

Mid-year population estimates QMI

Quality and methodology information for mid-year population estimates in England and Wales, detailing the strengths and limitations of the data, methods used, and data uses and users.

Contact:
Neil Park
pop.info@ons.gov.uk
+44 1329 444661

Release date:
21 December 2022

Next release:
To be announced

Table of contents

1. [Output information](#)
2. [About this Quality and Methodology Information report](#)
3. [Important points](#)
4. [Quality summary](#)
5. [Quality characteristics of mid-year population estimates data](#)
6. [Methods used to produce mid-year population estimates data](#)
7. [Other information](#)
8. [Analysis of estimates of children and age distributions of international migrants](#)
9. [Cite this methodology](#)

1 . Output information

- National Statistic: Yes
- Frequency: Annual
- How compiled: Based on third-party data
- Geographic coverage: UK
- Last revised: 21 December 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
- reduce the risk of misusing data
- help you to decide suitable uses for the data
- understand the methods used to create the data

3 . Important points

- Mid-year population estimates are the official source of population sizes in-between censuses, covering populations of local authorities, counties, regions and countries of the UK by age and sex.
- The estimates use the census definition of people who are "usually resident" in the UK for 12 months, excluding short-term migrants, and counting students at their term-time addresses.
- The estimates roll forward the population found by the previous census one year at a time, by accounting for births, deaths, international migration and internal migration; to accomplish this multiple registration, survey and administrative data sources are used.
- On 22 March 2018, a revised set of [population estimates for mid-2012 to mid-2016](#), incorporating methodological improvements for local authorities in England and Wales, were published.
- The mid-2021 population estimates are based on the 2021 Census. Births, deaths and migration between census day and 30 June are accounted for.
- The next set of revisions are under way and will be published in 2023.
- Following the suspension of the International Passenger Survey (IPS) in March 2020, international migration estimates for mid-2020 are based on a combination of long-term migration estimates (LTIM) and modelled migration estimates.
- For mid-2021, the [long-term international migration estimates](#) are produced using methods that are based predominantly on administrative data.
- For mid-2021 internal migration, we have incorporated a Personal Demographics Service (PDS) extract taken on 19 April 2021 as a proxy for Census Day 2021 alongside the usual extract for mid-year 2021; we have also used data from the 2021 Census to identify and remove lagged migration moves.

4 . Quality summary

Overview

The [mid-year population estimates](#) are the official set of population estimates for the UK and its constituent countries, the regions of England and local authorities. The Office for National Statistics (ONS) uses several data sources to compile the population estimates for England and Wales, including the General Register Office (GRO), the International Passenger Survey (IPS), the Higher Education Statistics Agency (HESA), and the Ministry of Justice.

Comparable estimates for Scotland and Northern Ireland are produced by [National Records Scotland](#) (NRS) and the [Northern Ireland Statistics and Research Agency](#) (NISRA) respectively. These are then combined with ONS's estimates for England and Wales to cover the UK. Revisions occurring in March 2018 did not affect Scotland or Northern Ireland. Annually published estimates are available from 1981 onwards.

The mid-year population estimates relate to the usually resident population on 30 June of each year. A mid-year estimate gives an indication of how many people are typically resident in a certain area over the calendar year. For example, to calculate unemployment in 2020 you need the average population resident in an area in that period, and hence a mid-2020 population. A second benefit of this approach is that a single mid-year estimate would include all of the excess mortality of a single winter period where it otherwise would be split over two calendar years.

Uses and users

The mid-year population estimates are essential building blocks for a wide range of [National Statistics](#). They are used directly as a base for other secondary population statistics, such as [population projections](#), [population estimates for the very old](#) and [population estimates by output areas, electoral, health and other geographies](#). These figures also contribute to international measures of the population such as those produced by the [European Union](#) and [United Nations](#).

Population estimates are also used in the weighting of survey estimates, such as the Labour Force Survey (LFS) and other social surveys to ensure that they are representative of the total population. Further details of how population estimates are used to weight the LFS can be found in [Volume 1 of the LFS user guide](#). Similarly, they are also used as denominators for rates or ratios, for example, in health and economic indicators. They are commonly used to calculate statistics "per capita" or per person, for the UK.

External users of the estimates include central and local government and the health sector, where they are used for planning and monitoring service delivery, resource allocation and managing the economy. Other users include commercial companies (for market research), special interest groups and academia.

How users perceive and use the population estimates is measured in several ways. We obtain information through user groups such as the [Central and Local Information Partnership](#), the [Population and Migration Statistics Inter-Departmental Strategy Group](#), and the [British Society of Population Studies \(BSPS\)](#). For example, following the publication of the revised back-series of population estimates in March 2018 a series of roadshow events were held across England and Wales in April and May. Around 200 stakeholders from a variety of backgrounds attended the events and took the opportunity to find out more about the changes to methods we have implemented and to hear about the changes to internal migration we had planned for the mid-2017 estimates.

Additionally, in 2019, a new feedback mechanism was introduced on our publication tables inviting users to indicate which tables meet or do not meet their requirements. Together with the large number of queries that are sent to pop.info@ons.gov.uk this provides us with a good understanding of our users' needs.

Strengths and limitations

Main strengths

- The estimates provide timely, official data on the size, age, and sex of the population between censuses.
- Users can analyse why an area's population is changing through breakdowns of the main drivers: births, deaths, internal and international migration.
- Methods are held as consistent as possible and use [nationally consistent data sources and methods](#); major changes are accompanied with a back-series allowing users to understand any changes.
- Information from administrative registers, such as the numbers of births and deaths, is considered to be very reliable.
- Estimates are rigorously tested against census data, and methods and data sources are designed to track as close as possible with the 2011 Census, and for mid-2021, with the Census 2021.
- These estimates are coherent with [the population estimates by output areas, electoral, health and other geographies](#) and official [population projections](#).

Main limitations

- The estimates only cover the usually resident population and so do not include "daytime" populations or short-term visitors.
- The estimates are subject to the coverage issues and errors associated with the multiple sources used, including those of the 2011 Census and 2021 Census.
- Internal and international migration involve combining multiple administrative sources managed by other organisations whose primary purpose is delivering services (such as healthcare, higher education, and benefits) rather than collecting data for population statistics.
- People measured by the 2011 and 2021 Censuses may not interact with all the data sources referenced previously, making it possible to keep too many or too few people living in a given area.
- Errors accumulate over time between censuses, so population estimates for the years immediately following a census year tend to be more accurate than for those immediately prior to a census year.

Information on the methods used to produce these components of population can be found in the methods guides produced by each national statistics institute:

- [Population estimates for the UK, mid-2021: methods guide](#)
- [Northern Ireland Methodology Report \(PDF, 135KB\)](#)
- [Scotland Mid-Year Population Estimates for Scotland: Methodology Guide 2021 \(PDF, 841KB\)](#)

Mid-year population estimates for 2021

The 2021 mid-year population estimates for England, Wales and Northern Ireland are rolled forward from 2021 Census bases. This means that mid-year population estimates for England, Wales and Northern Ireland for 2021 are very reliable as they only account for three months of population change, in addition to the 2021 Census base. The mid-2021 population estimates for Scotland have been rolled forward from the 2011 Census. They will be revised once the results of Scotland's Census 2022 are incorporated into the population estimates for Scotland.

The incorporation of 2021 Census data into the mid-year estimates for England, Wales and Northern Ireland means that these estimates are not consistent with population estimates for mid-2012 to mid-2020. Population estimates for mid-2012 to mid-2020 will be revised through the reconciliation and rebasing project that is under way. This will make population estimates for mid-2012 to mid-2020 consistent with the mid-2021 population estimates.

The population estimates for England and Wales use experimental international migration estimates by local authority, single year of age and sex. These estimates use the best available at the current time. We expect these methods to continue to develop in the future and this will necessitate revisions to the mid-year population estimates for 2021.

For mid-2021 we have used additional data to produce our internal migration flows, further details on this can be found in the [mid-2021 methods guide](#).

Mid-year estimates for 2021, for England and Wales, were published six months later than usual. The delay to publication reflects additional time required to incorporate the 2021 Census into the mid-year estimates and developments to internal and international migration.

More information on the methods to produce population estimates for mid-2021 are given in the [mid-2021 methods guide](#).

Recent improvements

The mid-2017 population estimates incorporated a new internal migration method that improved the measurement of the movements of those leaving higher education. More details can be found in [Population estimates for the UK, mid-2020: methods guide - Internal Migration](#). A new data source (Personal Demographics Service (PDS)) accounts for those making multiple moves, who are born or die during the year, or who immigrate or emigrate during the year.

Since the results of the 2011 Census were published, work has been undertaken to explain the differences that existed between them and the population estimates. The results of this reconciliation exercise have informed [revisions to the population estimates for mid-2002 to mid-2010](#), providing a consistent time series of population estimates.

The Office for National Statistics (ONS), in consultation with its users, carefully considers the balance between "bunching" revisions versus many successive revisions. Users often prefer grouping changes together to avoid multiple revisions. The following improvements have been applied to the mid-2012 to mid-2016 back-series for England and Wales, ready for use in the mid-2017 estimates:

- an updated model to distribute International Passenger Survey (IPS) estimates of emigration to local areas
- use of the latest administrative data to distribute immigrant workers, and improved matching techniques
- extension of the foreign armed forces method to include dependants as well as personnel

Further details are set out in [Population estimates for local authorities in England and Wales, new methods: February 2018](#), and in the [report accompanying the back series](#). We welcome comments on our research priorities and the proposed publication plan.

Further improvements include:

- estimates of [flows of refugees](#) in international migration estimates for England, Wales and Scotland
- corrected minor errors, set out in the Revisions section, such as correcting the age breakdown of older people in Scotland, 2002 to 2010

Population and migration statistics transformation

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](#) gives more information on this work. The resulting improvements will also be incorporated into future sets of population estimates.

The mid-year population estimates continue to remain the official population estimates for England and Wales, carrying the [National Statistics](#) accreditation. Benefits delivered from ongoing administrative data research will be used to better understand the current population estimates process and drive potential improvements wherever possible.

Review of population estimates and projections

In May 2021, the Office for Statistics Regulation (OSR) published a [review into population estimates and projections](#). This highlighted that at the national level, the approach taken by the ONS is fit for purpose and is supported by expert advice from demography and academic partners but that at the subnational level, the accuracy of estimates is variable because of factors such as the size and mobility of the population in a given area.

The review also identified the need to keep methods current and responsive, especially at some lower levels where there is more variability in the data. We are already progressing work in this area as we consider how best to meet these recommendations, and we will report back to the OSR about our plans while continuing to gather feedback on them more broadly. We recognise the need for:

- development work to keep these sources current and responsive
- developing how we work and engage with users of our statistics, particularly at a local level
- planning how we move to Census 2021-based estimates, and take on board improvements from the population and migration statistics transformation programme

5 . Quality characteristics of mid-year population estimates data

Relevance

This product is the official set of population estimates for the UK and constituent countries.

The [standard tables](#) include formatted tables designed to be a readable reference tool, and unformatted "detailed time series", which provide the greatest possible level of detail in a machine-readable format. The "detailed time series" data provide data from mid-2001 to the most recently published year.

The way tables are provided allow users to look at populations split by components of population change, age and sex, for years back to mid-2001, for any local authority area. Median ages for local authority areas and population densities are also provided. Finally, additional "supporting information" tables provide national and regional level estimates as far back as possible, in some cases back to 1838. In this way we republish each year the largest amount of data possible, but in multiple formats to meet different needs.

Population estimates are also provided through [NOMIS](#) and the Office for National Statistics' (ONS') [Customise My Data](#) tool, to allow users to create bespoke tables covering the specific age-groups, sexes, areas and time-periods they require.

The way in which the UK is subdivided into local areas is subject to change. For this reason the time series of population estimates by current local authorities is only available from 1981 onwards (this is best accessed through [NOMIS](#). Mid-1971 to mid-1980 population estimates by quinary age bands for local authorities within England and Wales are also [available](#). [Appendix 4 of the methodology guide](#) sets out the specific changes to area codes and boundaries that have occurred in recent years.

For geographical levels that are smaller than local authority district, estimates are published as a separate output and have their own specific quality information: the [Quality and Methodology Information for population estimates by output areas, electoral, health and other geographies](#). For estimates of the population at the current time, [population projections](#) are available.

Accuracy and reliability

Population estimates are produced using a well-established demographic approach called the cohort component method (refer to the 'How we process the data' section). The data sources are the best available that are nationally consistent down to local authority level, but the estimates are subject to the coverage and error associated with these sources. Information from administrative registers such as the numbers of births and deaths are considered to be very reliable. However, sometimes separate data sources are combined to estimate the number of people in a component, their location and their age and sex.

Accuracy – sampling error and statistical uncertainty

While errors can be introduced where our data on components of population change do not exactly match the flows occurring in real life, the stock that the estimates are based on can also introduce errors. Sample surveys were used in the derivation of the 2011 Census estimates - for example, the Census Coverage Survey is used to adjust for estimated non-response. Until mid-2020, estimates of international migration are based on the International Passenger Survey (IPS).

Sampling error from those sources allows the derivation of an estimated [confidence interval](#) of plus or minus 0.2%. This means that if the census and IPS were repeated many times, with a new sample for the related surveys selected each time, we would expect the true value to be within 0.2% of the estimated value 95% of the time. Note that this confidence interval does not include error arising from other components, nor does it provide a measure of bias in either the census, mid-year estimates or other components.

This confidence interval has been derived from published information available such as the [Confidence intervals for the 2011 Census report](#) for the England and Wales census, and from the [Migration Statistics Quarterly Report](#).

The confidence intervals at the local authority level have been combined with uncertainty arising from the sampling occurring in the IPS and from internal migration to create uncertainty measures for the mid-year population estimates. These have been created to give users additional quantitative information of the quality of these estimates. [Measures of statistical uncertainty](#) are available for the years mid-2012 to mid-2019. These uncertainty measures were calculated using the population estimate methodology used prior to the March 2018 revisions to population estimates for mid-2012 to mid-2016.

The mid-year estimates for 2020 are the final set of population estimates to be rolled from the 2011 Census as population estimates for mid-2021 are rolled forward from Census 2021. Even without the coronavirus (COVID-19) pandemic this would mean that the population estimates are subject to higher levels of uncertainty than at any other stage in the inter-censal period. It is not straightforward to quantify the precise level or increase in uncertainty for population estimates as they are produced using census, administrative and survey data alongside statistical modelling approaches. However, we recommend that users consult the experimental measures of statistical uncertainty for population estimates to better understand the level of uncertainty.

Accuracy – other measures

Several other products providing information on the likely accuracy of the estimates are available:

- a set of [quality indicators](#) provide high-level indications of the reliability of the estimates for each local authority and are published alongside each release (2013 onwards)
- a [data comparator tool \(QA pack\)](#), allows easy comparisons between the population estimates and administrative sources, also published alongside each release (2013 onwards)
- statistical measures of the reliability of the 2011 Census estimates - on which the population estimates are based - are published in the [Confidence intervals for the 2011 Census report](#)
- information is also available, on the likely [accuracy of the migration estimates](#), which are used in updating the population estimates each year

Accuracy – main determinants of the accuracy of population estimates

The use of a cohort component method rolled forward from a census year means that the quality of the population estimates varies over time; specifically, the accuracy of the estimates tends to decline as we move further away from the census base.

Mid-year population estimates for 2011 were largely based on the 2011 Census, adjusted for three months population change; estimates for 2020 will have accounted for nine years of births, deaths, internal migration and international migration and for some areas our estimates will inevitably have "drifted" away from the true population in an area.

The degree of drift relates to the amount of population churn (the total number of moves into and out of an area) that occur. More rural areas tend to be more accurate than urban areas as the populations experience much lower levels of churn. The impact of different components on each local authority are illustrated in the [Quality Indicators tool](#).

Estimates for large population aggregations (for example, the total UK population) are more accurate (proportionally) than those for small aggregations (such as population of 25-year-old men in a single local authority district). Larger aggregations are more accurate because less processing and manipulation is involved in their calculation. For instance, internal migration equals zero for the total UK population. At the local authority level, counts and age and sex distribution of international emigrants and immigrants are essential for estimating at lower aggregations.

Since the mid-year estimates are a product of a number of individual components, the impact of different errors, bias and sampling variability can be exacerbated or mitigated by errors, bias and sampling variability in other components of the process. A more detailed discussion of this is provided in [Further understanding of the causes of discrepancies between rolled forward and census based local authority mid-year population estimates for 2011](#) (PDF, 1,570KB).

Accuracy – Long-Term International Migration

Until mid-2020, estimates of international migration are obtained from the [International Passenger Survey \(IPS\)](#) and are therefore subject to sampling and other types of error. National figures have relatively small levels of uncertainty but at local levels the sample counts in the IPS are small and it is necessary to combine data across years and distribute figures using other administrative data sources. Further information about estimating international immigration at the local level is available in the [mid-2020 population estimates methods guide](#). Information on the methods to produce international migration estimates for mid-2021 are given in the [mid-2021 methods guide](#).

Further information on estimates of [international migration](#) is available and a detailed description of the quality associated with international migration estimates for national, UK constituent country and the regions of England is provided in the [Quality and Methodology Information for Long-Term International Migration](#).

The suspension of the IPS in March 2020 means that Long-term International Migration estimates for the year to mid-2020 are not available on a methodologically consistent approach for the whole reference period. A set of migration estimates for the full reference period of the mid-2020 mid-year estimates has been constructed by taking the available IPS-based LTIM data for the period to end-February 2020 and adding on migration estimates for March to June produced using a statistical modelling approach. For each quarter the data are sourced from:

- Quarter 3 (July to Sept) and Quarter 4 (Oct to Dec) 2019 - estimates are consistent with the [Migration Statistics Quarterly Report: August 2020](#)
- January and February of Quarter 1 2020 - estimates are consistent with [Migration Statistics Quarterly Report: August 2020](#), and include an adjustment to account for potential oversampling within the IPS of long-term non-EU student migrants
- March 2020 - following expert advice, the modelling research concluded that data collected up to the suspension of the IPS in mid-March would not provide a robust representation for March as a whole; therefore, estimates of LTIM for March 2020 are estimated entirely through the modelling exercise ([Using statistical modelling to estimate UK international migration](#))
- Quarter 2 (Apr to June) 2020 - with the IPS suspended throughout the whole of Quarter 2 2020, estimates of LTIM throughout this period are also [modelled](#)

This represents the most comprehensive solution available but it should be recognised that these estimates will be subject to revisions as migration estimates making greater use of administrative data become available in the future. It is anticipated that this will occur as part of the regular rebasing of population estimates that will follow the publication of Census 2021 data.

Quality assurance of recent mid-year population estimates (MYEs) has indicated that they may have overestimated the number of children in England and Wales, a process occurring gradually across the intercensal period. Our estimates use the most accurate information available to us but the reliability of the data behind different components of population change varies.

Investigation has shown the most likely cause of this overestimation to be the method by which we derive the age distributions of international immigrants and emigrants. We think the information we have on the number of immigrant children is broadly correct, however, the data source used to provide the age distribution of emigrants is less robust and we think this has led to an underestimation of the number of children emigrating (and consequently slightly overestimating the number of emigrant adults at working ages). This reflects the fact that the processes for assigning age and sex to international migrants is separate from the processes for determining their overall numbers or distributing them amongst local authority areas.

The context to this issue, and the difference compared with a method using an alternative age distribution, is set out in [Section 8: Analysis of estimates of children and age distributions of international migrants](#).

Accuracy – internal migration

Internal migration flows are primarily based on changes in record-level patient registrations with GP surgeries. To account for migration of people within the UK, data are obtained for flows of migrants between each pair of local authorities in England and Wales as well as for flows of migrants between England and Wales and the rest of the UK (cross-border flows).

The same combination of three administrative data sources has been used between mid-2017 and mid-2020 as a proxy for internal migration within England and Wales and for cross-border flows from England and Wales to Scotland and Northern Ireland. From mid-2021, the patient register was discontinued, so we have used the Personal Demographics Service (PDS) annual extract instead. Information on the methods to produce internal migration estimates for mid-2021 are given in the [mid-2021 methods guide](#).

There is inevitably a delay (lag) between people moving and the updating of GP patient registrations. Consequently, we use the change in patient registrations in the year to 31 July each year rather than 30 June to allow for delays in registrations. For higher education students, we know this approach is insufficient and additionally make use of data from HESA to move students to study areas. For graduates who have not updated their GP registration after leaving, an improved method was introduced from mid-2017 to move them out of their student areas and distribute them to areas based on previous cohorts of university leavers and in a more timely manner. The impact of using this newer approach is presented in [Appendix 2: Understanding the impact of changes to internal migration methods](#).

Evidence from several sources suggests that some population groups - in particular students - made internal migration moves in March and April 2020 in response to the coronavirus pandemic and the closure of university halls of residence. The evidence is not easily quantifiable but one example, from the National Union of Students [Coronavirus and students survey](#) from April 2020 suggests that pre-pandemic, around 24% of students lived with parents or guardians but this increased to 54% during the early part of the pandemic.

However, our internal migration estimates do not reflect moves of this scale. If students could not or did not update their GP registration after returning home or moving elsewhere because of the impact of the pandemic, then their moves would not be captured. However, by isolating moves made by students who did update their GP registration after 23 March 2020, we found that particularly for 20- and 21-year-olds, there were more moves than for the equivalent period in 2019. So, this combined with students moving to university pre-pandemic has led to lower decreases in internal migration in mid-2020 (from mid-2019) for 19- to 23-year-olds compared with other ages.

The extent to which internal migration affects each local authority area's population estimates is indicated in our [Quality Indicators](#) tool and in the [uncertainty measures](#).

Accuracy – location of armed forces mid-2016 to mid-2018

A variety of administrative datasets are used to estimate the location, age and sex of armed forces personnel. These datasets each have different strengths and limitations. In many cases a property such as age and sex or location has to be imputed for a specific group. These approaches are set out in the [Methodology guide](#). The [Quality Indicators](#) highlight the extent that armed forces affect the population of a local authority district.

A specific issue was discovered with the supplied location of personnel in the home armed forces data, covering mid-2016 to mid-2018. This resulted in small numbers of personnel on maternity leave being clustered into an incorrect base. While corrected data have been [published by the Ministry of Defence](#), they were not available in time for inclusion in the mid-2018 population estimates. The Office for National Statistics (ONS) is considering when the appropriate stage would be to incorporate these changes into mid-year estimates.

Accuracy – location of asylum seekers mid-2012 to mid-2017

A specific processing error was detected and corrected for the mid-2018 population estimates. Local authority areas that were amalgamated in 2009 were receiving additional shares of their region's asylum seekers. This has been corrected in the mid-2018 estimates, but as the impact of this was small (affecting the location of fewer than 800 people over seven years), the ONS does not have plans to reprocess the earlier data.

Accuracy - number of births mid-2020

In response to the coronavirus (COVID-19) pandemic, birth registration services in England and Wales were suspended in March 2020. After June 2020, birth registrations restarted but the collation of 2020 birth registration data by the Office for National Statistics (ONS) has been slower than usual as a result. At the time we would normally take an extract of births for mid-year estimates, there was a shortfall of around 3% between the number of birth registrations and the more timely birth notifications (the difference between these data sources is described in the [User guide to birth statistics](#)). The registration of births continued to catch up through spring 2021 such that by the time we took our final extract, the difference between birth registrations and notifications was reduced to 0.3%; in a typical year this difference would be 0.1% or lower.

Foreign Armed Forces dependents

In 2017, we introduced an adjustment to the mid-year estimates to better account for the movements of US Air Force (USAF) dependents into and out of England and Wales. However, the administrative data from the USAF that underpins the method is no longer available in the format it used to be, necessitating additional data manipulation and imputation before it can be processed. Ultimately this will likely result in an increase in uncertainty around population estimates for local authorities with foreign armed forces dependents. As part of the future development of population estimates we are considering alternatives to the current approach.

Coherence and comparability

The Office for National Statistics (ONS) compiles and publishes population estimates for the UK using estimates for England and Wales (also produced by the ONS), estimates for Scotland produced by [National Records of Scotland](#) and estimates for Northern Ireland produced by the [Northern Ireland Statistics and Research Agency](#).

Population estimates for each of the UK constituent countries are compiled using a common methodological approach and aim to be as consistent as possible. More information on comparisons between UK constituent countries can be found in [Consistency of methods used for population statistics across UK countries](#).

Where substantial changes in methods are implemented, we seek to publish a consistent back series of estimates to the year of the previous census. So, the rebasing of estimates to the results of the 2011 Census was accompanied by the publication of [a full set of comparable estimates back to 2002](#); and the methods changes implemented after the mid-2016 estimates led to the publication of a revised set of estimates from mid-2012 to mid-2016.

The mid-year population estimates provide data on components of population change that have overlapped with other ONS topic outputs. The coherence of these data can be affected by both reporting periods and context.

The comparability of migration statistics used to calculate the population estimates are described in the [Quality and Methodology Information for Long-Term International Migration \(LTIM\)](#) and the [Quality and Methodology Information for Internal migration estimates](#). The LTIM estimates cited for a year may be different to the international migration component of change in the population estimates for two reasons.

Firstly, the LTIM estimates are available on a quarterly rolling-year basis and the estimates for, say, 2014, would conventionally be taken as relating to the calendar year, whilst the population estimates component of change necessarily relates to the period between mid-years.

Secondly, even when comparing estimates for the same period, the estimates used to calculate the population estimates are based partly on provisional LTIM data rather than final (also see the 'Other information' section) and will therefore not tally exactly with the final year-to-end-June figures published in the Long-Term International Migration series.

Estimates of births and deaths used to calculate the population estimates are based on births and deaths that occur during the year to the mid-year reference point, irrespective of when registered. This definition is different to that used in other ONS outputs on births and deaths that use alternative reporting periods (for example, calendar year) and measure birth and death registrations rather than occurrences. Figures quoted from the components of change in the population estimates will therefore be slightly different from the standard ONS outputs related to these events.

The mid-year population estimates are used both within and outside government as the definitive set of population figures for the UK, constituent countries and subnational geographies to local authority level. They are used for calculating other official population statistics such as population projections, small area population estimates, population estimates by marital status and estimates of the very old population. These outputs are consistent with the current series of mid-year population estimates, though there is inevitably a lag between population estimates for a particular year being published and this being reflected in the derived products.

In addition to the official mid-year population estimates, alternative population estimates were, until 2020, supplied to [Eurostat](#) that are produced using different methods and reference dates. These estimates are produced for the UK and subnational Nomenclature of Territorial Units for Statistics (NUTS) geographies. They are used by Eurostat for calculating European demographic indicators. These estimates are not consistent with the current series of mid-year population estimates given the alternative methods used in their production and dissimilar reference dates.

Users often compare population estimates for individual local authorities with other data sources, for example, administrative records or anecdotal evidence. Comparisons between datasets should be treated with caution, as there are always definitional differences in the data collected (for example, whether the data differentiate between long-term or short-term migration, or whether they account for individuals who have left the country or authority). Also, other data sources may cover only a subset of the population.

Changes to migration estimates mid-2009 to date

In February 2018, Long-Term International Migration (LTIM) estimates for the year to mid-2017 were [revised upwards by 33,000](#). This revision addressed an isolated sampling issue with non-EU students' data for the year ending September 2016. A corresponding revision to the mid-year estimates is not being made at this time. The main reasons for this are:

- the change to LTIM of 33,000 would represent a revision of just 0.05% to the UK population estimate for mid-2017; this does not represent a material change to the UK population estimate, which has a 95% confidence interval of around 0.2%
- the mid-year estimates underwent a major set of revisions in 2018 and the disruption to users from another set of revisions in 2019 for the benefit of a relatively small change is not proportionate
- the revisions to LTIM are not accompanied by revisions to the detailed migration data that feed into the mid-year estimates; accounting for the revision would require the development of additional methods to account for the unavailable data

A subsequent revision to Long-Term International Migration was made in August 2019. This covers years from mid-2009 to the latest estimates. As with the previous revision, it is not possible for population estimates methods to incorporate the changes, as we are not able to distinguish between EU and non-EU migrants in our data sources.

The report accompanying the revision, [Understanding different migration data sources: August 2019 progress report](#), set out that these revisions were part of the reason for Long-Term Migration Statistics no longer being designated as National Statistics. The ONS's assessment finds that adjustments have a small impact but do not affect general trends. There is, however, differing patterns for EU and non-EU migration:

- building on evidence provided by the Department for Work and Pensions (DWP), the adjusted estimates for EU migration (up to the year ending March 2016) show an increase compared with the unadjusted estimates but trends remain very similar
- using evidence provided by Home Office exit checks, the adjusted estimates for non-EU migration (up to the year ending March 2019) were lower than unadjusted estimates but overall trends remain very similar
- these changes broadly cancel each other out; in the year ending March 2016, net migration is around 1% higher than the published estimate

Admin-based population estimates (ABPE)

Since 2011, we have been engaged in work to produce population estimates using administrative data rather than census data as the starting point. This work has resulted in several research outputs demonstrating strong potential for these approaches.

These research outputs were previously known as Statistical Population Datasets (SPDs) but are now referred to as Admin-based population estimates. However, the mid-year estimates remain the official estimates of the population of the UK. Further details on this work can be found in [Developing our approach for producing admin-based population estimates, England and Wales: 2011 and 2016](#).

Accessibility and clarity

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. Our website also offers users the option to download the narrative in PDF format. In some instances, other software may be used, or may be available on request. Available formats for content published on our website but not produced by the Office for National Statistics (ONS), or referenced on our website but stored elsewhere, may vary. 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 links:

- [terms and conditions](#) (for data on the website)
- [copyright and reuse of published data](#)
- [accessibility](#)

The population estimates release consists of a combination of HTML web pages for narrative, charts and graphs (brought together in a statistical bulletin), with data being provided in usable formats such as CSV and Excel. The [bulletin](#) can also be downloaded in PDF format.

As statistical disclosure control methods are applied to each component of the estimates, the standard outputs now include the most detailed (single year of age and sex) estimates at the local authority level and there is no requirement for data access agreements to use the estimates at any level of detail. Alternative presentations of the data - in response to an [ad hoc query](#) or a [Freedom of Information request](#) - are made available simultaneously with provision to the requester under the principle of equal access.

In addition to a summary table, providing the main results on one page, detailed unformatted tables can be downloaded free of charge in Microsoft Excel format. These provide unrounded data that are published to promote further analysis for users. A note provided with these detailed tables states that the estimates should not be taken to be accurate to the level of detail provided. An [analysis tool](#) (in Excel) is also published to help users easily manipulate the data.

Any additional enquiries regarding the mid-year population estimates can be made via email at pop.info@ons.gov.uk or by telephone on +44 1329 444661.

Advance notice of any forthcoming major changes in methodology will be announced.

Timeliness and punctuality

Population estimates for the UK and for England and Wales are normally published annually in June. For mid-2019, in response to the coronavirus (COVID-19) pandemic and a desire for expedited publication, [provisional data for the mid-2019 period](#) were released on 6 May 2020. These provided population estimates by local authority, age and sex but only included information on components of population change at the national level.

In April 2021, an [early indication of the population of the UK](#) was published. This suggested a slightly higher population than shown in the main mid-2020 population estimates release (by around 32,000). The main difference is caused by a slightly higher estimates of net international migration being used in that release and the unavailability of data on home and foreign armed forces personnel.

In a typical year, population estimates are available about 12 months after the reference date. This time lag reflects the availability of the data sources that measure the components of population change over the year preceding the estimate and the time required to process the data and calculate the estimates. Where substantial changes occur later to either the data or the methodology used in producing population estimates, a back-series of revised estimates is made available to create a continuous time series between censuses.

Mid-year estimates for 2021, for England and Wales, were published six months later than usual. The delay to publication reflects additional time required to incorporate the 2021 Census into the mid-year estimates and developments to internal and international migration.

The publication of mid-year population estimates would be later than the planned date only if essential data used to calculate the estimates were not available. For example, if estimates of internal migration were not received or delays were encountered in the supply of administrative data from third parties.

In previous years, the planned publication date, as entered into the [Release calendar](#), has always been met, though in 2013 the UK estimates were published six weeks after the estimates for England and Wales because of the timetable for the publication of the estimates for Scotland.

For more details on related releases, the [GOV.UK 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 will be explained fully at the same time, as set out in the [Code of Practice for Statistics](#).

Concepts and definitions (including list of changes to definitions)

Although the population estimates are not explicitly required by law, their production is consistent with our duty under Section 5 of the [Census Act 1920](#) to collect and publish "any available statistical information" with respect to the number and condition of the population between censuses.

A [conceptual framework for population and migration statistics](#) (including the population estimates) is available.

The mid-year population estimates are consistent with the standard UN definition for population estimates, which is based upon the concept of usual residence and includes people who reside, or intend to reside, in the country for at least 12 months, whatever their nationality. Visitors and short-term migrants (who enter or leave the UK for less than 12 months) are not included.

Members of Her Majesty's armed forces stationed in England and Wales are included at their place of residence but those stationed outside England and Wales are excluded. Members of the US armed forces and their dependants stationed in England and Wales are included.

Students are taken to be resident at their term-time address.

Prior to 2011, prisoners had been regarded as usually resident at an institution if they have served six months or more of a custodial sentence. However, from 2011 onwards, this definition has changed to those who have been sentenced to serve six months or more, which is consistent with the definition used in the 2011 Census. The figures for the UK do not include the population of the Channel Islands or the Isle of Man, which are Crown Dependencies rather than part of the UK.

For some people, the concept of usual residence is more complicated. People with no usual residence are counted in the census as being usually resident in the area in which they were staying on census day.

"Visitor switchers" (people who enter a country intending to visit but end up staying and becoming a usual resident) and "migrant switchers" (people who enter a country intending to become a usual resident but leave before that happens) are adjusted for at the time of their move into or out of the country rather than the precise point that they change their intentions or reach the 12-month threshold. This adjustment is made by applying multiplying factors to the estimates of visitors and migrants as described in the [Long-Term International Migration methodology](#).

Although usual residence is the recognised definition for population estimates, use of a single definitional base does not meet the needs of all users. The usually resident population does not always coincide with the number of persons to be found in an area at a particular time of day or year. The daytime populations of cities and the summertime populations of holiday resorts, for example, will normally be larger than their usually resident populations.

We have developed and published national estimates of short-term migrants to supplement the mid-year population estimates. These estimates refer to the flows of short-term migrants to and from England and Wales for each year since mid-2004. As part of the [Migration Statistics Improvement Programme](#), methods for producing short-term migration estimates at local authority level have been developed. Further information about these estimates can be found in the [Short-Term Migration Estimates methodology](#) and the accompanying [QMI report](#).

Geography (including list of changes to boundaries)

The mid-year population estimates have been affected by three types of local authority change in the past 10 years:

- local authorities have merged, for example, the 1 April 2019 creation of a single "Bournemouth, Christchurch and Poole" unitary authority; Buckinghamshire authorities merging in 2020; and Northamptonshire authorities merging in 2021
- local authority boundaries can change requiring a new local authority code (but often these have no material effect on the population estimates, for example, Gateshead's boundary change in 2013)
- local authorities have been renamed, such as when Shepway became Folkestone and Hythe in 2018

All these changes are listed in detail in Appendix 4 of the [Methodology guide for mid-2020 population estimates \(England and Wales\)](#). Our strategy is to focus on providing population estimates for the administrative geography that exists at the time of publication - that is on the latest current names and boundaries. However, these may not reflect the boundaries of the mid-year reference period; we acknowledge that it is helpful to provide users with choice by also providing tables on the previous set of boundaries.

[NOMIS](#) makes population estimates for the UK available on the three most recent sets of boundaries; these are also available through the [Analysis of Population Estimates Tool](#). [NISRA](#) provides local authority data for Northern Ireland on its former 26 authority areas.

Revisions

Estimates affected by the revisions described in this section remain on our website but are superseded by the latest release. Details of minor corrections are made available alongside affected tables.

Revised population estimates for England and Wales for mid-2012 to mid-2016

As described in the previous sections, we carefully consider the balance between "bunching" revisions compared with many successive revisions, in consultation with users. A suitable bundle of improved methods and more up-to-date data became available in 2017 and have been used to create a back series of [revised estimates for local authorities, counties and regions in England and Wales, covering mid-2012 to mid-2016](#). These new methods have been used in subsequent releases, alongside additional changes to internal migration. These changes are described further in Appendix 2 of the [Methodology guide](#).

The main changes are:

- two technical improvements were made and additional data sources added to the local authority distribution of International Passenger Survey (IPS) emigration estimates
- for mid-year 2015 and 2016 population estimates, the distribution of international immigrants at local authority level could not be calculated as usual; so up-to-date Migrant Worker Scan data (MWS) were incorporated into the back-series
- dependants of foreign armed forces personnel will be included for the first time, improving age and sex distributions particularly of women and children in Forest Heath and other local authorities surrounding US Air Force bases

The following additional changes have also been made:

- ensured consistency by applying the updated method for estimating the age and sex of asylum seekers at the local authority level for 2012 and 2013
- derive a more reliable distribution across Coventry and Warwick of students living in Warwick University halls of residence in 2014 and 2015

To improve transparency the Office for National Statistics (ONS) released these products on 22 March 2018:

- a detailed report setting out the impact of the changes and giving examples of their impact at different geographical levels
- new publication tables covering mid-2012 to mid-2016, including detailed time series tables giving the most detailed breakdown of England and Wales' population by local authority, single year of age, sex and component of population change
- a new population estimates revisions tool showing the impact of the changes for each local authority and component of population change
- an updated methodology guide describing the methods used to create the revised estimates

Revised mid-2012 to mid-2014 estimates following an error in the age distribution of the mid-year estimates for Scotland

The data presented in the [Population estimates for UK, England and Wales, Scotland and Northern Ireland, revised: mid-2012, mid-2013 and mid-2014](#) release published on 28 April 2016 include corrected 2012, 2013 and 2014 estimates that address the previously announced error in the age distribution of the mid-year population estimates for Scotland for the years 2002 to 2014. These errors only affected areas within Scotland; population estimates for England, Wales and Northern Ireland were unaffected. Whilst the estimated age distribution of the UK population was affected for the period, the total estimates of the UK population remained valid.

For subnational areas of Scotland, the errors had only a very small effect on the total population estimates for council and NHS board areas. The errors in the (total) council area populations were less than 0.10% in all council areas. In percentage terms, the largest underestimate was 0.07% in Angus and the largest overestimate was 0.09% in Dundee City, both in 2014. In absolute terms, all errors were generally very small; the largest was an overestimate of 130 people for Dundee City.

The errors affected the age distribution of the estimated population in Scotland and also the age distribution of estimates provided for Great Britain and UK populations. The errors affected the age distribution of the population, particularly in the age range 17 to 25 years. In percentage terms, the largest underestimate in the total estimated population of Scotland for mid-2014 was 1.28% at age 21 years and the largest overestimate was 2.28% at age 18 years. At UK level in percentage terms, these resulted in a largest underestimate in the total estimated population for mid-2014 of 0.11% at age 21 years and a largest overestimate of 0.18% at age 18 years.

The [Population](#) section of the National Records of Scotland (NRS) website has further information on the causes of the errors, their impact and how NRS reached the decision for the approach taken. This includes tables showing the cumulative net impact of the errors for the 2012, 2013 and 2014 mid-year estimates at Scotland, council and NHS board area level by sex and age.

Revised mid-2013 estimates following an error in the distribution of the foreign armed forces

The data presented in the [Population estimates for UK, England and Wales, Scotland and Northern Ireland, mid-2013 and mid-2014](#) release, published on 25 June 2015, include corrected 2013 estimates addressing an error in the distribution of foreign armed forces (FAF). The original error had the largest impact on the estimate for Forest Heath, with smaller impacts in other affected local authorities in England. Note that the national population estimates of the UK and its constituent countries have not been revised and remain valid.

Table 1 presents those local authorities and higher geographies that have revised estimates for mid-2013 that are in the absolute range of 50 or above.

Table 1: Local authorities and higher geographies in England that have revised population estimates for mid-2013 in the absolute range of 50 or above

Code	Name	Error (published 26 June 2014 - correct)	Corrected 2013 estimate (published 25 June 2015)	Error as percentage of correct estimate
E07000201	Forest Heath	2,000	61,200	3.3
E07000155	South Northamptonshire	200	87,200	0.2
E10000029	Suffolk	1,400	734,500	0.2
E07000139	North Kesteven	100	109,800	0.1
E07000011	Huntingdonshire	100	172,000	0.1
E10000021	Northamptonshire	200	706,400	0.0
E10000019	Lincolnshire	100	724,400	0.0
E12000004	EAST MIDLANDS	300	4,598,400	0.0
E12000008	SOUTH EAST	-100	8,792,800	0.0
E12000006	EAST	-100	5,954,300	0.0
E10000025	Oxfordshire	-100	666,200	0.0
E07000177	Cherwell	-100	143,800	-0.1
E10000020	Norfolk	-900	871,000	-0.1
E10000003	Cambridgeshire	-700	632,800	-0.1
E07000008	Cambridge	-200	126,700	-0.2
E07000143	Breckland	-400	132,900	-0.3
E07000146	King's Lynn and West Norfolk	-500	149,300	-0.3
E07000204	St Edmundsbury	-500	111,800	-0.4
E07000009	East Cambridgeshire	-500	85,900	-0.6

Source: Office for National Statistics

Of the other affected local authorities and higher geographies that have revised estimates for mid-2013, there were seven local authorities and one county with absolute revisions in the range 10 to 49, with 28 local authorities and four counties having absolute revisions in the range 1 to 9. The remaining 304 local authorities in England and Wales (and all local authorities elsewhere in the UK) were unaffected by this revision. The full list of affected geographies is available on request.

The revised estimates relate to a special population and as such have been restricted to ages in the range 18 to 59 years with the great majority of revisions being for males rather than females.

When we identified the error, we sought users' views on the preferred approach to correcting the estimates. We did this through direct contact with the most affected users, Local Insight Reference Panel events, posts on StatsUserNet and by publicising the error in our published outputs.

Considering the responses we received, we have:

- kept the affected 2013 estimates on the website but marked them as superseded
- published the corrected 2013 estimates alongside the 2014 estimates released on 25 June 2015
- used the corrected 2013 estimates in the mid-2012 to mid-2016 revised back-series, which also incorporates the dependants of foreign armed forces personnel

Revised age distribution for Scottish local authority areas, mid-2002 to mid-2010, following an error in the census rebasing of those aged 80 years and over for Scotland

Revised data were published on 25 September 2018 as [Population estimates for UK, England and Wales, Scotland and Northern Ireland, revised: mid-2002 to mid-2010](#) to address errors in the age distribution, mainly in those aged 80 years and over, of the population for Scotland for these years. It is this age group that has the biggest impact of change in population numbers. These errors only affected areas within Scotland; population estimates for England, Wales and Northern Ireland were unaffected. Whilst the estimated age distribution of the UK population was affected for the period, the total estimates of the UK population remained valid.

The impact on the overall population figures was small, with a difference of at most 30 people (in 2006). Some population estimates for ages and age groups below 80 years may have small negligible differences, caused entirely by rounding adjustments. Further details are available from the [National Records Scotland website](#) (PDF, 111KB).

In 2013, the mid-year estimates from 2002 to 2010 were rebased using the 2011 Census. This was done correctly for ages up to 80 years, but the adjustments for older people were aged on incorrectly. An error meant that the same age structure was used for those aged over 80 years in 2001 and those over 90 years in 2011. This is the same cohort (those born before or on 1921) but the age structure did not stay the same over the 10 years, because of people being much more likely to die as they get older.

The detailed time series tables published for mid-2018 initially contained the unrevised estimates for Scotland. This was detected, corrected, and the tables have been republished.

Output quality

To maintain the timeliness of the population estimates publications, the data sources used are the best available at the time of production. However, these may not be final or published sources. Death registrations data are constantly updated and while many late death registrations are incorporated, it is possible for some to be too late to be used, particularly if they occur towards the end of the mid-year period. Estimates are adjusted to account for late death registrations but rely on them evening out over time.

Some provisional International Passenger Survey (IPS) data are used in estimating international migration; information on the differences between these and final data are reported in the [Long-term international migration Quality and Methodology Information \(QMI\)](#).

Timeliness is particularly paramount when estimating immigration at the local authority level as the distribution relies upon multiple administrative data sources. Where all sources have not been available, alternative "three-year average" methods have been applied, initially for the mid-2015 and mid-2016 estimates, which have since been revised, and in the mid-2017 and mid-2019 estimates. The impact of this method is set out in the next section.

Impact of using a three-year average local authority distribution for international migration

Our national estimates of international migration are based on the International Passenger Survey (IPS), but the sample size is too small to estimate migrants at the local authority level. Instead, these estimates are derived from multiple data sources including the Migrant Workers Scan (MWS). For more information see the [Methodology guide](#).

For the original published mid-2015 to mid-2017, the mid-2019 and the mid-2020 population estimates, the distribution of international in-migrants at local authority level could not be calculated as usual as either the MWS or the Customer Information Service (CIS) were unavailable. Therefore, in line with our commitment to use the best available data sources at the time of production, the estimates of subnational international immigration were based on three-year averages of the local authority distribution used in previous releases.

When the up-to-date MWS data became available, these estimates for mid-2015 and 2016 were updated, in line with the usual method, in the [back-series of mid-2012 to mid-2016 estimates](#). The impact of both years' changes can be explored in detail using the [Population Estimates Revision Tool](#).

The unavailability of the 2015 MWS dataset also impacted the estimation of international emigration at local authority level. Typically, emigration is estimated using a statistical model containing the IPS and other data sources (covariates). One of these covariates is data from the MWS, and since these were not available for mid-2015 or mid-2016, an average of the previous three years' data was used instead.

A three-year average method had to be used to estimate the distribution of international in-migrants for the mid-2017 population estimates as the CIS was unavailable. Thus, an average of the distribution used in the revised mid-2014 to mid-2016 population estimates was used instead. Unlike mid-2015 and 2016, emigration was not affected as the CIS is not used within the statistical model. When the updated CIS data became available, international immigration was recalculated; since the overall total estimate was not affected, these figures will be published when more substantial changes require the publication of a back-series.

Table 2 shows the differences in population estimates between the published mid-2017 estimates and the subsequently recalculated ones. Overall, there were small changes in the distribution of international in-migrants at the local authority level. These were very minor differences; when comparing each method 87.6% of local authorities had a population difference of less than one-tenth of 1%.

Table 2: Use of 2014 to 2016 immigration distributions as proxy for 2017 data in the estimation of international immigrants; the effect on mid-year population estimates

Immigration

Percentage change in total mid-year population estimate (x)	Number of local authorities	Percentage of local authorities
0.00x0.05	256	73.6
0.05	49	14.1
0.10	36	10.3
0.25	7	2.0
Total	348	100.0

In mid-2018, the latest administrative data were available in time for processing and publication of immigration estimates. A processing error was uncovered in time to correct immigration estimates; however, it was too late to incorporate the latest MWS or Higher Education Statistics Authority (HESA) data into the statistical model that apportions shares of IPS emigration to each local authority. The mid-2017 MWS and HESA data were integrated into the model instead, with initial research suggesting that the presence of 14 other variables would make any impact minimal.

In summary, the current England and Wales population estimates have been calculated on this basis:

- mid-2012 to mid-2016 back-series: updated the emigration method back to the census using up-to-date immigration and emigration data
- mid-2017: calculated immigration using a three-year average (mid-2014 to mid-2016); emigration data was up-to-date
- mid-2018: calculated immigration using up-to-date administrative data; emigration used mid-2017 MWS and HESA data but up-to-date figures for 14 other covariates
- mid-2019: calculated immigration using a three-year average (mid-2016 to mid-2018); emigration used mid-2018 MWS but up-to-date figures for 15 other covariates
- mid-2020: calculated immigration using a three-year average (mid-2016 to mid-2018); emigration used mid-2018 MWS but up-to-date figures for 15 other covariates

Why you can trust our data

To produce these population estimates, the Office for National Statistics (ONS) uses the best data sources available and methods that are rigorously scrutinized by experts (both within and outside of the ONS) and that are consistently applied across England and Wales.

Methods are regularly reviewed and improvements made where possible. For example, methods for international and internal migration have evolved through the use of additional data sources and new methods to produce more robust estimates of population change.

Some sampling and methodological error is inevitable in any estimates but, even when errors have accumulated over 10 years, the mid-year population estimates are useful for robust population figures. The mid-year population estimates for 2011 rolled forward from 2001 closely matched the 2011 Census estimates, with 89% of local authorities having a difference of less than 5%.

We collaborate with National Records for Scotland (NRS) and the Northern Ireland Statistics and Research Agency (NISRA), producing some statistics for them but mainly using their outputs to compile population statistics for the whole of the UK.

Data suppliers are contacted when unusual patterns are found in the data and a comprehensive set of processing checks are followed in the production of each component of the population estimates. The processing checks applied by both data suppliers and the ONS are set out in a set of Quality Assurance of Administrative Data reports. Processing is carried out in SAS using programs that ensure that consistent processes are followed year to year.

Staff are encouraged to apply "curiosity" to each component of population change. The result is that each element of the population estimates gets rigorously checked by multiple people to ensure that changes over time are plausible. The few external data sources that are available before the estimates are published are used to quality assure the estimates; these include administrative data on GP patient registrations, State Pension recipients and changes in dwelling stock. In addition, we work throughout the year to look at wider changes in local authority areas and understand how this affects the plausibility of the population estimates over time.

6 . Methods used to produce mid-year population estimates data

How we acquire the data

Data are obtained from a variety of organisations to create the mid-year population estimates. The quality of data acquired from external sources are assured through memoranda of understanding. Different mechanisms are in place for internal data sources that allow concerns to be raised and data quality to be maintained.

In addition to Census data, the main data sources used in the compilation of the mid-year population estimates are:

- birth and death registrations from the [General Register Office \(GRO\)](#)
- a wide range of data sources are used to estimate international migration moves ([International Passenger Survey \(IPS\)](#), [Higher Education Statistics Agency \(HESA\)](#), [Migrant Worker Scan \(MWS\)](#), [GP Patient Register \(PR\)](#), [Home Office Visas](#), and other sources listed in the [Methodology guide](#))
- internal migration moves are estimated using the [Personal Demographic Service \(PDS\)](#), the [GP Patient Register Data System \(PRDS\)](#) and [Higher Education Statistics Agency \(HESA\)](#) data
- changes in the population of home and foreign armed forces in the UK are estimated using [Ministry of Defence](#) and [United States Air Force \(USAF\)](#) data
- the number of prisoners is estimated using [Ministry of Justice](#) data

The administrative sources used to process the England and Wales estimates are not designed to be tools for population statistics. To show how we ensure they remain fit for purpose, quality assurance of administrative data (QAAD) reports are published detailing how the data are collected, their quality, strengths, and limitations:

- [Births](#)
- [Deaths](#)
- [UK Armed Forces](#)
- [US Armed Forces](#)
- [Patient Register](#)
- [Higher Education Statistics Agency](#)
- [Prisoners](#)
- [Northern Ireland internal migration](#)
- [International migration data for Scotland](#)
- [International migration data for Northern Ireland](#)
- [Migrant Workers Scan](#)
- [Asylum Seeker Data and Non-Asylum Enforced Removals](#)
- [Home Office Immigration](#)
- [Asylum Seekers Support](#)
- [University of Warwick halls of residence data](#)

For more information on administrative sources of data that the Office for National Statistics (ONS) uses to produce statistics (including a list of administrative sources), or that are available for use in the production of statistics in the future, and information on statistical techniques for using administrative data, please see the [Statement of Administrative Sources](#).

For the main survey source, the International Passenger Survey, information on the collection and accuracy is provided in the [Long-Term International Migration Quality and Methodology Information](#) report.

How we process the data

The quality assurance of administrative data reports listed in the previous section provide details of how each individual source is quality assured. In some cases, data sources cover the necessary: location, age and sex; in most cases, however, some of these data are missing and need to be imputed; or one property is taken from one source, and another from a second. These methods are set out in the [Methodology guide](#).

The mid-year population estimates use the cohort component method. This is a standard demographic method that estimates the size of the population using the components of population change to update a population base such as the census estimate.

The resident population of the previous year is aged on; those who were born are added, those who have died removed; similarly, those who have immigrated into the country are added and those who have emigrated removed. To accurately estimate the population of areas within the UK movement of people into and out of those areas is also accounted for through internal migration. This can occur between constituent countries and at the lower local authority level. Special populations are exempted from this process with old figures being removed at the start and updated figures replacing them at the end. This is because their movements are not accounted for within the standard internal and international migration datasets.

The stages of this process follow.

Start

Resident population of the previous year on 30 June.

Stage 1

Remove static populations (prisoners, home and foreign armed forces).

Stage 2

Age on by one year.

Stage 3

Add children born between 1 July and 30 June as the population aged zero.

Stage 4

Subtract from the population the number of deaths between 1 July and 30 June.

Stage 5

Add or remove people who have entered or left the country between 1 July and 30 June.

Stage 6

Adjust areas' populations to account for those that have moved within the UK between 1 July and 30 June.

Stage 7

Add updated static populations (prisoners, home and foreign armed forces), and account for people entering and leaving them from areas of the UK.

Result

Resident population of the current year on 30 June.

The subnational mid-year population estimates for England and Wales are calculated first. The national estimates are produced by aggregating the subnational estimates. A different method is used to produce population estimates for smaller areas, for example, National Parks and wards. Details of the [methods used to produce population estimates by Output Areas, electoral, health and other geographies are available](#).

Many data sources are used within population estimates including some that use statistical disclosure control methods. Several components of population change take location from one source and age and sex from another, thus ensuring that the resulting population estimates do not refer to specific individuals. Additionally, we ensure, where possible, that definitions between data sources remain consistent. For instance, to ensure consistency between the 2011 Census and the subsequent population estimates, the definition of a prisoner was adapted to refer to those sentenced to serve six months or more.

For census years the population is aged by the period of time between the census and 30 June (in both 2011 and 2021 this was around 15 weeks). Similarly, the components only need to account for change during this period. For each component, this is established by the availability of data for the period between census day and 30 June and the amount of change expected. Further details of how this was done in 2001 can be found in [Population Trends 109](#). Details of the methods used in 2011 can be found in [Methods guide for census-based mid-2011 population estimates](#).

After the results of a new census are known, the population estimates over the previous decade are subsequently revised to ensure a consistent time series. In light of the 2011 Census results, the mid-2002 to mid-2010 population estimates were revised at [national](#) and [subnational](#) level. The methodology for revising the population estimates involved identifying parts of the population estimates that were under-or-over-estimated between 2002 and 2010, using 2011 Census data and other sources. Further details of the methods used to revise the mid-2002 to mid-2010 population estimates at national level can be found in the [Methodology guide for the national back series](#) and at subnational level in the [Methodology guide for the subnational back series](#).

The differences between the original population estimates and the revised ones is analysed in detail in [Further understanding of the causes of discrepancies between rolled forward and census-based local authority mid-year population estimates for 2011](#) (PDF, 1,570KB).

How we analyse the data

Once the data are processed using the methods outlined previously, no further analysis is required in terms of seasonal adjustment, weighting or indexing. Data are analysed extensively, however, as part of the quality assurance processes outlined in the next section, and to provide users with meaningful context in the bulletin that accompanies the population estimates.

The analysis covers the following lines of enquiry:

- How is the UK population changing in the short and long-term?
- How are the main trends in international migration, births and deaths affecting the population estimates?
- What are the ageing patterns of the population, over time and by area?
- How is population change distributed across the countries of the UK, and its local authority areas?
- Which components of population estimates drive local population change?

Links are provided to analysis conducted by [National Records of Scotland](#) and the [Northern Ireland Statistics and Research Agency](#) on their own population estimates.

How we quality assure the data

The population estimates are primarily quality assured in four separate stages:

1. on receipt of source data, as described in 'How we acquire the data'
2. as each data source is processed and turned into a component of population change (see 'How we process the data')
3. once the data are compiled, looking at how changes in components relate to one another, and the overall population change
4. as other data sources and feedback from users become available throughout the year

How we disseminate the data

To accompany publication of population estimates data, a [bulletin](#) is produced, which provides a narrative to help users understand patterns and changes in the data. The data itself are visible in the interactives within the bulletin as well as accompanying [publication tables and a detailed time series](#). Beyond the bulletin and data tables, greater customisability of analysis is facilitated to fulfil user need through the [Analysis of Population Estimates Tool](#), [Customise my Data](#), and NOMIS. To help users independently assess the quality of the population estimates for individual areas, [Quality Indicators and a comparator tool](#) are published with each release.

How we review the data

Each round of population estimates is reviewed before publication. This is carried out by colleagues from other teams within Demography at ONS who apply different statistical tests to those already applied to look at the plausibility of changes over time and detect outliers. For the mid-2020 estimates, given the unusual circumstances of the reference period (the first three months of the pandemic), we convened a meeting of experts from within Demography to discuss the estimates.

The main review mechanism is through peer review via the ONS's Research Review Group. This brings together experts from Population Statistics, Migration Statistics and Methodology divisions to provide expert views on issues and decisions. Where alternative methods have to be applied, for example, in the use of the three-year average immigration distributions detailed in the 'Quality' section, both the decision to proceed and the final impact are taken to that panel for scrutiny.

This also ensures that population and migration statistics remain joined up. For example, when methods were improved for the 2018 back-series (covering mid-2012 to mid-2016), the Research Review Group designed the methodology required to make sure that the population estimates remained compatible with population projections.

7 . Other information

Other useful links

Other information related to the topic of population statistics is available:

- [Consistency of methods used for population statistics across UK countries](#)
- [Estimates of the very old \(including centenarians\), UK](#)
- [Population and migration statistics system transformation](#)
- [Internal migration estimates QMI](#)
- [Local area migration indicators](#)
- [Measures of statistical uncertainty](#)
- [Mid-year population estimates methods guide](#)
- [National population projections](#)
- [National Records of Scotland](#)
- [Northern Ireland Statistics and Research Agency](#)
- [Overview of the UK population](#)
- [NOMIS](#)
- [ONS's Customise My Data](#)
- [ONS Geoportals](#)
- [Population estimates by marital status](#)
- [2011 Census](#)
- [Population estimates quality tools](#)

8 . Analysis of estimates of children and age distributions of international migrants

Population estimates are calculated using a cohort component method. This takes the last census estimate and adjusts it each year for births, deaths, international immigration, international emigration and internal migration. The data for some of these components (births and deaths) are more reliable than for others (international and internal migration).

International immigration estimates for local authorities by age and sex are calculated by:

- taking the national estimates of immigration, based primarily on the International Passenger Survey (IPS)
- distributing this to local authorities using administrative data by reason for migration (work, study, other and UK returning migrants)
- applying age and sex distributions derived from the 2011 Census

International emigration estimates for local authorities by age and sex are calculated by:

- taking the regional estimates of emigration, based primarily on the IPS
- distributing this to local authorities using a regression model that uses census, survey and administrative data
- distributing migrants by sex based on the current year's IPS data
- applying an age distribution based on the latest three years of IPS data

The differences between the methods for immigration and emigration reflect the greater availability of data for estimating immigration compared with emigration. One of the changes made to the mid-year population estimates (MYE) methods in 2012 was to move from using IPS data to derive an age and sex distribution of immigrants to using the age and sex distribution of immigrants from the 2011 Census. This change was made as there was a deficit of children in the [rolled forward MYEs compared with estimates of the census](#) that we could attribute to international migration. For England and Wales as a whole the rolled forward mid-year estimates for mid-2011 had around 1.4% fewer 5- to 10-year-olds and 4.4% fewer 11- to 15-year-olds than the 2011 Census.

While the age distribution of emigrants was improved following the 2011 Census, it is still based entirely on data from the IPS. This reflects that the IPS is the only data source that provides an age breakdown of emigrants. However, emerging evidence of the number of children in administrative data compared with the number of children expected based on the mid-year population estimates suggests that there is a shortcoming with the IPS age distribution.

There is no known issue with the IPS that would specifically result in an under-count of children. If this is indeed what has occurred, the lack of availability of alternative sources of emigrant ages makes it difficult to fully assess the impact at local level. However, we have conducted some initial analysis into the potential scale of the problem using one alternative age distribution. This analysis should be regarded as indicative rather than definitive.

Alternative age distribution

The approach taken to understand the impact of this issue involves using our understanding of differences between census-based and IPS-based age distributions of immigration and applying this to our IPS-based age distributions of emigration. This method makes a number of assumptions, and hence is only indicative.

Applying this alternative age distribution, it is likely that by mid-2016 this issue resulted in our population estimates for the whole of England and Wales including around 0.3% too many children aged 0 to 4 years and around 1.1% too many children aged 5 to 10 years.

At a local level these impacts are likely to vary depending on the levels of international migration experienced in different parts of the country. Areas of the country with high levels of international migration will be impacted more. For example, across London this issue is likely to have inflated that number of 0- to 4-year-olds by around 0.8% and the number of 5- to 10-year-olds by around 2.5%. The majority of local authorities (lower tier) outside of London will be impacted, on average, by around 0.2% for 0- to 4-year-olds and 0.8% for 5- to 10-year-olds.

It is important to note that other components of the population estimates method will also contribute to differences between our estimates of the number of children and the "true" number in the population.

Tables 3 and 4 show the impact this alternative age distribution would have on London boroughs. The impacts have been calculated on a cohort basis (so the 0- to 4-year-old age group uses the impact for mid-2016 for 0- to 4-year-olds, the impact in mid-2015 for 0- to 3-year-olds and so on).

Table 3: Local authority indicative impacts – London boroughs, mid-2016

	Population 0 to 4 years old in mid-2016	Indicative impact 0- to 4-year-olds	Indicative impact 0- to 4-year-olds (%)	Population 5 to 10 years old in mid-2016	Indicative impact 5- to 10-year-olds	Indicative impact 5- to 10-year-olds (%)
Westminster	13,676	385	3%	15,579	1,245	8%
Camden	14,358	288	2%	16,923	1,027	6%
Lambeth	20,380	252	1%	21,506	956	4%
Ealing	26,303	230	1%	28,344	891	3%
Tower Hamlets	22,293	304	1%	22,570	857	4%
Brent	25,169	237	1%	25,376	855	3%
Wandsworth	22,713	242	1%	21,599	855	4%
Southwark	21,591	238	1%	21,931	794	4%
Hammersmith and Fulham	11,521	220	2%	12,531	684	5%
Kensington and Chelsea	8,711	174	2%	10,067	666	7%
Barnet	27,137	189	1%	31,988	585	2%
Haringey	19,247	192	1%	20,137	556	3%
Lewisham	22,746	109	0%	23,699	512	2%
Newham	29,546	183	1%	27,998	510	2%
Waltham Forest	22,452	133	1%	22,338	504	2%
Hackney	20,880	140	1%	21,257	489	2%
Hounslow	21,328	153	1%	22,028	459	2%
Merton	15,978	132	1%	16,091	442	3%
Islington	13,318	120	1%	13,875	397	3%
Greenwich	22,493	101	0%	23,462	382	2%
Hillingdon	23,005	129	1%	24,737	379	2%
Harrow	17,935	76	0%	19,126	366	2%
Croydon	28,652	53	0%	32,796	331	1%
Richmond upon Thames	13,487	39	0%	16,509	292	2%
Redbridge	23,130	78	0%	25,835	272	1%
Kingston upon Thames	11,698	95	1%	13,687	267	2%
Enfield	25,108	75	0%	29,540	250	1%
Barking and Dagenham	20,015	39	0%	22,644	133	1%
Sutton	14,205	16	0%	16,296	131	1%
Bromley	21,710	27	0%	25,472	121	0%

City of London	363	20	5%	404	120	30%
Havering	17,035	29	0%	18,633	104	1%
Bexley	16,219	36	0%	19,562	85	0%

Table 4: Local authority indicative impacts – England and Wales (excluding London), mid-2016

	Population 0 to 4 years old in mid-2016	Indicative impact 0- to 4-year-olds	Indicative impact 0- to 4-year-olds (%)	Population 5 to 10 years old in mid-2016	Indicative impact 5- to 10-year-olds	Indicative impact 5- to 10-year-olds (%)
Manchester	39,288	211	1%	41,682	1,034	2%
Birmingham	85,939	207	0%	97,608	1,006	1%
Leeds	51,612	158	0%	57,076	718	1%
Bristol, City of	30,687	142	0%	32,534	572	2%
Oxford	9,033	126	1%	10,543	484	5%
Cambridge	6,956	116	2%	8,036	466	6%
Cardiff	22,533	122	1%	26,139	454	2%
Bradford	40,903	104	0%	48,758	443	1%
Liverpool	29,276	128	0%	30,917	442	1%
Sheffield	33,436	84	0%	40,625	425	1%
Nottingham	21,328	74	0%	23,172	411	2%
Bournemouth	11,357	140	1%	12,165	390	3%
Leicester	26,078	69	0%	28,669	367	1%
Reading	12,250	92	1%	12,970	363	3%
Coventry	23,706	92	0%	27,067	360	1%
Newcastle upon Tyne	17,078	71	0%	19,894	356	2%
Brighton and Hove	14,739	73	0%	17,462	344	2%
Salford	17,637	77	0%	19,107	324	2%
Southampton	16,367	64	0%	17,382	310	2%
Luton	18,100	82	0%	19,690	302	2%
Kirklees	28,143	84	0%	34,336	287	1%
Northampton	16,483	66	0%	18,645	273	1%
Wiltshire	28,164	61	0%	36,840	266	1%
Cheshire East	20,454	34	0%	25,933	257	1%
Milton Keynes	20,126	57	0%	24,650	257	1%
Cornwall	29,309	27	0%	36,088	253	1%
Cheshire West and Chester	18,851	60	0%	22,621	224	1%
Wolverhampton	18,195	54	0%	20,518	222	1%
Medway	18,723	61	0%	21,662	216	1%
Derby	17,494	62	0%	20,981	212	1%

We will continue to discuss the extent of this issue with our stakeholders. However, until an alternative data source can provide a robust age distribution for emigrants that improves estimates across England and Wales, it will not be possible to change the official estimates based on this indicative method.

9 . Cite this methodology

Office for National Statistics (ONS), released 21 December 2022, ONS website, methodology, [Mid-year population estimates QMI](#)