence provide details on the number of forces stationed in Northern Ireland by age, sex and area.

7.3. Prisoners

For England & Wales and Scotland, prisoners are treated as a special population, similarly to the treatment of armed forces. In Northern Ireland, prisoners are not treated as a special population.

7.4. Asylum Seekers

In Scotland, data on ward level asylum seekers used to calculate the 2002 ward level SAPE already existed. To apportion this data to data zone level a data zone corresponding to a given ward was randomly selected for each asylum seeker in Glasgow City. For later years, asylum seeker estimates are apportioned to data zones in Glasgow City, based on the data zone distribution of the previous year. Aggregated data zones are made consistent with the age-sex distribution of asylum seekers.

In England & Wales, asylum seekers are not treated as a special population. There are very small numbers of asylum seekers in Northern Ireland; there is no special treatment for this population.

8. Published statistics

For all four UK countries, small area population estimates are available for the period mid-2001 to mid-2010. In August 2007, NRS published the mid-year small area population estimates in Scotland at data zone level for each year in the period 1996-2000, consistent with the revised mid-year population estimates in that period in light of the 2001 Census results.

The table below presents the age groups for which population statistics are available for each country.

Age group	England & Wales - LSOA	England & Wales - MSOA	Scotland – Data Zones	Northern Ireland – SOA
0-4	Yellow	Light Green	Cyan	Purple
5-9		Dark Green	Light Cyan	
10-14		Light Green	Cyan	
15		Dark Green	Light Cyan	
16-19		Orange	Light Green	
20-24	Light Green		Cyan	
25-29	Dark Green		Light Cyan	
30-34	Light Green		Cyan	
35-39	Dark Green		Light Cyan	
40-44	Yellow	Light Green	Cyan	Purple
45-49		Dark Green	Light Cyan	
50-54		Light Green	Cyan	
55-59		Dark Green	Light Cyan	
60-64		Light Green	Cyan	
65-69	Yellow	Dark Green	Light Cyan	Maroon
70-74		Light Green	Cyan	
75-79		Dark Green	Light Cyan	
80-84		Light Green	Cyan	
85-89		Dark Green	Light Cyan	
90+	Light Green	Cyan		

Note that the age groups for Scottish data zones are not exactly 5-years: the 10-15 and 16-19 age bands include 6 and 4 single years of age respectively. This was done to allow the creation of child population (aged 0-15 years) and working age population. Single year of age population estimates for data zones in Scotland are available on request.

For MSOAs in England & Wales, there are exact five-year age bands, thus when comparing populations with Scotland using published estimates, this can only be done for the combined 10-19 years age bracket at MSOA level, or 0-15 and 16-29 years age bracket at LSOA level. However, estimates by single year of age are available on request for both MSOAs and LSOAs.

For Northern Ireland, the working age population was split into two groups, where the older working age consists of ages 40-59 for females, and 40-64 for males, in accordance to the definition of pensionable age at the time of publishing the 2001-08 small area population estimates. Therefore, its populations cannot be made consistent with the oldest age group of LSOAs in England & Wales. Estimates by single year of age are not available for small areas in Northern Ireland.

Population estimates for small areas in England & Wales are available at:

<http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-230902>

Population estimates for small areas in Scotland are available at:

<http://www.gro-scotland.gov.uk/statistics/theme/population/estimates/special-area/sape/index.html>

and

<http://www.gro-scotland.gov.uk/statistics/theme/population/estimates/special-area/sape/archive/1996-2000/list-of-tables.html>

Population estimates for small areas in Northern Ireland are available at:

<http://www.nisra.gov.uk/demography/default.asp125.htm>

9. Publication timelines, revisions and designation

Small area population estimates for England & Wales were first published for MSOAs and LSOAs in 2006 (mid-2001 to mid-2004) as 'experimental statistics'. New estimates are published on an annual basis, most recently on 28 September 2011 for mid-2010, three months after the publication of the mid-year population estimates. The estimates for mid-2002 to mid-2008 were revised in September 2010 following revisions to the mid-year population estimates in May 2010 to incorporate improvements resulting from the Migration Statistics Improvement Programme.

The assessment by the UK Statistics Authority of Statistics on ONS Population Estimates and Projections¹ will grant National Statistic status to small area population estimates in England & Wales subject to ONS implementing the enhancements listed in the assessment report.

The Scottish population estimates for the years 2003 to 2006 were revised in July 2007 after a review of methodology. The revisions affected six Council areas only: Aberdeen City, Aberdeenshire, Angus, Moray, Dundee City and Perth & Kinross. Subsequently, revised versions of small area population estimates for those years were created and published. The latest small area population estimates for mid-2010 were published on 30 August 2011, four months after the Scottish mid-year population estimates were released.

The assessment by the UK Statistics Authority of Statistics on Population and Demography in Scotland² will grant National Statistic status to small area population estimates in Scotland subject to NRS implementing the enhancements listed in the assessment report.

Small area population estimates for Northern Ireland – relating to mid-2003 – were first published in 2005, as part of the Multiple Deprivation Measure 2005³. The update of this Measure in 2010 led to small area population estimates to be derived for each year in the period mid-2001 to mid-2008, including revised estimates for mid-2003. Subsequent estimates for mid-2009 and mid-2010 were published in May and September 2011 respectively. The latest estimates were published roughly three months after the mid-year population estimates were released.

¹ <http://www.statisticsauthority.gov.uk/assessment/assessment/assessment-reports/assessment-report-103---population-estimates-and-projections.pdf>

² <http://www.statisticsauthority.gov.uk/assessment/assessment/assessment-reports/assessment-report-113---statistics-on-population-and-demography-in-scotland.pdf>

³ Small area population estimates for 2003 were created by external consultants, based on the Ratio Change methodology. Further detail is available in Appendix 2 of the Multiple Deprivation Measure 2005 report at: <http://www.nisra.gov.uk/deprivation/archive/NIMDM2005FullReport.pdf>

The assessment by the UK Statistics Authority of statistics of demography and vital events in Northern Ireland⁴, carried out in early 2011, will grant National Statistic status to small area population estimates in Northern Ireland subject to NISRA meeting the requirement set in the assessment report.

10. Future developments

There are no further planned publications of small area population estimates until the release of 2011 Census statistics. This will provide an opportunity to revise estimates and review the methodology and use of data sources.

The 2011 Census may also lead to a revision in the small area geographies. Population changes in the last 10 years may lead to some small areas being aggregated or split to conform to a uniform size or make-up. A consultation has been set up in Scotland to review the Data Zones, see <http://www.scotland.gov.uk/Topics/Statistics/sns/SNSRef/DZresponse>

11. Users' guidance

This document has set out the differences and similarities between the small area population estimates produced by ONS, NRS and NISRA for England & Wales, Scotland, and Northern Ireland respectively.

The population size of small areas varies across the United Kingdom. Datazones in Scotland are on average smaller in population than LSOAs in England & Wales, which are in turn smaller on average than SOAs in Northern Ireland. This is important as the smaller the area in population terms, the more likely the people living the area share similar social characteristics and thus the more likely there is to be extreme values in the spatial distribution of people's characteristics.

⁴ <http://www.statisticsauthority.gov.uk/assessment/assessment-reports/assessment-report-124---statistics-on-demography-and-vital-events-in-northern-ireland.pdf>

There are also differences in the age groups for which statistics are published, which could restrict comparisons to be made across all four countries for specific age groups.

12. Further documentation

More detailed information on small area population estimates are available from ONS, NRS and NISRA. This section provides some useful links.

For England & Wales, see:

<http://www.ons.gov.uk/ons/guide-method/method-quality/specific/population-and-migration/pop-ests/methodology-note-on-production-of-super-output-area-population-estimates.pdf>

and

<http://www.ons.gov.uk/ons/guide-method/method-quality/quality/quality-information/social-statistics/summary-quality-report-for-small-area-population-estimates.pdf>

For Scotland, see:

<http://www.gro-scotland.gov.uk/statistics/theme/population/estimates/special-area/sape/background.html>

and

<http://www.gro-scotland.gov.uk/statistics/theme/population/estimates/special-area/sape/archive/2001-2004/methodology.html#Section2a>

For Northern Ireland, see:

http://www.nisra.gov.uk/archive/demography/population/small_area/Small%20Areas%20Population%20Estimates%202010%20-%20Statistical%20Report.pdf

and

http://www.nisra.gov.uk/archive/demography/population/small_area/SAPEdocFinal.pdf