

Population estimates for local authorities across UK constituent countries: a comparison of data sources and methods

Introduction

The Office for National Statistics (ONS) compile and publish population estimates for the UK using estimates for England and Wales (also produced by ONS), estimates for Scotland produced by National Records of Scotland (NRS) and estimates for Northern Ireland produced by the Northern Ireland Statistics & Research Agency (NISRA).

Population estimates for each of the UK constituent countries are compiled using a common methodological approach and aim to be as consistent as possible; however there are some differences in the detail of the data sources and methods used. This paper outlines the similarities and differences and explains the impact for users of the statistics.

Details of the specific data sources and methods used are summarised here in Appendix 1 and documented separately by ONS, NRS and NISRA on their websites (see Useful links).

Comparisons

Definition of usually resident population

The mid-year population estimates for each of the UK constituent countries refer to the usually resident population of an area on 30 June of each year. The usually resident population is defined by the standard United Nations definition for population estimates, and includes people who reside in the area for a period of at least 12 months whatever their nationality.

Overall approach

National and local authority population estimates for each of the UK constituent countries are produced using the cohort component method. This is a well established demographic method and is used by many other countries that do not have a population register. The cohort component method uses information on components of population change, namely natural change (births minus deaths) and net migration, to update a population base (in this case the decennial census estimates). It involves combining information from a number of data sources, using the previous

census population count as the population base, and survey data and administrative registers to measure the components of population change for the years following the census.

Changes in some population subgroups in some countries are not adequately accounted for through the components of natural change or net migration. These subgroups, known as 'special populations', are accounted for separately depending on the impact they have on population change in each constituent country. For example, ONS account for changes to the population of foreign armed forces as a separate component because the presence of a foreign military base has a sizeable impact on the population at local authority level in England and Wales. Accounting for this population subgroup separately is unnecessary when compiling estimates for Scotland and Northern Ireland because the numbers of foreign armed forces are so small.

Each UK country achieves the best estimate possible for each relevant component of population change using the best data sources available. The resulting population estimates compiled using the cohort component method are therefore the best available for each constituent country and when combined they provide the best available estimate for the UK as a whole.

Geography

Each constituent country publishes population estimates at national level and an equivalent local area level (Local Authorities in England and Wales, Council areas in Scotland and Local Government Districts in Northern Ireland). Estimates are also published for health areas (NHS Boards in Scotland, Local Health Boards in Wales, and Health & Social Care Trusts in Northern Ireland). Estimates for Strategic Health Authorities in England are available on request from ONS. Population estimates for Clinical Commissioning Groups in England effective from April 2013 are available as part of the set of Small Area Population Estimates produced by ONS.

Age/sex group breakdown

Population estimates for each country are available by single year of age, up to age 90 and over.

Publication date

All UK constituent countries normally publish population estimates within one year of the reference date providing timely data for users. Estimates for Scotland are usually available earlier than those for England and Wales, and Northern Ireland. In the year following a census this timeline is extended to allow for the processing of census results.

Impact for users of the statistics

Mid-year population estimates have a wide variety of uses within central government as well as being used by local authorities and health bodies, other public bodies, commercial companies and individuals in the private and academic sector.

The main uses of population estimates can be divided into two categories:

1. Uses where the absolute numbers are of key importance. This may be in terms of allocating financial resources from central government, planning services or grossing up survey results.
2. Uses where the population figures are used as denominators, for example in the calculation of social and economic indicators.

The population estimates for each of the UK constituent countries are comparable. The main methodological approach for producing the estimates for each country is the same and while there are some variations in the detail of the data sources and methodology used for each of the individual components of population change, these small differences should not prevent the use of these population estimates as comparable statistics across the UK at national and local authority level. However, users wanting to compare individual components of change across UK countries should be mindful of the differences specific to that component.

Useful links

England & Wales

An [Overview of Population Statistics](#) is available on the ONS website.

Latest publications and summaries of population estimates are available on the ONS [Population Estimates by Age and Sex Subtopic](#) webpage.

Population estimates methods are available from the ONS [Guidance and Methodology](#) webpage.

Further information on the quality of mid-year population estimates can be found in the ONS [Population Quality and Methodology Information](#) webpage.

Details on the population estimates improvements made for estimating international and within UK migration at local authority level are available on the ONS [Migration Statistics Improvements Programme](#) webpage.

Scotland

The latest annual mid-year population estimates for Scotland are available on the NRS [Mid-Year Population Estimates](#) webpage.

A [guide](#) to the methodology used to produce the mid-year population estimates is available from the NRS website.

Northern Ireland

Latest publications of population estimates are available on the NISRA [Mid-Year Population Estimates](#) webpage.

Details on the [methodology](#) used to create population estimates are available from the NISRA website.

Information on the quality of population estimates is available in a [Quality Report](#) from the NISRA website.

Details of [improvements](#) to Northern Ireland and Republic of Ireland long term international migration are available from the ONS website.

Appendix 1

Data sources and methods used for compiling the population estimates for England & Wales, Scotland and Northern Ireland

		England & Wales	Scotland	Northern Ireland
Producing organisation		Office for National Statistics (ONS)	National Records of Scotland (NRS)	Northern Ireland Statistics & Research Agency (NISRA)
Overall approach		Census-based cohort component method	Census-based cohort component method	Census-based cohort component method
Components				
Births				
	Data sources:	General Register Office (GRO) <ul style="list-style-type: none"> Live births occurring between 1 July and 30 June by sex and area of usual residence of mother Births to non-resident mothers are included as a proxy for the number of births to resident mothers of England and Wales who give birth abroad, who would otherwise be missed from the population estimates 	National Records of Scotland (NRS) <ul style="list-style-type: none"> Live births occurring between 1 July and 30 June by sex and area of usual residence of the mother Births to non-resident mothers are included as a proxy for the number of births to resident mothers of Scotland who give birth abroad, who would otherwise be missed from the population estimates 	General Register Office Northern Ireland (GRONI) <ul style="list-style-type: none"> Live births occurring between 1 July and 30 June by sex and area of usual residence of mother Births to non-resident mothers are not included
	Methods:	<ul style="list-style-type: none"> The number of live births between 1 July of the previous year to 30 June of the reference year are added to the population estimates at age zero, according to the area of usual residence of mother Babies born to non-resident mothers are allocated to local authorities proportionately using the distribution of births occurring to resident mothers in the year. 	<ul style="list-style-type: none"> The number of live births between 1 July of the previous year to 30 June of the reference year are added to the population estimates at age zero, according to the area of usual residence of mother Babies born to non-resident mothers are allocated to the council area of their place of birth 	<ul style="list-style-type: none"> The number of live births occurring between 1 July of the previous year to 30 June of the reference year are added to the population estimates at age zero, according to the area of usual residence of mother
Deaths				
	Data sources:	General Register Office (GRO) <ul style="list-style-type: none"> Deaths occurring between 1 July and 30 June by sex, age at death and area of usual residence An adjustment is made to account for late registrations occurring in the previous year in anticipation of a similar number in the current year Deaths of non-residents are included. 	National Records of Scotland (NRS) <ul style="list-style-type: none"> Deaths occurring between 1 July and 30 June by sex, age at 30 June and area of usual residence No adjustments are made for non-resident deaths, that is, deaths of non-residents are included 	General Register Office Northern Ireland (GRONI) <ul style="list-style-type: none"> Deaths occurring between 1 July and 30 June by sex, age on 30 June and area of usual residence Deaths of non-residents are included, allocated to the place of death

	Methods:	<ul style="list-style-type: none"> Deaths are subtracted from the mid-year population by age (calculated at mid-year) and sex at the area of usual residence of the deceased Where local authority of residence is not recorded it is imputed using the local authority distribution of all other deaths by age and sex that have occurred during the year 	<ul style="list-style-type: none"> Deaths are subtracted from the mid-year population by age (calculated at mid-year) and sex at the area of usual residence of the deceased, or place of occurrence for non-resident deaths 	<ul style="list-style-type: none"> Deaths are subtracted from the starting mid-year population by age on 30 June and sex at the area of usual residence of the deceased
Migration				
Long Term International Migration (LTIM)	Data sources:	<p>International Passenger Survey (IPS)</p> <ul style="list-style-type: none"> Estimates of the number of people intending to enter/leave England and Wales for a period of 12 months or more <p>Labour Force Survey (LFS)</p> <ul style="list-style-type: none"> Estimates of international immigration to England and Wales that have already occurred, by region <p>Migrant Worker Scan</p> <ul style="list-style-type: none"> Number of national insurance number registrations by international migrants <p>National Health Service Central Register (NHSCR)</p> <p>GP Patient Register Data System (PRDS)</p> <ul style="list-style-type: none"> Number of international migrants registering with a GP <p>Further Education Learner data</p> <ul style="list-style-type: none"> Further education data on international students <p>Student Record (Higher Education Statistics Agency)</p> <ul style="list-style-type: none"> Number of international students at HE establishments <p>Certificate of Acceptance to Study and Leave to Remain for Study</p> <ul style="list-style-type: none"> Numbers of international students issued visas and sponsorships to study <p>ONS</p> <ul style="list-style-type: none"> International migration inflows by sex, age citizenship and local authority from 2011 Census data. 	<p>International Passenger Survey (IPS)</p> <ul style="list-style-type: none"> Estimates of the number of people intending to enter/leave Scotland for a period of 12 months or more <p>Labour Force Survey (LFS)</p> <ul style="list-style-type: none"> Estimates of international immigration to Scotland that have already occurred <p>NHS Central Register (NHSCR)</p> <ul style="list-style-type: none"> Number of international migrant inflows and UK outflows by age, sex and Scottish NHS Board <p>Community Health Index (CHI)</p> <ul style="list-style-type: none"> Number of international migrant inflows and UK outflows by age, sex and Scottish Council area 	<p>GP Patient Register</p> <ul style="list-style-type: none"> List of patients registered with a family doctor (for inflows and outflows) Provides information to separate flows to/from GB and Rest of World, which allows the same definition of international migration to be used for UK level estimates

	<p>Methods:</p>	<p>National and regional level</p> <ul style="list-style-type: none"> The IPS provides an estimate of international (between England and Wales and non-UK countries) migrant inflows and outflows by age and sex An adjustment is made to the IPS estimates of long-term international migration to account for people who change their intended length of stay within the country or away from the country (these people are known as visitor and migrant switchers) Immigration estimates also use LFS data on moves that have already occurred to improve estimates at regional level. <p>Local area level</p> <ul style="list-style-type: none"> Administrative data sources are used to distribute the England and Wales immigration totals from the IPS directly to local authorities. IPS data is split into different streams for international migrant inflows, mainly by 'reason for migration' (worker, student, other) Other splits are made for age group and citizenship (British, EEA27 and non-EEA). Citizenship data is used in order to align with the method for estimating visitor switchers Streams are mapped to relevant administrative sources which are then used to distribute immigrants to each local authority. International migrant outflows are obtained by apportioning higher level estimates down to local authority level, using a model-based distribution The outflow distribution is based upon estimates from a regression model using weighted IPS estimates of migration and a range of predictor 	<p>National level</p> <ul style="list-style-type: none"> The IPS provides an estimate of international (between Scotland and non-UK countries) migrant inflows and outflows by age and sex An adjustment is made to the IPS estimates of long-term international migration to account for people who change their intended length of stay within the country or away from the country (these people are known as visitor and migrant switchers) Allocation of immigration flows to Scotland from the UK-level IPS immigration estimates use the LFS while emigration flows from Scotland use just the IPS <p>Local area level</p> <ul style="list-style-type: none"> International migration inflows at Scottish NHS Board level are allocated by using overseas inflows recorded on the NHSCR International migration outflows at Scottish NHS Board level are allocated using proportions based on international inflows, outflows to the rest of the UK and the population size of each NHS Board Age and sex distributions of international in-migrants are based on those of international inflows to that NHS Board area on the NHSCR. The age/sex distribution of international out-migrants is based on the distribution of out-migrants to the rest of the UK, and in-migrants from overseas as recorded by the NHSCR. An adjustment is made to increase sex ratios based on data from the IPS. International migration inflows at Council area level are based on records from the Community Health Index (CHI), which are made 	<p>National and local area level</p> <ul style="list-style-type: none"> The number of people who joined or rejoined the list of patients registered with a family doctor within a one-year period provides an estimate of international migration inflows by age at 30 June, sex and local area The number of people who de-registered from the patient list provides an estimate of international migration outflows by age, sex and local area. There is no information on the destination of de-registrations. The number of de-registrations is scaled up by an additional 67 per cent as the health card system is known to not capture all international migration outflows. The up-scale factor was derived from the rebasing exercise following the 2011 Census results. The age distribution of young adult males is adjusted to match the young adult female age distribution to account for the fact that administrative data (health cards) are known to be deficient in recording young adult males Local Government District population estimates are adjusted for net international migration by single year of age and sex using these estimates
--	-----------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

		<p>covariates. These covariates are assessed periodically to ensure continued relevance</p> <ul style="list-style-type: none"> The international outflow estimates are then constrained to match the IPS national and regional estimates. Local authority population estimates are adjusted for net international migration by single year of age and sex using these estimates 	<p>consistent with the NHSCR geographic and age / sex distributions</p> <ul style="list-style-type: none"> International migration outflows at Council area level are allocated using a combination of in-migrants to Scotland from overseas and migrants leaving Scotland for the rest of the UK Council area population estimates are adjusted for net international migration by single year of age and sex using these estimates 	
Asylum Seekers	Data sources:	<p>Immigration and Nationality Directorate, Home Office</p> <ul style="list-style-type: none"> Number of asylum seekers who remain in England and Wales for more than 12 months and their dependants <p>National Asylum Support Service (NASS)</p> <ul style="list-style-type: none"> Number of asylum seekers receiving financial support and/or accommodation by local authority 	<p>Immigration and Nationality Directorate, Home Office</p> <ul style="list-style-type: none"> Number of asylum seekers who remain in Scotland for more than 12 months and their dependants <p>National Asylum Support Service (NASS)</p> <ul style="list-style-type: none"> Number of asylum seekers receiving financial support and/or accommodation by local authority 	Very small numbers. Not considered as a separate component of the population estimates for Northern Ireland.
	Methods:	<ul style="list-style-type: none"> Applications for asylum provide the basis for estimated inflows of asylum seekers, and adjustments are made to exclude those removed from the UK within one year and a small number of asylum seekers captured by the IPS Data collated by NASS are used to determine the subnational distribution of asylum seekers Regional estimates of asylum seekers and their dependants are broken down to local authority level using information on the location of asylum seekers receiving financial support and/or accommodation 	<ul style="list-style-type: none"> Applications for asylum provide the basis for estimated inflows of asylum seekers, and adjustments are made to exclude those removed from the UK within one year and a small number of asylum seekers captured by the IPS All NASS asylum seekers are allocated to Glasgow City as it is the only Council with the facilities in place to accommodate supported asylum seekers Non-NASS asylum seekers are very small numbers and not treated as a separate component The age/sex distribution is based on current asylum seeker stocks in Glasgow, and their estimated age at arrival and household characteristics. UK level age/sex distribution is used for out-migrants. 	N/A
Internal	Data sources:	National Health Service Central Register	National Health Service Central Register	GP Patient Register

migration		<p>(NHSCR) GP Patient Register Data System (PRDS)</p> <ul style="list-style-type: none"> Mid-year extracts of register by age, sex and postcode for two consecutive years <p>Higher Education Statistics Agency (HESA)</p> <ul style="list-style-type: none"> Information on domicile and term-time address of students at start and end of study period 	<p>(NHSCR)</p> <ul style="list-style-type: none"> Monthly counts of moves <p>Community Health Index (CHI)</p> <ul style="list-style-type: none"> Mid-year extracts of index by age, sex and postcode for two consecutive years 	<ul style="list-style-type: none"> Data on transfers of health cards to/from Great Britain (within-UK migration), address changes within Northern Ireland (within-NI migration) <p>Higher Education Statistics Agency (HESA)</p> <ul style="list-style-type: none"> Information on domicile and term-time address of students at start and end of study period, only used for within-NI migration
	Methods:	<ul style="list-style-type: none"> Two consecutive annual mid-year extracts of the PRDS estimates of the number of people whose postcode differs between the two consecutive years are compared PRDS counts are constrained to NHSCR former health authority level data to produce the final internal migration estimates An adjustment is also made to better account for moves made when students begin their studies and moves made at the end of studies The adjustments are based upon comparisons between moves identified in HESA data and those identified in the patient register data 	<ul style="list-style-type: none"> Patient records from two extracts of the CHI, taken one year apart, are matched to determine the number of internal migration moves by identifying postcode changes The CHI-based counts are constrained to NHSCR Board data to ensure they are consistent with the NHSCR data for moves across an NHS Board boundary by origin, destination, age and sex 	<ul style="list-style-type: none"> The total number of health card transfers between the UK countries are agreed at the national level Record-level information on age at 30 June, sex and origin/destination of health card transfers are used to distribute the agreed total Information on address changes within Northern Ireland for registrations are used for with-in Northern Ireland migration The age distribution of young adult males is adjusted to match the young adult female age distribution to account for the fact that administrative data (health cards) are known to be deficient in recording young adult males
Special populations				
Home Armed Forces	Data sources:	<p>Defence Analytical Services and Advice (DASA)</p> <ul style="list-style-type: none"> Total number of UK armed forces (based in the UK and overseas) by age, sex, service and country of stationed location as at 1 July, 1 October, 1 January and 1 April Number of UK armed forces stationed in England and Wales by age, sex, service and local authority of base as at 1 July <p>British Forces Germany</p> <ul style="list-style-type: none"> Numbers of UK armed forces' dependents for accompanied 	<p>Defence Analytical Services and Advice (DASA)</p> <ul style="list-style-type: none"> Number of UK armed forces stationed in Scotland by age, sex and area annually <p>NRS Station Commanders return</p> <ul style="list-style-type: none"> Number of home armed forces personnel usually resident in each Council area by sex <p>NRS</p> <ul style="list-style-type: none"> Number, age, sex and distribution of armed forces personnel in 2011 Census. 	<p>Defence Analytical Services and Advice (DASA)</p> <ul style="list-style-type: none"> Number of forces stationed in Northern Ireland by age, sex and area on an annual basis

		<p>postings by sex and age on an annual basis</p> <p>ONS</p> <ul style="list-style-type: none"> UK armed forces by area of base and area of usual residence from the 2011 Census Dependents of UK armed forces by area of permanent residence from the 2011 Census 		
	Methods:	<p>National</p> <ul style="list-style-type: none"> To account for the change in the population of armed forces stationed in England and Wales, the previous year's estimated population is subtracted from the current year's estimated population, by sex, age and local authority of usual residence. <p>Subnational</p> <ul style="list-style-type: none"> UK armed forces population is estimated at the residence at which they spend most of their time. A base to residence distribution based on Census data is used to adjust personnel from local authority of base to local authority of residence. The calculate the change in the overseas dependent population, the current year's estimated overseas dependants population who are usually resident in England and Wales is subtracted from the previous year's overseas dependant population, by sex and age. A local authority of residence is imputed for each net flow using a local authority distribution derived from the Census for members of the home armed forces living with a partner 	<ul style="list-style-type: none"> Administrative data on personnel residing in barracks / ships was used to adjust local area distributions of armed forces recorded on the 2011 Census to better reflect 'usual residence'. Information from the Station Commanders return is used to determine whether there has been a change in the number of home armed forces in each area Any changes are applied to the previous years' population to get total by Council and NHS Board area 2011 Census age and sex distributions will be updated with DASA data for base areas in future years. 	<ul style="list-style-type: none"> Previous year's armed forces based in Northern Ireland are removed from the previous year's population estimate Once the civilian population has been aged on, the armed forces of the current year are added back into the population
Foreign Armed Forces	Data sources:	<p>US Air Force</p> <ul style="list-style-type: none"> Number of US Air Force resident in England and Wales, by base of residence, age and sex <p>US Department of Defence's Statistical</p>	There are no foreign armed forces stationed in Scotland.	There are no foreign armed forces stationed in Northern Ireland.

		<p>Information Analysis Division (SIAD)</p> <ul style="list-style-type: none"> Aggregate number of US Army, Navy and Marine Corps personnel based in England and Wales <p>ONS</p> <ul style="list-style-type: none"> US armed forces by area of base and area of usual residence from the 2011 Census 		
	Methods:	<ul style="list-style-type: none"> Local authority of usual residence is imputed using data derived from the 2011 Census. An adjustment is made for the local authorities of Harrogate and North Kesteven for other US service arms to account for pockets of foreign forces. The change in the foreign armed forces population between the two mid-year points is estimated by subtracting the previous year's estimated foreign armed forces population from the current year's estimated foreign armed forces population, by local authority of residence, sex and age. Non-US foreign armed forces are not accounted for in the method as there are no data currently available. However, these are considered very small in number 	N/A	N/A
Prisoners (subnational level estimates only)	Data sources:	<p>Ministry of Justice (MoJ)</p> <ul style="list-style-type: none"> Number of prisoners usually resident in each prison, by age and sex, as at 30 June A person is regarded as usually resident in a prison if they have been sentenced to six months or more. 	<p>Scottish Prisons Service (SPS)</p> <ul style="list-style-type: none"> Number of prisoners usually resident in each prison, by age and sex, as at 30 June A person is regarded as usually resident in a prison if they have been sentenced to six months or more 	Prisoners are not treated as a separate component of the population estimates for Northern Ireland.
	Methods:	<ul style="list-style-type: none"> Prisoners are allocated to a local area based on the postcode of the prison in which they reside. The numbers of prisoners are aggregated to obtain estimates at local area level Change in the prisoner population between the two mid-year points is 	<ul style="list-style-type: none"> Prisoners are allocated to a local area based on the postcode of the prison in which they reside. The numbers of prisoners are aggregated to obtain estimates at local area level The prison population is removed from the base population for the 	N/A

		<p>estimated by subtracting the previous year's estimated prisoner population from the current year's estimated prisoner population, by local authority, sex and age. This change can only be indicative as the prison estate population can fluctuate widely between mid-year points due to operational needs.</p>	<p>previous year. After the base population has been aged on, the prison population for the current year, by age, sex and local area is added back in</p> <ul style="list-style-type: none"> An adjustment is made for changes in the size/make-up of the prison population each year to prevent double counting. 	
Contact information		<p>http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Population pop.info@ons.gov.uk 01329 444661</p>	<p>http://www.nrscotland.gov.uk/customer@gro-scotland.gsi.gov.uk 0131 3144299</p>	<p>www.nisra.gov.uk/demography/default.asp17.htm census.nisra@dfpni.gov.uk 028 90348160</p>