Office for National Statistics

Subnational population projections across the UK: a comparison of data sources and methods

User guidance, uses, assumptions and methodology for the subnational population projections for each constituent country of the UK.

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1 . Introduction

Information on the size and structure of the population is invaluable in allocating government funding and planning the provision of services. In the UK, the primary sources of information on this are the decennial census and the annual mid-year population estimates. While the census provides a great level of detail on different aspects of the population and provides results for very small geographic areas, the mid-year estimates provide a relatively up-to-date picture of the age and sex structure of the UK population between censuses.

These mid-year estimates are produced for local authorities throughout the UK, typically with a lag of one year (for example, the population estimates for mid-2018 were published in 2019). They are based on the UN definition of the usually resident population, which is the population who have been usually resident for a period of 12 months or more. They use the UN definition of long-term migrants, which is individuals who change their place of usual residence for a period of 12 months or more. Uses of the estimates include allocation of resources by central government, planning by local authorities, derivation of grossing factors for surveys and use as denominators in calculated population rates (for example, fertility rates).

As well as annual population estimates, there is also a need to understand the likely size and structure of the population in future years. This is important at the national level, where the future structure of the population is a vital factor in considering policies relating to issues such as housing provision and pensions. It is also important at the local level, where future changes in the population will affect the planning and development policies of local authorities and feed into the planning of healthcare provision.

In recognition of this need, population projections are produced by UK statistics agencies at both the national and subnational level. These projections are based on observed demographic trends and show how the population will change if those trends continue.

The national population projections are produced by the Office for National Statistics (ONS). These provide projections of the size and structure of the population of the UK and of its constituent countries for the next 100 years.

Lower-level subnational population projections are produced by the appropriate organisation for each part of the UK: the ONS (for England), the Welsh Government, the National Records of Scotland (NRS), and the Northern Ireland Statistics and Research Agency (NISRA). These projections are usually produced every two or three years (depending on the production cycle) for local authority districts and similar administrative areas, and they are for the 25 years that follow the base year.

Although methods of producing population projections may be discussed by the UK Population Theme Advisory Board (UKPTAB), differences in requirements and data availability in the various parts of the UK mean that different approaches are adopted when producing the subnational projections. This article outlines the differences and similarities of approach and provides some guidance on using the subnational population projections.

This article relates to the 2018-based subnational population projections published by the ONS, NISRA, NRS and the Welsh Government. It contains three main parts in addition to this introduction. Section 2 describes the national population projections. Section 3 to Section 17 summarise the methodology used in producing the subnational population projections in each part of the UK. Finally, Section 18 provides some advice for using the subnational projections.

2 . National population projections

The national population projections are based on the latest available mid-year population estimates and a set of demographic assumptions about future fertility, mortality and migration based on analysis of trends and expert advice. The projections are produced for each of the constituent countries of the UK and are published at individual country level and for the UK.

The main focus of the projections is on the next 25 years, although longer-term projections for the next 100 years are produced. Long-term figures are likely to be less accurate since population projections become increasingly uncertain the further they are carried forward, particularly so for smaller geographical areas and age–sex breakdowns.

The projections are produced using the internationally accepted cohort component methodology. This method accounts for changes that increase or decrease the population (births, deaths and net migration) and models the effect of these changes and the passage of time on the age structure of the population.

The assumptions about future levels of fertility, mortality and net migration are agreed by the Office for National Statistics (ONS) in liaison with the National Records of Scotland (NRS), the Northern Ireland Statistics and Research Agency (NISRA), and the Welsh Government. This follows consultation with the main users of projections in each country and advice from an expert academic advisory panel.

The projections are not forecasts, and they do not attempt to predict the impact that factors such as future political or economic change might have on demographic behaviour. They simply provide the population levels and age structure that would result if the underlying assumptions about future fertility, mortality and migration were to be realised. The projections do not therefore predict the impact of the UK's withdrawal from the EU. However, projections of the number of people of State Pension age do reflect future changes to State Pension age under existing legislation.

The principal projection is based on assumptions about future fertility, mortality and migration considered to best reflect demographic patterns at that time. However, because of the inherent uncertainty of demographic behaviour, any set of projections will inevitably differ, to a greater or lesser extent, from actual future population change. To give users an indication of this uncertainty, the ONS also produces a number of variant population projections based on alternative, but still plausible, assumptions of future fertility, mortality and migration. These variant population projections do not represent upper or lower bounds but do illustrate what the population could look like if, for example, international migration were either higher or lower than the assumptions used for the principal projection.

3 . Subnational population projections across the UK

The following 14 sections detail the methodology used in preparing the subnational population projections for each part of the UK.

Some aspects of the projections are common to each set of projections.

Conceptual approach

As with the national population projections, the subnational population projections are produced using a cohort component method. The starting point for this is an existing estimate of the population (by age and sex) in each area. The projection for the first year is produced by ageing on the estimated population by one year, adding births and subtracting deaths, and adjusting for migration.

Averaging to reduce volatility

Given the base population, the projections are determined by the assumptions on fertility, mortality and migration. These are based primarily on observed data. As these demographic rates can vary significantly from year to year, the subnational projections generally adopt some element of averaging the observed figures over several years to provide a more reliable projected value.

Consistency with other population figures

The projections use the standard definition of the resident population and are constrained to be consistent with the totals in the national population projections for that country.

4 . Main uses of subnational population projections

England

The subnational population projections for England are used by central and local government for planning and monitoring services such as education, healthcare and housing provision and as a basis for local authorities to produce their own projections.

Subnational population projections were one of the main variables used by the Ministry of Housing, Communities and Local Government (MHCLG) in the last assessment of local authority need in the financial year ending March 2014. Depending on the outcome of the review of local authorities' relative needs and resources, they may form part of a new funding formula from the financial year ending March 2022 onwards. They are also used as an input into household projections, which were previously produced by the MHCLG and are now produced by the Office for National Statistics (ONS). Other users include academic researchers and market research companies.

Wales

Subnational population projections for Wales are used for planning services and to estimate future need (for example, in the provision of education, health care and social services). They are used for housing planning purposes (for example, in Local Development Plans), and they are the basis for producing subnational household projections. They are also used to support well-being assessments required under the Well-being of Future Generations (Wales) Act 2015.

Subnational population projections are usually the primary population indicators used in the Welsh local government settlement calculations, distributing funding to local authorities in Wales.

Scotland

The primary purpose of population projections for Scottish areas is to provide estimates of the future population of areas in Scotland as a common framework for use in resource allocation and local planning in a number of different fields such as education and health, for environmental scanning, and for land-use and transport models. They are also used to inform policy briefings and publications setting out how Scotland's population is projected to change and the variations across Scotland.

The projections are used as inputs to Grant Aided Expenditure (GAE) funding allocations and when looking at the implications of an ageing population. They are also used for making comparisons between areas, as inputs to the National Records of Scotland (NRS) household projections and as controls for small area population projections.

Northern Ireland

Population projections for areas in Northern Ireland are used for planning services and to estimate future need (for example, in the provision of education, regional development, health care and social services). They are also the basis for producing household projections for local government districts (LGDs).

5 . Process for agreeing assumptions

England

Historically, a consultation was held where representatives from local authorities and counties were invited to comment on the provisional projection data for their areas and on any changes to the peer-reviewed methodology. After a review of previous releases, we have decided to not run future consultations for three main reasons:

- it was extremely rare for these consultations to lead to any change
- rules restricting advance access to Office for National Statistics (ONS) data prior to publication have been strengthened
- this enabled us to publish two months earlier than on previous occasions and to include the variant subnational population projections in the same output

Our users' views are important to us in terms of methodological changes and the outputs we produce, so we will continue to give opportunities to provide feedback on any aspects of both current and future projections.

Wales

The methodology for the projections is developed in close collaboration with local authorities and main users in Wales through the Wales Sub-national Projections working group (WaSP). WaSP meets on a regular basis during the process of calculating the projections, and it is a forum for technical discussion on the methodology and the base data used. Members of WaSP include local authority and national park representatives with knowledge and experience of demographic data and population projections.

Scotland

The projections are produced by the National Records of Scotland (NRS). The main users are consulted through the Population and Migration Statistics (PAMS) committee, which meets on a regular basis. This includes presenting any methodology changes to the PAMS committee for agreement. The membership of the PAMS committee includes council representatives and other parties with an interest in population data and projections.

Northern Ireland

The projections are produced by the Northern Ireland Statistics and Research Agency (NISRA). The methodology and demographic assumptions are presented to the Northern Ireland Demographic Statistics Advisory Group (DSAG) for agreement. The membership of the DSAG includes representatives from local authorities, armslength bodies, academics and other interested parties with knowledge and experience of population data and projections.

6 . Base population

England

The standard mid-year population estimates by single year of age and sex are used as the population base. This means that usual residents temporarily away from home are included, visitors are excluded and students are counted at their term-time address. Members of HM armed forces and non-UK armed forces stationed in England are included; HM forces stationed outside England are excluded.

The Office for National Statistics (ONS) uses the UN recommendation for defining an international long-term migrant, which is someone who changes their country of usual residence for a period of at least a year, so that the country of destination effectively becomes the country of usual residence. Short-term migrants (that is, those changing country of residence for less than a year) are not included in the mid-year population estimates.

This population definition also applies to the subnational population projections for England and is consistent with the subnational population projections produced for other parts of the UK.

Wales

The base population is defined the same way as for England, with "Wales" replacing "England" where appropriate.

Scotland

The base population is defined the same way as for England, with "Scotland" replacing "England" where appropriate. There are no non-UK armed forces stationed in Scotland.

Northern Ireland

The base population is defined the same way as for England, with "Northern Ireland" replacing "England" where appropriate.

7 . Fertility assumptions

England

Long-term age-specific fertility assumptions for each local authority in England are produced by combining projected age-specific fertility rates (ASFRs -- the number of births to women of that age divided by the number of women of that age) from the national population projections with observed fertility trends for each local authority during the past five years. For each of the past five years, ASFRs are calculated for females aged 15 years and over by single year of age for each local authority in England.

These five years of local ASFRs are added together and divided by the sum of five years of the national ASFRs, to produce an estimated "fertility differential". This differential is then multiplied by the national projected ASFR for the first year of the projection to give the local ASFR. This process is repeated using a rolling five-year average to produce local rates for each year of the projection period.

The projected number of births is then calculated by multiplying the local ASFRs by the female population for that age in that local authority in the projected year.

To allocate the projected births to each sex, a sex ratio (that is, the ratio of boys born to girls born) for England is calculated using the last five years of births data and is applied to the projected births in each local authority. The average of these sex ratios is close to the sex ratio used in the national population projections, which is 105 boys to every 100 girls.

The total number of births across all local authorities is constrained to the projected number of births in the national population projections.

The process includes checks and, if necessary, adjustments to ensure that ASFRs for very small local authorities (for example, Isles of Scilly and City of London) are appropriate.

Wales

Long-term age-specific fertility assumptions for each local authority in Wales are produced by analysing age-specific fertility trends for each local authority during the most recent five years.

For each of the five years, ASFRs are calculated for females aged 15 to 49 years by single year of age for each local authority in Wales.

To reduce data volatility, five-year averaged ASFRs are calculated for each local authority, then constrained to the fertility levels of the most recent year. This is done by using the most recent births data to calculate a ratio of the actual births over expected births for each local authority and multiplying the averaged ASFRs by this ratio for each local authority. These constrained ASFRs form the assumed ASFRs for the projection period.

Fertility differentials are also used to predict the pattern of fertility by age over the projection period. These fertility differentials are taken from the national population projections for Wales; therefore, the differentials are the same for each local authority. The differentials are combined with the local authority-specific five-year average constrained ASFRs to form the final fertility assumptions.

To allocate the projected births to each sex, a sex ratio of 105:100 is used. This is the same as the ratio used for the national population projections.

Scotland

Long-term age-specific fertility assumptions for each local authority in Scotland are produced by combining projected ASFRs from the national population projections with observed fertility trends for each local authority during the most recent five years.

Scotland-level ASFRs for women aged 15 to 46 years are applied to the population in each area in the base year to calculate expected births for each area of Scotland.

Births figures from a five-year period preceding the projection are used to calculate an average. These averages are constrained to the Scotland projected births for the first year of the projection period. The constrained average is then divided by the expected births figure mentioned previously, and the result is the local fertility scaling factor for each area. This is applied to the population of women of childbearing age across each year of the projection period to calculate the number of births for each area.

To allocate the projected births to each sex, a sex ratio of 105:100 is used. This is the same as the ratio used for the national population projections.

Northern Ireland

Long-term age-specific fertility assumptions for each area in Northern Ireland are produced by combining projected ASFRs from the national population projections with observed fertility trends for each local authority during the most recent five years.

For the first year of the local area projections, the best estimate of births is used as this is available when the local area projections are compiled. For subsequent years, Northern Ireland-level ASFRs are adjusted for local variations. Long-term age-specific fertility assumptions for each local government district (LGD) are produced by analysing age-specific fertility trends for each area during recent years.

Total period fertility rates (TPFRs) are calculated for females aged 15 to 44 years for each LGD. The average TPFRs for each LGD are computed from the most recent five years and transformed into a LGD-specific scaling factor by dividing it by the Northern Ireland TPFR. These LGD scaling factors are used to constrain the Northern Ireland single year of age fertility rates used in the Northern Ireland level population projections for each LGD.

To allocate the projected births to each sex, a sex ratio of 105:100 is used. This is the same as the ratio used for the national population projections.

The overall projected births are constrained to be consistent with the Northern Ireland-level projected births.

8 . Mortality assumptions

England

Long-term age-specific mortality assumptions for each local authority in England are produced by combining projected age-specific mortality rates (ASMRs -- the number of deaths to people of that age and sex divided by the number of people in that age and sex group) from the national population projections with observed mortality trends for each local authority during the past five years.

Local mortality differentials are calculated in a similar way to the fertility assumptions. For each of the past five years, ASMRs are calculated for males and females aged newborn and over by single year of age for each local authority in England.

These five years of local ASMRs are added together and divided by the sum of five years of the national ASMRs, to produce an estimated mortality differential. This differential is then multiplied by the national projected ASMR to give the local ASMR. This process is repeated using a rolling five-year average to produce local rates for each year of the projection period.

The projected number of deaths is then calculated for each year by multiplying the local ASMRs by the number of people of that age and sex in that local authority in the projected year and then scaling the total deaths of that age--sex group (across all local authorities) to the number in the national population projections.

Checks and, if necessary, adjustments are made to ensure that ASMRs for very small local authorities (for example, Isles of Scilly and City of London) are appropriate.

Wales

Long-term age-specific mortality assumptions for each local authority in Wales are produced by analysing age-specific mortality trends for each local authority during the most recent five years.

ASMRs are calculated for males and females aged newborn and over by single year of age for each local authority in Wales.

To reduce data volatility, five-year averaged ASMRs are calculated for each local authority, then constrained to the mortality levels of the most recent year. This is done by using the most recent deaths data to calculate a ratio of the actual deaths over expected deaths for each local authority and multiplying the averaged ASMRs by this ratio for each local authority. These constrained ASMRs form the assumed ASMRs for the projection period.

Mortality differentials are also used to project the pattern of mortality by age over the projection period. These differentials are calculated in a similar way to those used for the fertility assumptions. The mortality differentials are taken from the national population projections for Wales; therefore, the differentials are the same for each local authority. The differentials are combined with the local authority-specific five-year average constrained ASMRs to form the final mortality assumptions.

Scotland

Long-term age-specific mortality assumptions for each local authority in Scotland are produced by combining projected ASMRs from the national population projections with observed mortality trends for each local authority during the most recent five years.

Mortality assumptions are calculated in a similar way to fertility assumptions. Expected deaths are calculated by applying the Scotland-level ASMRs to the base population.

An average deaths figure is calculated for each area using the observed deaths from the five years preceding the projection period, and these are constrained to the Scotland deaths figure from the first year of the national projections. The constrained averages are then divided by the number of expected deaths mentioned previously, and the result is the local mortality scaling factor.

Separate scaling factors are calculated for: mortality of males aged 0 to 59 years, mortality of males aged 60 to 79 years and mortality of males aged 80 years and over, and the same three factors are calculated for females for each area.

Confidence intervals are calculated around the mortality scaling factors. In instances where the confidence intervals overlap, there is statistically no significant difference between the scaling factors. In these instances, the age groups are combined, and a new scaling factor is calculated using the new age group. The test of confidence intervals is then repeated until only statistically different scaling factors remain.

The local mortality scaling factors are then applied across the population for the projection period, and the projected deaths are calculated for each area.

Northern Ireland

Long-term age-specific mortality assumptions for each local authority in Northern Ireland are produced by combining projected ASMRs from the national population projections with observed mortality trends for each local authority during the most recent five years.

For the first year of the local area projections, the best estimate of deaths is used as this is available when the local area projections are compiled. For subsequent years, Northern Ireland-level ASMRs are adjusted for local variations.

For each area, mortality scaling factors are derived by dividing the observed number of deaths in a five-year period by the expected number of deaths given the area's population and Northern Ireland-level age-sex-specific mortality rates.

Separate scaling factors are calculated for mortality of three age groups of males and three age groups of females. The age bands used to create the groups are chosen to give roughly equal numbers of deaths in each age group. Different age groups might be chosen for use with males than for females.

These LGD scaling factors are used to constrain the Northern Ireland mortality rates by single year of age (up to 90 years and over) used in the Northern Ireland-level population projections.

9 . Migration

England

Migration is treated as consisting of three components: international migration, cross-border (within UK) migration and internal (within England) migration. For the 2018-based subnational projections, internal migration inflows and outflows are projected using trends over the past two years because of a change in methodology with a limited back series. The inflows and outflows for other components are projected using trends over the past five years. Projected totals for all components are constrained to the national population projections.

International migration

International migration is moves made by people between England and outside of the UK, and it includes adjustments for visitor and migrant switchers and asylum seekers.

Projections of long-term international migration for each local authority are produced by calculating an average of five years of migration trends by age and sex. The international migration component of the mid-year estimates is used for this purpose.

The migration trends are estimated using the most recent five years of International Passenger Survey (IPS) data on migration and the most recent five years of asylum seeker data provided by the Home Office and the National Asylum Support Service. The projected outflows (by single year of age and sex) in the main (principal) subnational population projections for each local authority are then constrained so that the sum of projected outflows across all local authorities is equal to the total outflow assumed in the national projections for each year of the projection.

The sum of projected inflows across all local authorities is not equal to the total inflow assumed in the national projections. This is because people from Syria granted humanitarian protection and dependants of returning armed forces from Germany are included in the international inflow in the national projections but are added separately in the subnational projections. However, these two groups are included in the total projected population. Therefore, the subnational population projections remain consistent with the national population projections.

The subnational population projections include people from Syria granted humanitarian protection under the Vulnerable Persons Resettlement Scheme (VPRS). It is expected that around 5,000 people will be granted humanitarian protection in England between mid-2019 and mid-2020. Those arriving between mid-2018 and mid-2019 are distributed to the local authorities where they actually arrived. Those arriving after mid-2019 have been distributed by using Home Office data on numbers of VPRS migrants received by each local authority during the period between September 2015 and June 2018.

Cross-border (within UK) migration

Cross-border migration is moves made by people between England and the rest of the UK. To calculate crossborder moves, an average of five years' cross-border estimates data is used to give an average estimate of moves between local authorities in England and each of the other constituent countries of the UK (Wales, Scotland and Northern Ireland).

Information on moves between England and Wales is captured in a similar way to internal migration flows and uses a combination of four administrative sources: the NHS Patient Registration Data Service (NHS PRDS), which in 2017 was replaced by the NHS Personal Demographics Service (NHS PDS); the NHS Central Register (NHS CR); and Higher Education Statistics Agency (HESA) data.

In February 2016, the system that collects the NHS CR data (Central Health Register Inquiry System, CHRIS) closed. As a result, no complete NHS CR data are available beyond 2015. To avoid using partial data for mid-2016, the data for the year ending mid-2015 were re-used for the year ending mid-2016. For mid-2017 and future years, data that had been provided by the NHS PRDS and NHS CR were received from the NHS PDS.

Information on moves into and out of Scotland and Northern Ireland are based on data from the NHS PRDS, NHS PDS and NHS CR together with data from the National Records of Scotland (NRS) and the Northern Ireland Statistics and Research Agency (NISRA).

The cross-border migration is constrained to the national population projections, by age and sex for each year, so the local authority-level figures vary across the projection period.

Internal (within England) migration

Internal migration is moves made between local authorities in England. The 2018-based subnational population projections uses a revised methodology for internal migration to be more robust and in line with the mid-2018 population estimates. This methodological change relates to how we account for the movements of the highly mobile population leaving higher education.

Prior to the 2018-based projections, internal migration used five-year averages based on NHS PRDS, NHS PDS, NHS CR and HESA data. Following the discontinuation of the NHS CR in February 2016, the 2018-based projections' internal migration data use two-year averages based on NHS PDS and HESA data.

The decision to use two-year averages for internal migration in the 2018-based projections was because analysis conducted by the Office for National Statistics (ONS) showed the new methods used for the years ending mid-2017 and mid-2018 were more accurate and robust at picking up moves. There is a chance that using only two years of data will create unusual averages for local authorities experiencing abnormal migration patterns over this short period. However, we decided that although there may be risks associated with this change, the general increase in accuracy outweighs any possible adverse impacts on individual local authorities. However, future projections will still use five-year averages for internal migration when a longer back series is available.

The proportion of people moving from a local authority (known as the "propensity to migrate") is calculated by dividing the number of people moving out of the area by the number of people living there. This is calculated separately for males and females, by age, for each of the trend years, and then a two-year average (for the principal projections and high and low migration variants) and a five-year average (for the alternative migration variant) is calculated to produce rates of out-migration by age and sex.

By applying these proportions to the population figures, we create projected rates of internal migration. By adding up the number of outflows from every authority into a particular authority, we calculate the projected inflows into that authority.

Wales

Migration is treated as consisting of two components: international migration and within-UK migration (including both migration within Wales, and between Wales and other parts of the UK).

International migration

Long-term international migration assumptions for each local authority are produced by analysing age- and sex-specific migration trends for each local authority during the most recent five years. The international migration component of the mid-year estimates is used for this purpose.

Owing to the volatility relating to migration figures year-on-year, the long-term international migration assumptions are based on an average of the most recent five years of data. Five-year average flows by five-year age groups and sex are set as a static migration assumption for each local authority for both in-migration and out-migration for each year of the projection period.

Within-UK migration

Internal inward migration is calculated as a rate relative to the rest of the UK population. Internal outward migration is calculated as a rate relative to the resident population of each local authority. Age- and sex-specific rates are calculated for each local authority using the most recent five years. The estimates are based on population components of change data from the mid-year estimates.

Scotland

Migration is treated as consisting of three components: international migration, cross-border (within UK) migration and internal (within Scotland) migration.

International migration

International migration is migration between Scotland and countries outside of the UK. It includes migration by asylum seekers and refugees, both of which are modelled separately from other international migrants.

It is assumed in the national population projections that international migration will move from levels seen in the base year to a long-term trend several years later. The time taken to reach the long-term trend is known as the run-in period. In the 2018-based population projections, the run-in period was seven years, with the long-term trend beginning in the year ending mid-2025.

International migration is projected for each area in three stages:

- stage one: project total inflows and outflows by sex
- stage two: adjust averaged historical age distributions to projected totals
- stage three: adjust projected age and sex distributions to national population projections' distribution

In stage 1, historical estimates of total international migration to and from an area are taken, split by sex, and time series analysis applied to them.

The time series technique that is applied is auto-regressive integrated moving averages (ARIMA). For international migration totals, the simplified model involving just the auto-regressive (AR) component was chosen as it provided the most robust results when implementing models.

The best AR model based on statistical tests of fit is then selected, and subjective examination of the projected output is carried out. If either the model fails the tests or the projected output looks atypical in comparison with estimated data, then the data are re-examined and a model that passes the quality tests is chosen instead.

Once a model is chosen, several years' worth of projected data are output. The number of years projected represents the run-in period, with the last projected data point as the long-term assumption.

The output from the AR modelling is then used to create a proportion for each area, which is then applied to the Scotland-level international migration data from the national population projections. This ensures that each area's migration is higher or lower under the high and low migration variants.

The next stage in the process is to take an average of estimated international migration over the previous five years, by single year of age and sex. These distributions can then be constrained to the totals created in the previous step.

Migration of asylum seekers is taken from the national population projections, and it is assumed that all the asylum seekers coming to Scotland will migrate to Glasgow City Council. Similarly, it is assumed that all asylum seekers migrating out of Scotland, migrate out from Glasgow City Council. Migration of refugees is also taken from the national population projections and is distributed to councils based on distribution numbers from the previous three years under the VPRS.

The projected age and sex distributions obtained for each area in the previous stage are then constrained to the Scotland totals obtained from the national population projections.

Rest of UK and within Scotland migration

Although these two components of migration are modelled separately, the method used is the same for both.

Rest of UK migration is migration between Scotland and the other constituent countries of the UK. Within Scotland migration is migration between areas of Scotland.

Migration is calculated for each area and for the rest of the UK as a whole. Because of the availability of data, it is not possible to model migration between Scottish areas and the constituent countries of the UK separately. Migration is modelled by single year of age and sex for each flow between areas.

The migration is created using a multi-region rates-based model. Rates are calculated for each movement between areas. The rate is created from the population and migration exhibited in the five years prior to the year that is being projected. Rates are calculated and then averaged. The average rate is then applied to the population at risk, and this projects the out-migration from that area.

Once all flows have been projected, it is possible to aggregate flows by origin, or destination, to calculate the out- or in-migration respectively.

For the rest of UK migration, the projected age and sex distributions obtained for each area are then constrained to the Scotland totals obtained from the national population projections.

In addition, the within Scotland migration outflows are constrained to the remaining population once international and rest of UK outflows have been removed. This is to prevent the within Scotland migration from projecting more out-migration than there are people in the area.

Northern Ireland

Migration is treated as consisting of two components: international and cross-border (within UK) migration and internal (within Northern Ireland) migration.

For the first year of the local area projections, the best estimate of migration flows is used as these data are available when the local area projections are compiled. To project local area gross migration flows, the average annual flow over the last five years is used. The aggregate average annual flow into and out of Northern Ireland is constrained to the national projected flows to and from the rest of the UK and outside the UK.

The national-level projections for Northern Ireland do not include migration related to people moving address within Northern Ireland (internal migration). However, internal migration is required for the local area projections.

Migration by age and sex often differs between areas (for example, some areas attract more students than others). So, unlike fertility and mortality, the Northern Ireland age-specific migration rates are not applied to all areas. Instead, each area has its own individual age-specific migration rates calculated using the last complete year's data, and these are applied to the gross flows for that area.

10 . Special populations

England

The following are considered as special population groups in the local authority projections for England:

- home armed forces
- foreign armed forces
- dependants of foreign armed forces
- UK armed forces returning to England from Germany
- prisoners (first treated as a special population group for the 2018-based projections)

The populations in these groups as at 30 June in the base year of the projections are assumed to be static throughout the projection period for each local authority.

The national population projections have made an allowance for the return of armed forces and their dependants from Germany by 2020. The subnational population projections have used data from the Ministry of Defence and British Forces Germany to allocate the majority of returning UK armed forces and their dependants to the local areas where their units are based. The returning armed forces are treated as a special population group within the projections. Their dependants are included in the usual resident population and aged on in the normal way.

Wales

The following are considered as special population groups in the Welsh subnational population projections: home armed forces and prisoners.

The populations in these groups as at 30 June in the base year of the projections are assumed to be static throughout the projection period for each local authority.

Scotland

The following are considered as special population groups in the Scottish subnational population projections: home armed forces and prisoners.

The populations of the home armed forces and prisoners are modelled separately using the same method. The populations are averaged over the previous five years. This is used to create the assumption for each area, which is then assumed to be static throughout the projection period.

Northern Ireland

Only home armed forces are treated as a special population group in the population projections for areas in Northern Ireland.

The population in that group as at 30 June in the base year of the projections is assumed to be static throughout the projection period for each local authority. Planned changes to locations and/or levels of HM forces are also taken into consideration.

11 . Geography

England

The latest 2018-based projections are published for the 326 local authority districts existing in England in 2018, together with corresponding counties and regions. To reflect the changes to geography areas in April 2019, outputs are also available for the 319 local authority districts existing in England in 2019. In addition, the projections are published for NHS England regions and clinical commissioning groups (CCGs) in England.

Wales

The projections are published for the 22 local authorities in Wales. Projections have also been developed for the three national park areas in Wales. These are based on a similar methodology to that used in the local authority projections.

Scotland

National Records of Scotland (NRS) produces population projections for Scotland's 32 council areas, 14 NHS Board areas, four strategic development plan (SDP) areas and two national park areas.

To produce consistent population projections for all of these geographies, Scotland is split into 42 processing units for the production of the projections. These processing units consist of councils and (where SDP or national park areas intersect a council) part-councils. This system means that the projections for all geographic areas, including national parks and SDPs that only cover part of the country, are run together and are fully consistent with each other.

Northern Ireland

The projections are published for the current 11 local government districts (LGDs) in Northern Ireland and the former 26 LGDs. Population projections for other areas (such as health trusts) are created by aggregating the projected populations of combinations of the former 26 LGDs.

12 . Projection period

The subnational population projections for all four countries are produced for the 25 years that follow the base year. Reporting tends to focus on results within that period (for example, projected changes over the next 10 years and next 25 years).

13 . Frequency of projections

England

Local authority population projections for England are usually published every two years with a two-year lag (for example, 2018-based projections published in 2020), which is a broadly similar timetable to projections for other constituent countries of the UK. The variant subnational population projections are now published with the main subnational release.

Although we usually publish population projections every two years, we are currently proposing not to produce 2020-based projections, which would theoretically be published in autumn 2021 for the national projections and spring 2022 for the subnational projections. This is because the first results from Census 2021 are also expected in spring 2022; we therefore propose that the next round of projections will be 2021-based, enabling them to use the updated base population that the results from Census 2021 will offer. This approach would also apply to our household projections.

At this stage, this is not a definitive policy and we cannot be certain of exact timings. Factors that will affect our plans include how different the results from Census 2021 are from the current population estimates and our evaluation of the causes of any differences. However, we aim to produce national population projections using a mid-2021 population base by around the end of 2022.

We welcome any feedback on this proposed approach. In addition, please note that updates on this will be communicated in our quarterly Migration and Population Statistics Newsletter. To sign up to this, please email us at pop.info@ons.gov.uk.

Wales

Subnational population projections for Wales were published for the first time in June 2008, and they are usually published every three years.

The 2017-based subnational population projections, following the 2014-based subnational population projections, were postponed following the release of the 2018-based national population projections. The subnational population projections were subsequently re-based on 2018 data to reflect the different trends seen in the national population projections for Wales.

The next set of subnational population projections for Wales will be 2021-based. The publication of these projections will be influenced by the timetable for publishing data from Census 2021 and, subsequently, the national population projections.

Scotland

Subnational population projections for Scotland are published every two years to a broadly similar timetable to projections for other constituent countries of the UK. Timing of future releases will be subject to review, in line with the Office for National Statistics (ONS), to take into account the timescales for the results from Census 2021.

Northern Ireland

Subnational population projections for Northern Ireland are usually published every two years to a broadly similar timetable to projections for other constituent countries of the UK. The Northern Ireland Statistics and Research Agency (NISRA) is planning for Census 2021; this will have an impact on all population statistics, including the dates of the next national and subnational Northern Ireland population projections.

NISRA will rebase all Northern Ireland population estimates using the next census. The usual two-year projection timeframe would mean the production of 2020-based projections before the rebasing was complete, so it is currently proposed that 2020-based national and subnational population projections will not be produced.

In line with the ONS, it is proposed that the next round of projections will be 2021-based and likely be published by the end of 2022. This would be in line with the position taken after the last two censuses and would mean future Northern Ireland subnational population projections (in line with Census 2021) would not be published until 2023 or 2024.

This is not yet a definitive policy and timings may change. Users of national and subnational population projections are currently being consulted on the proposed approach.

14 . Published statistics

England

Subnational population projections for England are available by sex and quinary age group (up to 90 years and over) for regions, counties, local authorities, clinical commissioning groups (CCGs) and NHS regions. Additional tables provide summary components of change for regions, counties and local authorities.

Subnational population projection data by single year of age and components of change are also published to enable users to carry out further analysis.

Wales

Subnational population projections for Wales are available from StatsWales by single year of age (up to 90 years and over) and by sex for each local authority and national park area.

Projected components of change are also published on StatsWales for each local authority and national park area.

Scotland

Subnational population projections for Scotland are available from the National Records of Scotland (NRS) by single year of age (up to 90 years and over) and by sex for each area. Tables summarising population change, components of change, fertility rate, life expectancy, and fertility and mortality scaling factors for each area are also published.

Additional detailed tables are also made available on request, providing projected components of change (births, deaths and migration) by single year of age and sex for each area.

Data are also published on Scotland's Open Data Platform (for official statistics).

Northern Ireland

Population projections for areas within Northern Ireland are available by single year of age (up to 90 years and over) and by sex. Additional tables provide projected components of change (births, deaths and migration) for each area.

Data are also published on OpenDataNI, a digital portal created to facilitate access to Northern Ireland public sector data for both reuse and redistribution.

15 . Variant projections

England

The 2018-based subnational population projections included variant projections featuring different projected levels of migration. The high international migration and low international migration variants are produced broadly using the same methods as the 2018-based principal subnational population projections, except that the totals are constrained to match those in the 2018-based high and low migration variant national population projections for England.

The 2018-based 10-year migration variant uses 10 years' (the years ending mid-2008 to mid-2018) worth of input data for international migration (including asylum seekers), internal migration and cross-border migration. The 10-year migration variant is consistent with the principal subnational population projections in that all components are constrained to the principal 2018-based population projection for England.

The 2018-based subnational population projections also included an alternative internal migration variant. This combined the two years of new method internal migration data and three years from the old method, giving a five-year trend in total. This variant was produced to allow a comparison between the two-year average used for the 2018-based population projection and the usual five-year average. This variant is also constrained to the principal 2018-based population projection for England.

Wales

For the 2018-based subnational population projections, variant projections include a "high population" variant (based on high fertility, life expectancy and migration assumptions) and a "low population" variant (based on low fertility, life expectancy and migration assumptions). The Welsh Government is working on the feasibility of producing additional variants looking at alternative migration assumptions.

Scotland

Seven variant projections in addition to the principal projection are produced for Scottish areas. These are high and low fertility, life expectancy and migration variants and a zero outwith Scotland migration variant.

These are all constrained at the Scotland level to the equivalent variant from the national population projections.

Northern Ireland

There are currently no variant population projections produced for areas within Northern Ireland. They may be considered in the future, subject to user needs, the feasibility of the variant and available resource for production.

16 . Production and dissemination

England

The local authority population projections for England are produced by the Population and Household Projections team in the Centre for Ageing and Demography of the Office for National Statistics (ONS).

The release of the projections is announced on the ONS and GOV.UK release calendars.

The population projections are published in datasets on the ONS website.

The tables are accompanied by supporting information including a statistical bulletin, a methodology guide and a Quality and Methodology Information (QMI) report. Interactive population pyramids and maps are also available.

Wales

The subnational population projections for Wales are published by Knowledge and Analytical Services in the Welsh Government.

The release of the projections is announced on the GOV.UK release calendar. Detailed projection results are published in tables on StatsWales.

The Welsh Government seeks permission from the ONS to share the base data with local authority representatives in Wales so that they can use them to form alternative assumptions and create their own projections for their local authorities.

The subnational population projections (local authority): 2018-based report is available on the Welsh Government website.

Scotland

The subnational population projections are produced by National Records of Scotland (NRS). The release of the projections is announced on the NRS and Scottish Government websites.

The subnational population projections report, tables, figures and detailed tables are published on the NRS website. A separate methodology guide is also published.

The members of the Population and Migration Statistics (PAMS) Committee are consulted on the methodology for the population projections. The papers can be found on the NRS website.

The latest subnational publication and data are available from the NRS website.

Northern Ireland

Population projections for areas in Northern Ireland are published by the Census Branch of the Northern Ireland Statistics and Research Agency (NISRA).

The release of population projections for areas in Northern Ireland is announced on the GOV.UK release calendar.

The projections are published on the NISRA website and include a press release and statistical report as well as papers on assumptions and methodology.

17 . New and future developments

England

The 2018-based subnational population projections were the first time that prisoners were included as a special population.

Because of requests from our users, the 2018-based subnational population projections included new outputs: an old-age dependency ratio (OADR) was published at the county level for the first time, and age-standardised mortality rates and age-standardised fertility rates were published at the local authority level.

It is our mission to provide the best insights on population and migration using a range of new and existing data sources to meet the needs of our users. Our ambition is to deliver a fully transformed system by 2023, making regular improvements to our statistics along the way as more administrative data become available. We will rigorously quality assure new methods and share the impact of any changes made. The Transformation of the population and migration statistics system: overview article gives more information on this work. The resulting improvements will also be incorporated into future editions of population projections.

Wales

The Welsh Government is continually looking to improve the methodology for calculating subnational population projections in Wales, in collaboration with the Wales Sub-national Projections working group (WaSP).

We welcome any feedback on our projections by emailing stats.popcensus@gov.wales. In addition, we publish a quarterly demography newsletter to keep users informed of the latest development in population statistics for Wales.

Scotland

National Records of Scotland (NRS) is exploring the feasibility of using data from the Higher Education Statistics Agency (HESA) to improve internal student migration estimates. Future developments will include consultation with users and assessment of their needs. Demographic trends, data availability and methodology are also periodically reviewed.

Northern Ireland

Developments will include consultation with users and assessment of the need for and feasibility of variant projections for areas in Northern Ireland. Demographic trends, data availability and methodology are periodically reviewed.

18 . Guidance on using subnational population projections

This section provides some guidance on using the subnational population projections correctly and avoiding some common errors in interpreting them.

Population projections are not forecasts; they simply provide the population levels and structure that would result if assumptions about fertility, mortality and migration were realised. In the subnational population projections, these assumptions are based primarily on recent observed demographic trends. Consequently, they do not reflect, for example, the impact of government policies or likely housing development in an area. The projections do not therefore predict the impact of the UK's withdrawal from the EU.

Subnational population projections cover a 25-year horizon, and small changes to assumptions can result in more substantial differences in the projected population at the end of that period. There is therefore a greater degree of uncertainty the further ahead the projection. Similarly, since assumptions may be reasonably accurate for a population as a whole but less accurate for subgroups within the population, the projections are more robust at greater levels of aggregation, by age or area.

Where possible, the mid-year population estimates should be used in an analysis instead of the projections. An exception to this would be an analysis of likely change in a population between a recent year (where both a projection and an estimate exist) and a future year (where it would be better to compare projected figures for the two years from one set of projections).

The fact that the subnational population projections for different parts of the UK are prepared using different methodologies does not, in itself, make it inappropriate to compare the projection for an area in England, say, with an area in Wales. However, you should be careful that the conclusion you draw from the comparison is not simply a result of the different approach.

It is important to not draw conclusions from the projections that are a result of the assumptions that they are based on. For example, analysis of internal migration for an area in England would show the age-specific propensity to migrate to elsewhere in England varying slightly in the first few years of the projection before settling at a constant value. This pattern of migration over time would be reflecting the way in which internal migration is projected rather than a true prediction of migration behaviour.