

National population projections QMI

Quality and methodology information (QMI) for national population projections, detailing the strengths and limitations of the data, methods used and data uses and users.

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1 . Output information

National Statistic	
Product name	National population projections
Data collection	Using existing data
Frequency	Every two years
How compiled	Administrative data, survey data and projections methodology
Geographic coverage	UK
Last revised	12 January 2022

2 . About this Quality and Methodology Information report

This quality and methodology report contains information on the quality characteristics of the data (including the European Statistical System five dimensions of quality) as well as the methods used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about existing uses and users of the data
- understand the methods used to create the data
- help you to decide suitable uses for the data
- reduce the risk of misusing data

3 . Important points

- National population projections (NPPs) provide statistics on potential future population levels of the UK and its constituent countries.
- Projections relate to the usually resident population, and do not include people who come to or leave the country for less than 12 months.
- They are not forecasts and do not attempt to predict the impact of future political and economic changes.
- They will inevitably differ to a greater or lesser extent from actual future population.
- Projections become increasingly uncertain as they go forward into the future.

4 . Quality summary

Overview

We usually publish national population projections (NPPs) every two years. We base them on the most recently available population estimates together with assumptions about future levels of fertility, mortality and migration. Each new edition of the NPPs supersedes the previous one. The most recent set of projections (2020-based) are an interim set for the reasons set out in Chapter 5 of the Background, Methodology and Assumption Setting document. This also details why there are no variant projections for this release. We plan for the next NPPs to be 2021-based, and include a range of variant projections when they are published in early 2023.

NPPs are broken down by sex and single year of age, and usually cover the following 100 years. Although, because of the uncertainty of longer-term projections, we only focus on the first 25 years in our bulletins.

Uses and users

National population projections (NPPs) are used within and outside of government as the definitive set of national population projections. Examples of their uses include forming fiscal projections, identifying future demand for health and education services, and estimating the future cost of state pensions. They are also used as the base for subnational population projections and household projections, although [we announced in June that we plan for our next subnational population projections and household projections to be 2021-based](#) using Census 2021 data.

Strengths and limitations

Strengths

- These data provide users with an indication of the potential size of the future population of the UK and its constituent countries, and the potential age and sex structure.
- Projections are produced on a nationally consistent basis using the internationally accepted cohort component methodology, and the same data sources across the constituent countries of the UK.
- In a standard release, variant projections offer a wide range of alternative demographic scenarios.

Limitations

- Population projections are not predictions of the future; they are an illustration of future population size and structure based on assumed levels of fertility, mortality and migration.
- Long-term assumptions are held constant throughout much of the projection period; each assumption is not a prediction, but an illustration of an assumed average trend.
- Variant population projections, when produced as part of a standard release, are illustrations of alternative scenarios and are not quantified measures of uncertainty.
- Demographic behaviour is inherently uncertain, and therefore projections will inevitably differ from actual future population trends.

5 . Quality characteristics of national population projections data

This report provides a range of information that describes the quality of the data and identifies the issues that should be noted when using the output.

We have developed [Guidelines for measuring statistical quality](#) based upon the five European Statistical System (ESS) quality dimensions. This report addresses the quality dimensions and important quality characteristics, which are:

- relevance
- accuracy and reliability
- coherence and comparability
- accessibility and clarity
- timeliness and punctuality

More information is provided about these quality dimensions in the following sections. Additionally, concepts and definitions commonly used in the national population projections (NPPs) are defined.

Relevance

Relevance is the degree to which the statistical product meets user needs for both coverage and content.

The national population projections (NPPs) serve a wide range of users across government and beyond. We produce the projections at the request of the National Statistician and the Registrars General for Scotland and Northern Ireland. As such, their content and method of production have been formally agreed and are regularly revisited to see if changes are required.

The Office for Statistics Regulation (OSR) assessed the NPPs, along with other population projections and estimates, for their compliance with the [Code of Practice for Statistics](#). OSR published its findings in [Report Number 309](#) in July 2015, and confirmed the NPPs' [reaccreditation with National Statistics](#) status in April 2019. More recently, in May 2021 the OSR published a [review of population estimates and projections produced by the Office for National Statistics \(ONS\)](#) and found that the approach taken to produce projections is fit for purpose. In July 2021, the ONS published a response to this review which outlined its [Future plans for research on population estimates and projections](#).

The NPP committee oversees the projections process. This committee includes representatives from the ONS and the devolved administrations and is accountable to the National Statistician and Registrars General. Within the projections process we and the devolved administrations consult leading stakeholders, including representatives from relevant government departments. User engagement meetings allow stakeholders to highlight potential new data requirements or request changes to presentation or the publication timetable. We take into account stakeholder views and suggestions as far as possible, within the Code of Practice for Statistics.

A robust and objective methodology is employed to create national population projections that are relevant for all types of users. The projections do not attempt to predict the impact of future political and economic changes. This means, for example, that the principal projections do not make adjustments for the possible demographic consequences of Brexit. The projections cover a period of 100 years, but uncertainty necessarily increases the further into the future they go. Long-term figures should be treated with great caution, especially projections by single year of age when looking beyond 25 years.

We regularly consider what user needs are not being met by our published statistics – we identify these needs using the processes described in the Assessment of user needs and perceptions section.

Accuracy and reliability

Accuracy and reliability is the degree of closeness between an estimate and the true value.

The national population projections (NPPs) use the latest official mid-year population estimates for each UK country as their base year and are inevitably dependent on the accuracy of these estimates. The accuracy of these estimates can be assessed after a census has been carried out. When the 2021 Census data is available, we plan for the population estimates for mid-2012 to mid-2020 to be rebased to ensure a consistent time series. This will involve identifying parts of the population estimates that were under- or over-estimated between 2012 and 2020, using 2021 Census data and other sources. In Scotland, it is planned that 2022 Census data will be used to rebase the Scottish population estimates between 2012 and 2021.

NPPs also use the latest available data on births, deaths, internal and international migration. However, the NPPs are not forecasts, and because of the inherent uncertainty of demographic behaviour, any set of projections will inevitably differ from actual future outcomes to a greater or lesser extent. It would be improbable for any projection to correspond entirely with the actual demographic outcome. Changes in government policy, in the economy, in individual, family and household behaviour and in events both in and outside the UK will influence the three main components of population change. This will inevitably include the impact of the coronavirus (COVID-19) pandemic.

We consider each component of the projections – fertility, mortality and migration – separately when setting the assumptions for each set of projections. The assumptions are based largely on extrapolation of past trends. Inevitably there is some element of subjective judgement. Our choices of main assumptions are produced by analysis of historical trends to determine plausible scenarios, and we consult with an independent advisory panel of academic experts to help inform our thinking. The expert advisory panel does not have direct influence over our final assumptions; these are produced by the ONS and agreed solely by the NPP committee. Further information on the expert advisory panel can be found in the section on the long-term assumptions in the paper on Background, Methodology and Assumption Setting.

Because of the inherent uncertainty around future demographic behaviour, we often hold long-term assumptions of each component constant. International migration numbers are particularly unpredictable, so we usually assume a constant level from just a few years into the projection period – in the 2020-based projections, for the UK, we assume annual net migration of 205,000 per year from the year ending mid-2027 onwards. Fertility measures are less volatile, although as a period measure the total fertility rate (TFR) is affected by when women have their children as well as the number they have. We usually assume the TFR to be static about 10 to 15 years into the projection. We measure mortality in terms of improvements in mortality rates. As changes in mortality are more gradual and stable, we assume the current rates gradually converge to a standard rate of improvement at the same level, for all but the oldest ages, 25 years into the projection. We review all these time periods for each new set of projections.

To give users of the projections an indication of the uncertainty outlined above, we normally produce a number of variant population projections based on alternative assumptions about the future. The interim 2020-based projections are not supported by variant projections for the reasons outlined in the introduction to the article on Background, Methodology and Assumption Setting. Variant projections offer a set of plausible alternative scenarios according to higher or lower assumptions about the trajectories of fertility, migration and mortality. Some of the variants combine alternative assumptions – for example, a “young” population assumption (high fertility, high migration and low life expectancy assumptions). Other variants allow users to decompose the projections to increase understanding of how changes in the assumptions affect the projected population. For example, by comparing the zero net migration variant with the principal projection, the impact of the level of assumed migration in the principal projection can be assessed. In a standard release, variant projections are made available alongside the principal projection. For further guidance on how to use variant projections, please see our recent publication [Variant national population projections for the UK and subnational population projections and household projections for England: user guide](#).

The method we use to produce the projections does not enable statements of probability to be attached to them, or for confidence intervals to be ascribed to the variant projections because the variants are based on different demographic scenarios. Therefore, the levels of uncertainty for the fertility, mortality and migration assumptions are not directly comparable. However, study of past data shows that international migration has been more volatile than the other components.

It is also possible to look at earlier projection sets and compare them with what subsequently happened. In February 2016, we published an [accuracy report](#), which compared NPPs with population and migration estimates and births and deaths data up to 2013, where available. In 2007, we published the article [Fifty years of United Kingdom population projections: how accurate have they been? \(PDF, 868 KB\)](#). A previous analysis covering the projections made during the period 1971 to 1991 is in Population Trends number 77 – details of this are in the [Index to Articles 1975 to 2003 \(PDF, 383KB\)](#).

All of these articles consider how close to the actual outcome the NPPs have been, the errors for each of the three individual assumptions and whether accuracy has improved in more recent projections. They also discuss the variant projections. These analyses are inevitably dependent on comparisons with the latest population estimates. Revisions to estimates of the past and current population (for example, the revisions made to population estimates following the 2001 and 2011 Censuses) also play a part in explaining projection error. Revisions may make the projections look more or less accurate than they really are.

The 2007 article [UK national population projections in perspective: How successful compared to those in other European countries? \(PDF, 564KB\)](#) by Professor Nico Keilman (University of Oslo) offers an international comparison of accuracy.

As explained, actual population change is almost certain to differ from what is projected. Because updated projections are usually produced every two years, we do not go back and change old projections retrospectively. However, in the unlikely event that a production error or a major revision to the source data causes our latest projections to be substantially inaccurate, we would consider the best approach in line with the [revisions policy for population statistics](#).

An error was found in our 2018-based NPPs and a correction notice issued. The error was caused by incorrect processing of cross-border flows between Wales and England. Following discussions with the NPP Committee, it was agreed:

- to publish corrected projections for Wales
- to not change the projections for England, where the much larger population size, combined with the inherent uncertainty around the projections and underlying estimates, meant a correction would not have been statistically beneficial
- to not change the 2018-based subnational population projections for England; there was also no change to the projections for Northern Ireland, Scotland or the UK as a whole
- to publish an explanatory note with the correction, including advice for users

Coherence and comparability

Coherence is the degree to which data that are derived from different sources or methods but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain, for example, geographic level.

Each set of national population projections (NPPs) is unique, comprising assumptions made using the best information available at a point in time. This means that each new set of projections, using the most up-to-date background data available, supersedes the previous set. Although the results of subsequent projections can be compared, this will not be comparing like with like, but instead observing what effect the most recent data has on the projected future population of the country.

All NPP publications from the 2014-based onwards are available on our current website. The complete set of [online materials up to the 2014-based NPPs](#) is available on the National Archives website. This includes the [NPP historic series](#) page containing data from the 1954-based to 2004-based projections.

The only known official population projections for the UK, apart from those produced by the Office for National Statistics (ONS), are those which were produced by Eurostat and those produced by the United Nations (UN). The UN produces [worldwide population projections](#) every two years. They publish a combination of population estimates and projections. The UN uses a Bayesian method to project the fertility and mortality assumptions, and then the standard cohort component model to project the population forward. Individual countries such as the UK have no input into the UN population projections.

Accessibility and clarity

Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the release details, illustrations and accompanying advice.

The national population projections (NPPs) are available online and can be downloaded free of charge in Microsoft Excel and CSV format. Graphs, textual background information and supporting documents are provided as part of each release.

If you have any additional enquiries regarding national population projections, you can [contact us by email](#) or by telephone on +44 1329 444661. It may be possible to meet additional data requests, but these may be chargeable depending on the time required to produce the additional data requested. Metadata describing the limitations of additional data are provided with individual requests. These requests are also published on the Office for National Statistics (ONS) website.

Our recommended format for accessible content is a combination of HTML web pages for narrative, charts and graphs, with data being provided in usable formats such as CSV and Excel file types. We also offer users the option to download the narrative in PDF format. In some instances, other software may be used or may be available on request. For further information, please refer to the contact details at the beginning of this report.

For information regarding conditions of access to data, please refer to the following:

- [terms and conditions \(for data on the website\)](#)
- [freedom of information](#)
- [accessibility](#)

Timeliness and punctuality

Timeliness refers to the lapse of time between publication and the period to which the data refer. Punctuality refers to the gap between planned and actual publication dates.

We usually publish the national population projections (NPPs) every two years, typically in the October following the reference year (for example, we published the 2018-based NPPs in October 2019). The 2020-based NPPs were published in January 2022, slightly later than the usual time. This meant that there was sufficient time to use the latest and best available death occurrences data, which maximised the quality and relevance of the projections throughout the subsequent projections period. A standard publication includes the principal projection and all variant projections where we have discussed which variants to produce with our main stakeholders across government. In early releases, we have published lower priority variants around a month after the main release, but for the 2018-based NPPs all variants were published alongside the principal projection. The interim 2020-based projections are not supported by variant projections for the reasons outlined in the introduction to the report on Background, Methodology and Assumption Setting. Our current plans are for the next NPPs to be 2021-based and include a range of variant projections when they are published in early 2023.

The starting point for the projections is the population estimates for [England and Wales](#), [Scotland](#) and [Northern Ireland](#), which are produced by the Office for National Statistics (ONS), National Records of Scotland (NRS) and the Northern Ireland Statistics and Research Agency (NISRA) respectively. The last of these estimates become available at the end of June of the year following the reference year, and we usually publish the NPPs approximately four months later. The 2020-based interim projections were published slightly later in January 2022. With the exception of the delay to the 2020-based interim projections, we have always met the planned publication date.

For more details on related releases, the [release calendar](#) provides 12 months' advance notice of release dates. In the unlikely event of a change to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change explained at the same time, as set out in the Code of Practice for Statistics. Information on the reason for the [delay to the 2020-based interim projections](#) was published on the ONS website and emailed to subscribers to our email newsletter and NPP email distribution lists.

Concepts and definitions

Concepts and definitions describe the legislation governing the output and a description of the classifications used in the output.

Usually resident: population projections and the estimates they are based on, include the “usually resident” population only. This is the standard United Nations (UN) definition and includes only people who reside in a country for 12 months or more. As such, short-term international migrants are excluded.

Components of change: population changes between one year and the next are caused by three components of change: births (fertility), deaths (mortality) and migration. To inform the projections we make assumptions about how each of these will change in future.

Fertility: in a demographic or projections context fertility relates to how many children a group of women have, rather than their ability to conceive (which is the common understanding of fertility).

Mortality: the likelihood of death, often presented as mortality rates – the proportion of a group of a particular age and sex who die during the course of the year.

Mid-year: 30 June of any given year, where the period from one mid-year to the next is from 1 July of year x until 30 June of year x plus one.

6 . Methods used to produce national population projections data

We calculate the national population projections (NPPs) using a number of standard demographic methods. Full details of the methods can be found via our Background, Methodology and Assumption Setting document. Some of the main methodological points are detailed in this section.

We make the projections for successive years running from one mid-year to the next using the cohort component method, which can be summarised as:

Population (year x) plus Births (between years x and y) minus Deaths (between years x and y) plus In-Migrants (between years x and y) minus Out-Migrants (between years x and y) equals Population (year y).

For each age, the starting population plus or minus the net number of migrants (immigrants minus emigrants) less the number of deaths produces the number in the population, one year older, at the end of the year. To this, we add survivors of those born during the year. We define age as completed years at the last birthday.

We use the mid-year population estimates from each country as the starting population. These are calculated using the internationally recognised cohort component method – starting with the population data from the last decennial census and updating each year with the available data on births, deaths and migration. The report [Population estimates for local authorities across UK constituent countries: a comparison of data sources and methods](#) compares the population estimates methodology used across the four UK countries.

We calculate the numbers of births, deaths and migrants using the assumptions of future levels of fertility, mortality and migration, which we determine using a mixture of data observation and extrapolation, as well as consideration of expert opinion. We may also adjust the assumptions for the first year of the projection to take into account the very latest data.

In 2012, we commissioned a migration assumptions methodology review from the University of Southampton. This made various recommendations on the methodology for setting international migration assumptions with the intention of increasing transparency and streamlining previous processes. The results are as follows.

From the 2012-based NPPs onwards, we have applied overall international migration assumptions, rather than breaking them down by world area. From the 2012-based NPPs onwards, we have also produced separate international migration assumptions for each UK country.

For the 2012-based NPPs we used ARIMA models (a standard approach to time series extrapolation) to determine the principal international migration assumptions. However, the rise in net migration by 2014 led to the models projecting values that were deemed improbably high. In consequence, for the 2014-based NPPs we used a 25-year rolling average of international migration to and from the UK. For the 2016-based NPPs we modified this to a straight 25-year average covering the period 1992 to 2016, so avoiding the weighting towards the latter end of the series. Our Expert Advisory Panel and delegates at the NPP consultation supported the use of this approach, which we used again for the 2018-based and 2020-based interim projections.

For the 2012-based NPPs we also used ARIMA models for the cross-border flows between the four nations of the UK. However, since the 2014-based NPPs we have calculated the cross-border flows using rates of movement by age and sex rather than fixed numbers – this avoids the projections producing implausible values, such as negative population stocks, when projected fixed levels of out-migration are bigger than the initial population size.

The 2001 National Statistics Quality Review of methodology for projecting mortality assessed various projection methods. It concluded that no alternative method would be likely to outperform the existing method. It recommended some amendments to the methodology, such as setting a target year at 25 years from the base year and using UK rather than England and Wales data to analyse past trends. These changes were implemented in subsequent projections. In 2015, we initiated a new review into the methodology for setting mortality assumptions. We implemented some enhancements for the 2014-based NPPs, including a new method of smoothing historical mortality data to analyse past trends and determine the rates of mortality improvement. In the 2020-based interim National Population Projections, an adjustment to the mortality improvement rates was made for the impact of coronavirus (COVID-19). More information can be found in the Mortality assumptions section of the release.

We have used a consistent method for the fertility assumptions for several rounds of projections. We assume a completed family size (CFS) for the 25th year of the projections and then set the trajectory between the current level of fertility and the long-term CFS using analysis of recent trends, an assessment of their implications for future CFS and expert opinion.

We compute the population for each of the constituent countries of the UK and add the results together to produce projections for England and Wales (combined), Great Britain and the UK. We produce variant projections using the same method but with alternative assumptions of future levels of fertility, mortality and migration. We have published details of these alongside the release.

Quality assurance of administrative data

In 2015, the Office for Statistics Regulation (OSR) issued the Regulatory Standard for the quality assurance of administrative data. This new standard applies to all official statistics where administrative data are used in the production of these statistics. All producers of official statistics that use administrative data need to implement this requirement, by embedding good practice into their production to assure the quality of the data.

In response, the Office for National Statistics (ONS) Centre for Ageing and Demography has published a set of [Quality Assurance of Administrative Data](#) reports for all of the administrative datasets that underlie its products. Many of these underlie the national population projections either directly or indirectly (via the population and migration estimates).

7 . Other information

Assessment of user needs and perceptions

Assessment of user needs and perceptions is the processes for finding out about uses and users and their views on the statistical products.

Because we publish national population projections (NPPs) for each of the four UK nations, we work closely with our partners in the devolved administrations, including discussing appropriate methods. We do this via at least twice-yearly NPP committee meetings, as well as ongoing liaison.

We collect other information on users' needs for, and perceptions of, the NPPs in a number of ways:

- meetings with other primary stakeholders, such as government departments – this includes the NPPs user event and also bespoke events occurring just after publication
- user groups, for example, the Central and Local Information Partnership and the UK Population Theme Advisory Board – allowing our main users to comment on existing plans and to put forward changes in their requirements
- contact with individual users – drawing on the evidence provided by users who contact us with requests for, or queries on, the projections
- web analytics data showing use made of specific parts of a release
- feedback on NPPs may also come from the Office for National Statistics' (ONS') other engagement with users, including its annual customer satisfaction surveys

The information collected through these methods feeds into decisions on content and formats of outputs.

In the 2018-based projections we indicated a proposal not to release 2020-based NPPs (autumn 2021) and subnational population projections (spring 2022) because their publication would be in close proximity to the planned release of provisional first Census 2021 results in 2022. To receive user feedback on their needs for 2020-based projections and on other aspects of our projections, in October 2020 we published an [invitation to provide feedback on timescales for future national and subnational population projections](#). We achieved a high number of responses to this exercise. In April 2021, we published a final article and announcement about production of 2020-based interim national population projections in the article [National and subnational population projections – user feedback: April 2021](#).

8 . Related links

[National population projections, background, methodology and assumption setting: 2020-based interim](#)

Article | Released 12 January 2022

Information on the data, methods and assumption setting process used to produce the 2020-based interim national population projections.

[National population projections, subnational population projections and household projections for England –future plans: June2021](#)

Article | Released 25 June 2021

An update on plans to publish 2020-based national population projections and for England, future rounds of subnational population projections and household projections after Census 2021.

[National and subnational population projections – user feedback: April 2021](#)

Article | Released 19 April 2021

Overview of responses to our invitation to provide feedback on the future timescales for national population projections (NPPs) and subnational population projections (SNPPs) for the UK.