

Comparing national population projections to estimates report

Methodology on the comparison of national population projections from 1971 to 2022 with population estimates, births, long-term international migration, and deaths, including measures of error.

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Notice

3 June 2025

We have identified an error in the data used for Figure 1 showing the total population estimates compared with projections by UK country, 1971-based to 2022-based projections. The NPP data for Figure 1 is presented one year ahead of the published NPP data for the 2012-, 2014-, 2016- and 2018-based NPPs as the original base year data for 2012, 2014, 2016, and 2018 are presented in the rows for 2013, 2015, 2017, and 2019 respectively. Subsequent projections data are also presented one year ahead of the published data. Users who require the correct data for the projections should access these through the [National population projections table of contents](#) until we are able to update this figure.

We will update the underlying data and the figure and update this notice when the error has been corrected. We will also revisit the quality assurance processes used in the development of this methodology.

Users who are concerned and require further information should contact pop.info@ons.gov.uk. We apologise for any inconvenience caused by this error.

2 March 2026

We have made several corrections to the data. As a result of these corrections, the mean error and mean percentage error figures have also been recalculated. Please be aware these corrections affect the analyses in this release but do not affect the national population projections (NPPs) themselves.

We have also made further changes to improve the consistency of the overall formatting of the datasets. Some total population, deaths and births time series have been increased or decreased in length to match the rest of the datasets. Some figures for the UK NPPs were initially rounded, but have been changed to unrounded when that data was available.

These corrections affect all figures within the release except Figure 3, and the following datasets:

- Comparison of mid-year population estimates with projections, UK and constituent countries
- Comparison of deaths estimates with projections, UK and constituent countries
- Comparison of births estimates with projections, UK and constituent countries

- Comparison of fertility estimates with projections, UK and constituent countries
- Comparison of international migration estimates with projections, UK and constituent countries
- Comparison of life expectancy estimates with projections, UK and constituent countries
- Comparison of old age dependency ratio estimates with projections, UK and constituent countries.

We have also updated the text where necessary. We apologise for this correction.

Table of contents

1. [Overview](#)
2. [Sources of error](#)
3. [Total population](#)
4. [Fertility](#)
5. [Ageing and mortality](#)
6. [Net long-term international migration](#)
7. [Dependency ratios](#)
8. [Related links](#)
9. [Cite this methodology](#)

1 . Overview

The Office for National Statistics (ONS) produces national population projections (NPPs) by age and sex for the UK and its constituent countries. The projections are based on the mid-year population estimates (MYEs), historic demographic data and a set of underlying assumptions regarding future fertility, mortality, and migration.

For more information on the general production of NPPs see our [National population projections, background, methodology and assumption setting: 2022-based methodology](#). The primary purpose of the NPPs is to provide an indication of the potential future population, which is used for national planning in several important policy areas.

It is important to emphasise that the NPPs are not forecasts and do not attempt to predict the effect of future government policies, changing economic circumstances or other factors on demographic behaviour. Projections become increasingly uncertain the further they are carried forward, which is why we generally redevelop assumptions on a two-year cycle to incorporate the latest data and expert views. The assumptions should be seen as long-term averages where there is year-to-year variation in demographic components of change and so we would expect for there to be variation when looking at really granular data for single years.

We produce several variant projections alongside the principal projections that are based on alternative demographic scenarios to show users a range of possible outcomes. This methodology only compares the principal projections and includes projections up to and including the 2022-based NPPs, projected 40 years into the future from the base year.

Measuring the accuracy of the projections

Following the completion of a census and the routine reconciliation and rebasing exercise, to enable users to understand the accuracy of the projections, we have published a comparison of projections, population estimates and components of population change. We have previously done this following the 2001 and 2011 censuses. For the NPPs these reports include [National population projections accuracy report](#) and [Fifty years of United Kingdom population projections: how accurate have they been? \(PDF, 868 KB\)](#).

At the total population level, we assess accuracy by comparing the NPPs with the MYEs. These are produced every year and provide an estimate of the resident population of England and Wales on 30 June each year. For more information on these, please see the [Mid-year population estimates quality and methodology information \(QMI\)](#).

The MYEs also incorporate census data through the reconciliation and rebasing process across the UK ([England and Wales](#), [Scotland](#) and [Northern Ireland](#)), as well as the MYEs produced separately by National Records Scotland (NRS) and Northern Ireland Statistics and Research Agency (NISRA).

This methodology contains comparisons of actual and projected figures for births, deaths, international migration, and old age dependency ratios separately. For births we compare figures for the total fertility rate (TFR), as well as the total number births.

For deaths we look at the total number of deaths and life expectancy at birth.

Long-term international migration data is produced using a wide range of sources, including Home Office Borders and Immigration data and the Registration and Population Interaction Database (RAPID) from the Department for Work and Pensions. See our [Methods to produce provisional long-term international migration estimates methodology](#).

In this methodology we only compare total immigration and emigration numbers. Please note that the estimates for births, deaths, TFR and period life expectancy at birth refer to the calendar year, whereas the projected figures, as well as international migration and old age dependency ratio (OADR) estimates, refer to the average of successive mid-year to mid-year points.

The difference between each projection and its associated estimate is calculated at set durations from the base year so that comparisons can be made between different projections and their performance. For example, the 2012-based projection for mid-2016 can be compared with the 2018-based projection for mid-2022.

We compare projections to estimates in two different ways in this methodology. The mean error (ME) reflects the bias in assumed values using the projection error. This is calculated as the difference between the projected value minus its actual value, for a specified projection duration, (for example, five years ahead), and provides an average if more than five observations are available. A positive error indicates overprojection and a negative error indicates underprojection.

Lastly, this methodology includes analysis of the mean percentage error (MPE). This measure uses the mean error and expresses it as a percentage of the relevant component of population change, such as total births. The main benefit of using MPE is that it allows for a more direct comparison of the differences between populations of different sizes. We use the term "error" in this context to describe the difference between the projection and estimates, not in the sense of a mistake in the data.

2 . Sources of error

Changes to underlying demographic trends

The national population projections (NPPs) rely on a set of fertility, mortality, and migration assumptions, which are primarily based on past demographic trends. However, demographic behaviour is inherently uncertain, especially in the case of international migration. Future net migration has been consistently underprojected since the 1970s and differences between projected and actual migration have been the single biggest component of total error for most of our projections.

Compared with other demographic behaviour, international migration is the most sensitive to political and economic changes. For example, the 2004-based projections underprojected the total population. Following the accession of 10 countries to the European Union (EU) in 2004, the subsequent increase in migration flows from these countries was not reflected in the migration assumptions for the 2004-based projections. One of the important reasons for this is that there is a need for an emergent demographic event or trend to be seen in the data for several years before a suitable assumption can be developed based upon the historic timeseries.

Similarly, the size and effect of unpredictable global events that may lead to changes to UK net migration are difficult to incorporate accurately into the migration assumptions. After Brexit, there were many different views on what the effect would be on international migration, but there was no way of knowing for certain. The Office for National Statistics (ONS) blog [Why ONS projections are not predictions](#) explains some of the challenges around projections in more detail.

Rebasing of the mid-year population estimates

The population estimates used for the base year of the projections may also be a source of error because, while the projections are based on the best mid-year estimates of population size and age structure at the time they were made, these estimates tend to accumulate errors the further they are made from the previous census in our present system. For example, in the 2010-based projections, error in the base population accounts for most of the total error, which would be expected given that these projections were made at the maximum possible distance from the previous census. Population estimates are generally most accurate immediately after a census as this provides a new benchmark and removes errors that have accumulated because of the annual updating process.

Methodological changes to statistics

There have been a series of research programmes that aim to investigate methodological improvements to population and migration statistics. For each release, quality and methodology information (QMI) releases provide a summary of changes in methods. Changes to each of these sources will in turn affect the input data for developing projections. For example, since 2020, international migration statistics no longer primarily rely on International Passenger Survey (IPS) data. Instead, they use an admin-based approach, see [Methods to produce provisional long-term international migration estimates](#).

3 . Total population

This methodology uses data from 1971 onwards, although projections have been produced since 1955. The initial projections grappled with projecting future births both before and after the baby boom in the 1960s. This led to an initial underprojection and a subsequent overprojection of fertility as the number of births subsequently declined. Within the total population projections, the various overprojections and underprojections of the components of change can cancel each other out. For example, by 2013 the 1975-based projections overprojected the number of births by 3 million, which was largely offset by an overprojection of deaths of almost 3 million.

More recent projections have generally assumed an increasing UK population, as below replacement fertility is generally offset by higher life expectancy and higher assumptions of net international migration. See our [National population projections: 2022-based bulletin](#). However, international migration assumptions have particularly changed, from assuming negative net migration in the 1970s to assuming net positive migration of 340,000 from mid-2028 onwards in the 2022-based projections.

The estimated population of the UK at mid-2022 was 67.6 million. The projections for this date made were all underprojections. The 1983-based projection produced a mid-2022 population projection of 58.6 million (9.0 million lower than the actual mid-2022 estimate).

The scale of population growth and the relationship between estimates and projections varies by UK country. Figure 1 shows these differences. The population of England has increased since the 1970s, though at varying speeds. Since the early 2000s projections for England have assumed more rapid population growth as actual growth accelerated.

The population of Wales has also increased since the 1980s, but growth has been more intermittent with projection comparisons showing more periods of overprojection, whereby projections of increasing population were not followed by a similar level of increase in the actual population. Like England, there has been a convergence of projections since the early 2000s.

In contrast, recent projections for Scotland show variation regarding potential future long-term population size. From 1980 to 2005, the assumptions for Scottish population growth have led to overprojections as the population decreased.

Northern Ireland's population growth has been consistent in size since the 1980s, although the projections have generally been consistent in their assumptions that the growth would slow.

Figure 1: Projections from 2006-based onwards generally follow the estimated population increase closely

Total population estimates compared with projections by UK country, 1971-based to 2022-based projections

Notes:

1. There are no 1971-based projections for England or Wales as that release only produced projections for England and Wales combined.
2. We did not produce 2020-based interim projections for Northern Ireland.
3. We did not produce 2021-based projections for Scotland.

Download the data

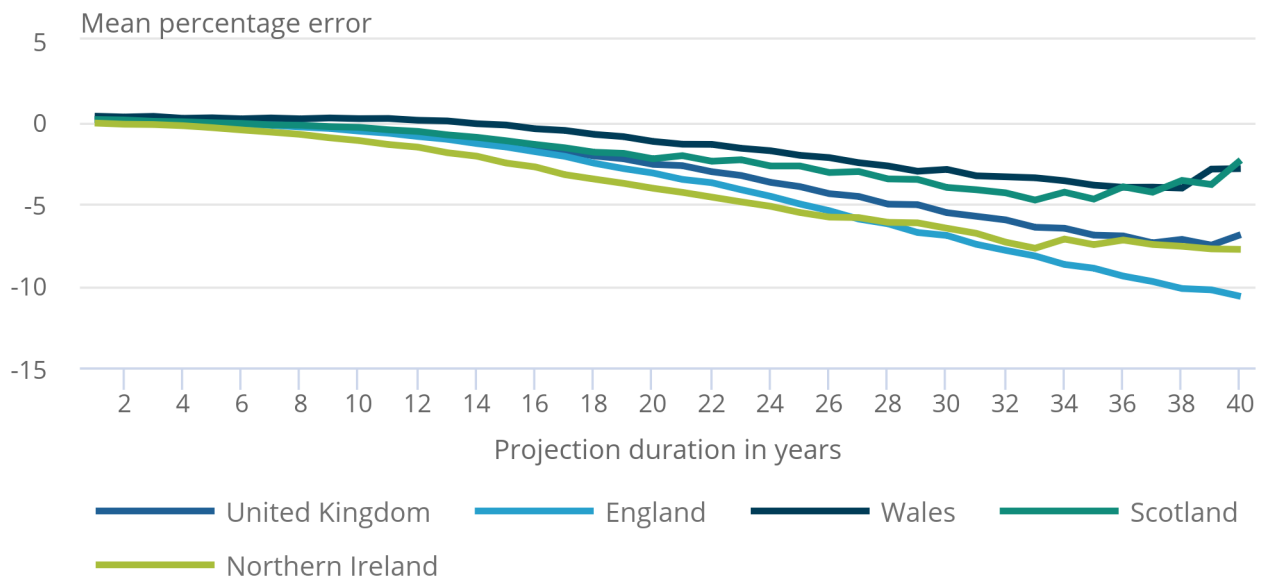
When the projections are expressed as a percentage of the total population, it becomes clear that the size of the underprojection increases the further the projections move away from the base year (Figure 2). The exceptions are Wales and Scotland, where the underprojection decreases after 30 to 35 years. The relative underprojection for Scotland, Wales and Northern Ireland is smaller compared with England and the UK. After 14 years, the size of the underprojection for the average UK projection is more than 1% for the first time. When comparing the differences between projections and estimates for the UK countries, the scale of the underprojection is similar for the male and female population.

Figure 2: Underprojection of the population increases further from the base year

Mean percentage error of population projections for the UK and constituent countries

Figure 2: Underprojection of the population increases further from the base year

Mean percentage error of population projections for the UK and constituent countries



Source: Calculations based on the mid-year estimates and national population projections from the Office for National Statistics

4 . Fertility

Total fertility rate

The total fertility rate (TFR) represents the hypothetical average number of children born per woman, if women experienced the age-specific fertility rates (ASFR) of the particular year, throughout their childbearing lives.

Fertility rates may decline in periods of high unemployment or economic uncertainty and can increase when the opposite is the case. International migration can also affect the TFR if immigrants have a different rate compared with the British-born population. The fertility assumptions that informed the latest NPPs can be found in our [National population projections, fertility assumptions: 2022-based methodology](#).

Figure 3 shows how assumed future TFRs have changed since the 1971-based projections, which is when detailed information on fertility rates was first available. Since the 1970s, fertility rates have gradually declined for all UK countries, though at different rates. A notable exception is the period from 2000 to 2010.

For England, Wales and Scotland, TFR projections have ordinarily been based on assumptions that fertility would increase within a few years of the start of the projection. This assumption was particularly pronounced for projections between 1973 and 1981. This has not been the case for Northern Ireland, which has the highest fertility rate in the UK.

Figure 3: While fertility rates have declined across the UK, projections have generally suggested a potential long-term increase

Total fertility rate (TFR) estimates compared with projections for the UK and constituent countries, 1971-based to 2022-based projections

Notes:

1. The TFR estimates are based on calendar year. The TFR projections cover births from mid-year to mid-year.
2. There are no 1971-based projections for England or Wales as this release only produced projections for England and Wales combined.
3. We did not produce 2020-based interim projections for Northern Ireland.
4. We did not produce 2021-based projections for Scotland.

Download the data

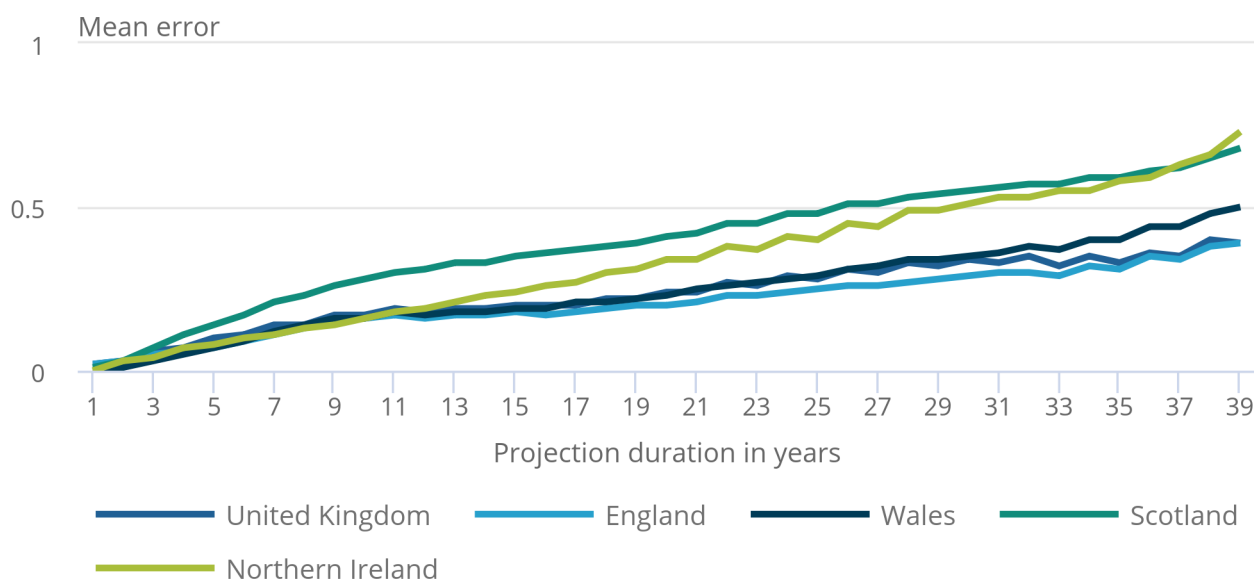
Figure 4 shows that overprojection of TFR increases for all UK countries the further the projection duration. For the UK, the average difference between the TFR estimate and projection is 0.2 after 15 years. For Scotland and Northern Ireland, the overprojection is larger than that of England and Wales.

Figure 4: Overprojection of total fertility rates increases further from the base year

Mean error of fertility projections for the UK and constituent countries

Figure 4: Overprojection of total fertility rates increases further from the base year

Mean error of fertility projections for the UK and constituent countries



Source: Calculations based on births data and national population projections from the Office for National Statistics

Births

The number of births in a given year depends on both the TFR and the number of women of childbearing age in the population. The number of women of childbearing age is in turn determined by the past number of births (relative cohort size) as well as levels of internal and international migration along with mortality. Some projection years can have a lower fertility rate, but an increase in births compared with a year with higher fertility rates. As projections have used assumptions with higher fertility rates compared with the estimate, projections of births in turn have also been higher compared with the estimate for many of the early projections. Figure 5 shows that the projections assumed the future increase in births in the early 2000s.

Figure 5: Projections tend to differ from the increase and subsequent decline in births between 2000 and 2020

Births estimates compared with projections for the UK and constituent countries, 1971-based to 2022-based projections

Notes:

1. The births projections cover births from mid-year to mid-year, whereas births estimates are based on calendar year.
2. Births in England and Wales are based on occurrences, births in Scotland and Northern Ireland are based on registrations.
3. There are no 1971-based projections for England or Wales as that release only produced projections for England and Wales combined.
4. We did not produce 2020-based interim projections for Northern Ireland.
5. We did not produce 2021-based projections for Scotland.

Download the data

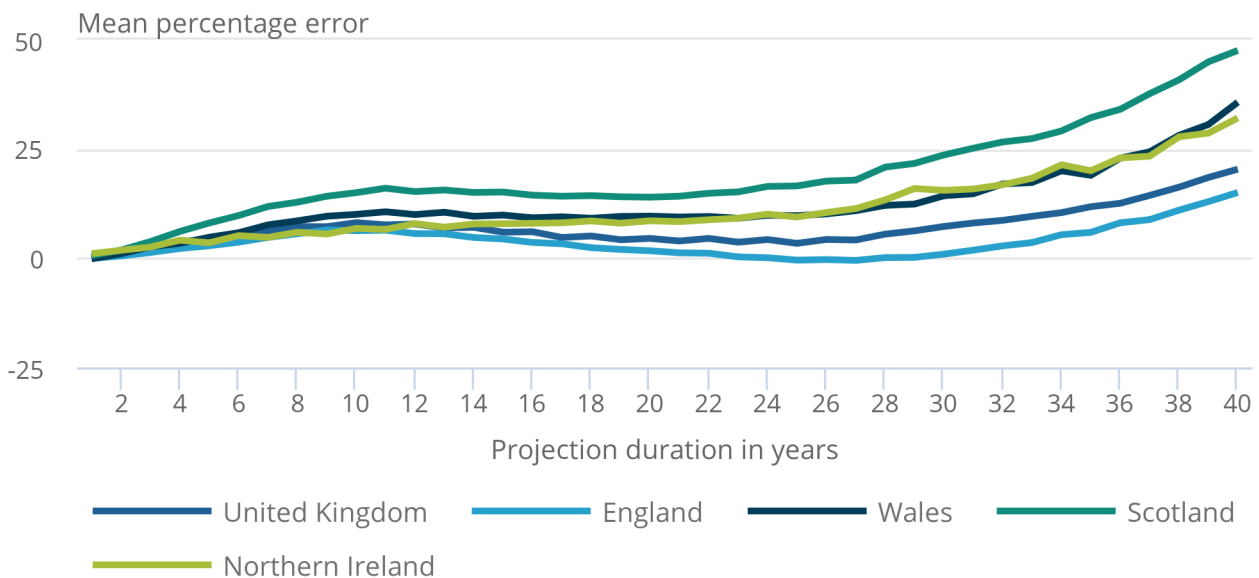
For the UK and its constituent countries, the gap between projected and actual births generally widens as time goes on, showing that we have overprojected the number of births. However, Figure 6 shows that there is a notable decrease in the size of the overprojection after a projection period of roughly 10 years. This fall is attributed to period effects, which are events during a specific time period that affect people across age groups. While projections assumed an increase in births in the early 2000s, for most UK countries this happened earlier and at higher rates than initially projected. This led to a temporary underprojection of births. As such, the average gap between births and projections 10 years after the start of the projection is 8.1%, but after 21 years this falls to 3.9%.

Figure 6: Overprojection of births is lowest in England and highest in Scotland

Mean percentage error of births projections for the UK and constituent countries

Figure 6: Overprojection of births is lowest in England and highest in Scotland

Mean percentage error of births projections for the UK and constituent countries



Source: Calculations based on births estimates and national population projections from the Office for National Statistics

5 . Ageing and mortality

Life expectancy at birth

Period life expectancy has generally increased for both males and females over the last 50 years (Figure 7). As the rates of improvement started to slow, from 2010 onwards, the projections have overprojected future life expectancy. The coronavirus (COVID-19) pandemic led to a temporary decrease in life expectancy. This is reflected in the more recent projections. See our [National population projections, mortality assumptions: 2022-based methodology](#).

Figure 7: Projections of life expectancy produced after 2010 are higher than actual life expectancy

Estimated period life expectancy at birth compared with projections for the UK by sex, 1971-based to 2022-based projections

Notes:

1. The life expectancy projections are calculated from mid-year to mid-year. The life expectancy estimates are based on calendar year.
2. The estimates are based on single-year life tables. Unlike the three-year life tables, these are not accredited official statistics. They are considered less robust and more prone to annual fluctuations in deaths caused by seasonal events.

[Download the data](#)

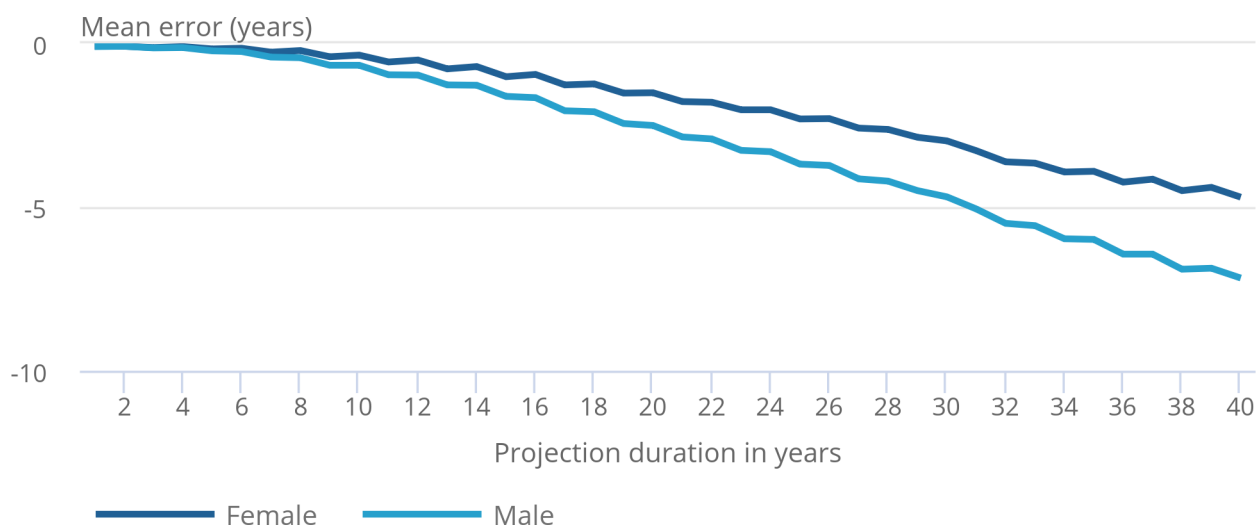
Despite recent trends, average life expectancy is underprojected (Figure 8), and the underprojection is larger for males than it is for females. The female life expectancy projection is 1.5 years lower than the estimate, whereas for males it is 2.5 years lower, 20 years into the average UK projection.

Figure 8: The average underprojection of life expectancy in the UK for males is larger than for females

Mean error of life expectancy projections in the UK by sex

Figure 8: The average underprojection of life expectancy in the UK for males is larger than for females

Mean error of life expectancy projections in the UK by sex



Source: Calculations based on single-year life expectancy estimates and national population projections from the Office for National Statistics

Deaths

Similar to the underprojection of life expectancy, deaths were overprojected until the early 2000s (Figure 9). The increase in deaths is mostly attributed to a larger number of people in the highest age category than was projected, compared with previous decades.

Figure 9: Deaths are higher than the projections produced after 2010

Deaths compared with projected deaths for the UK and constituent countries, 1971-based to 2022-based projections

Notes:

1. Deaths projections are calculated from mid-year to mid-year. The deaths estimates are based on calendar year.
2. We did not produce 2020-based interim projections for Northern Ireland.
3. We did not produce 2021-based projections for Scotland.

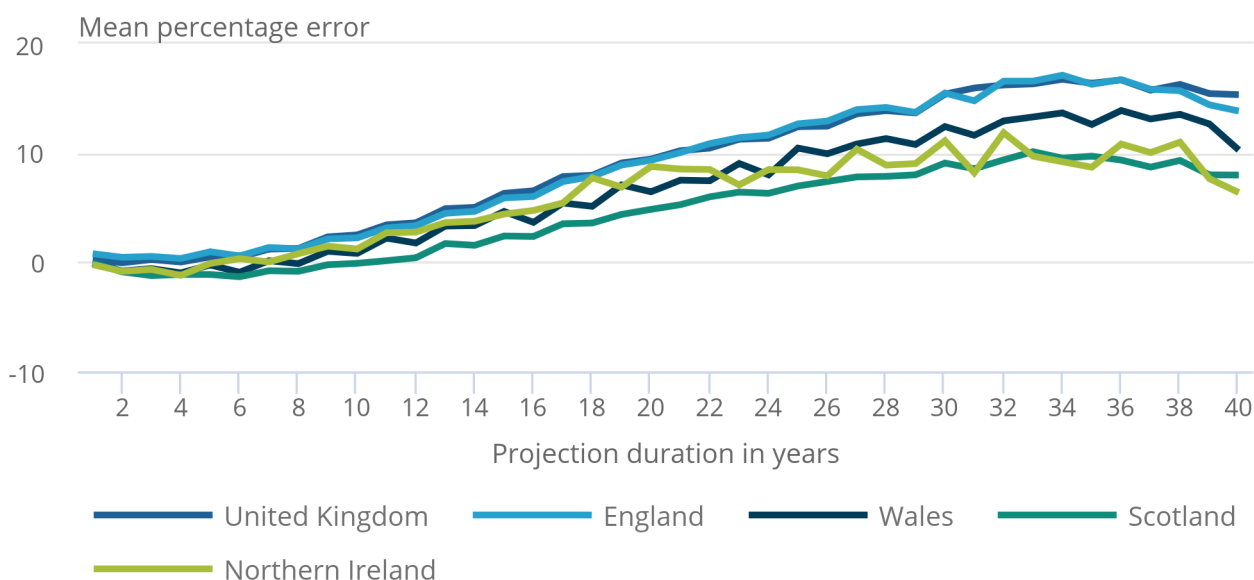
Figure 10 shows that as a percentage of total deaths, deaths are generally more overprojected for England and Wales than for Scotland and Northern Ireland. For the UK, the average gap between projected and actual deaths is 2.5% after 10 years.

Figure 10: Overprojection of deaths is generally largest for England and Wales

Mean percentage error of deaths projections for the UK and constituent countries

Figure 10: Overprojection of deaths is generally largest for England and Wales

Mean percentage error of deaths projections for the UK and constituent countries



Source: Calculations based on deaths estimates and national population projections from the Office for National Statistics

6 . Net long-term international migration

At the UK level, net international migration has been consistently positive since the early 1990s. Figure 11 shows that the 1996-based projections were the first to assume long-term net inflows for the UK. Figure 11 also shows that projected and estimated increases in net migration has varied across the UK's four constituent countries.

Figure 11: Net international migration has increased in both the estimates and projections

Net migration estimates compared with projections for the UK and constituent countries, 1971-based to 2022-based projections

Notes:

1. There are no 1971-based projections for England or Wales as this release only produced projections for England and Wales combined.
2. We did not produce 2020-based interim projections for Northern Ireland.
3. We did not produce 2021-based projections for Scotland.
4. The 2021 to 2024 estimates for England and Wales have been created by disaggregating the UK figure.

Download the data

The methodology behind the net international migration projections keeps the long-term migration assumptions constant. This is not because of a belief that international migration will be constant in the future. It is because of a lack of data to suggest the direction and scale of net migration beyond a few years into the future, after which a long-term average is used. The assumptions that underpin the net migration component of the projections can be found in our [National population projections, migration assumptions: 2022-based methodology](#).

Many factors affect international migration. Government policies can affect international migration both directly and indirectly, as do economic and labour market conditions. In addition, the global geopolitical landscape in which the UK exists is constantly changing, which can affect the flow of people to and from the UK. As such at any given point, even with a wealth of information available on who is arriving and leaving, it is difficult to project with certainty, how that may affect migration in a few years' time. This is one reason why the projections are not forecasts that attempt to predict the future level of migration.

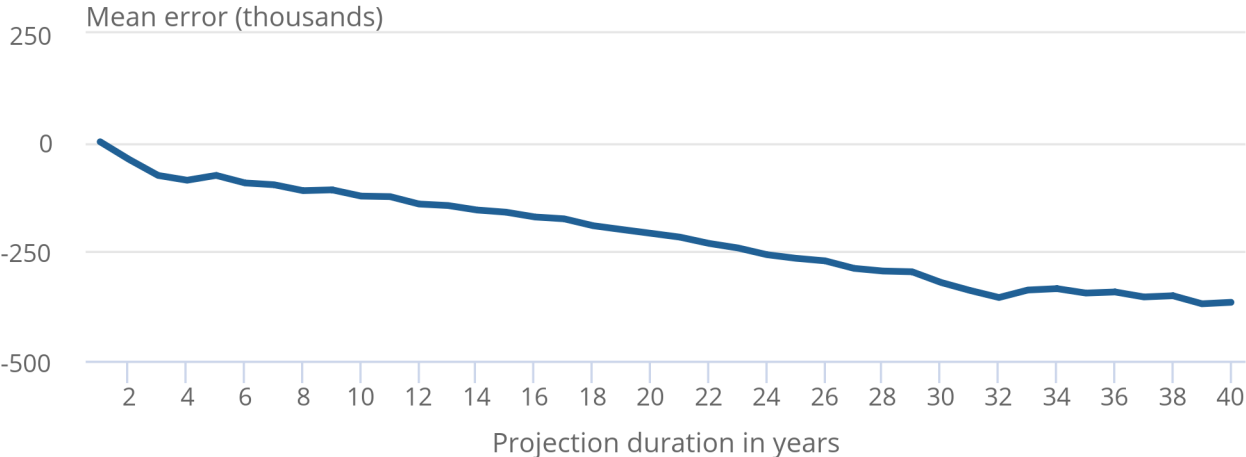
Figure 12 shows that the UK has had migration underprojected for the entire duration of the projection. The UK migration projection is 75,476 lower when compared with the estimates, five years into the average projection.

Figure 12: Underprojection of international migration increases further from the base year

Mean error of net international migration projections for the UK

Figure 12: Underprojection of international migration increases further from the base year

Mean error of net international migration projections for the UK



Source: Calculations based on long-term international migration estimates and national population projections from the Office for National Statistics

7 . Dependency ratios

The old age dependency ratio (OADR) relates the size of the working age population to the size of the population of state pension age (SPA) and over. An increase in the ratio indicates an increase in the pension age population relative to those of working age. This has implications for the economy in terms of providing services and state pensions.

The OADR is calculated based on the Pensions Act 2014 in which the SPA was increased from 66 to 67 years between 2026 and 2028. Pension policies are informed, in part, using the OADR from the population projections.

Figure 13 shows the actual OADR from 1972 to 2022 compared with the projected OADR. Most projections initially follow a similar trajectory to the actual OADR before diverging, illustrating the combined effects that all the components of population change have on the dependency ratios. At the start of a projection, the number of working age and pension age people is only affected by migration and mortality assumptions. Later, the fertility assumptions begin to affect the working age population as people born during the projections period reach working age.

Figure 13: Recent higher international migration assumptions are lowering the short-term old age dependency ratio projections

Old age dependency ratio (OADR) estimates compared with projections for the UK and constituent countries, 1971-based to 2022-based projection

Notes:

1. There are no 1971-based projections for England or Wales as this release only produced projections for England and Wales combined.
2. We did not produce 2020-based interim projections for Northern Ireland.
3. We did not produce 2021-based projections for Scotland.
4. The OADR estimates were calculated in July 2024, and do not consider the recent revisions to population and international migration estimates.
5. The 1987-based projections for England include a calculation error behind the 1990 OADR figure. Data for this year has not been included in the data.

[Download the data](#)

In the past, underprojections of older people because of less optimistic life expectancy assumptions have been partially offset by underprojections of net migration of working age people. Most projections contained higher OADRs than the subsequent estimates. Recent projections deviate from this as the increase in net migration filters through into the projections. Initially this lowers the OADR as the working age population increases. However, as the projections do not assume that the current levels of net migration will persist, the OADR increases in the long term as the larger working age population is projected to become older.

Between the 1981-based and 1994-based projections, the OADR was projected to increase significantly. The OADR estimate does not show a similar increase. The OADR projections since 1996 have been lower than those of earlier projections. This is visible for both the UK and England, but for Wales, Scotland and Northern Ireland the decrease in the OADR projections has been more gradual. Overall, Northern Ireland's OADR is projected to increase the most during the first 40 years of the projection, which would bring it more in line with the other UK countries.

Figure 14 shows that the positioning of the actual OADR relative to the projections is similar across all UK countries for the first 20 years of the average projection. After 20 years, however, the mean error for the different countries start to diverge.

The mean error for Northern Ireland consistently shows an underprojection of the OADR, which increases further into the average projection. The mean error for England, Wales and Scotland shows an overprojection that peaks 30 years into the average projection, after which the mean error for Wales and Scotland reduces and even shows an underprojection.

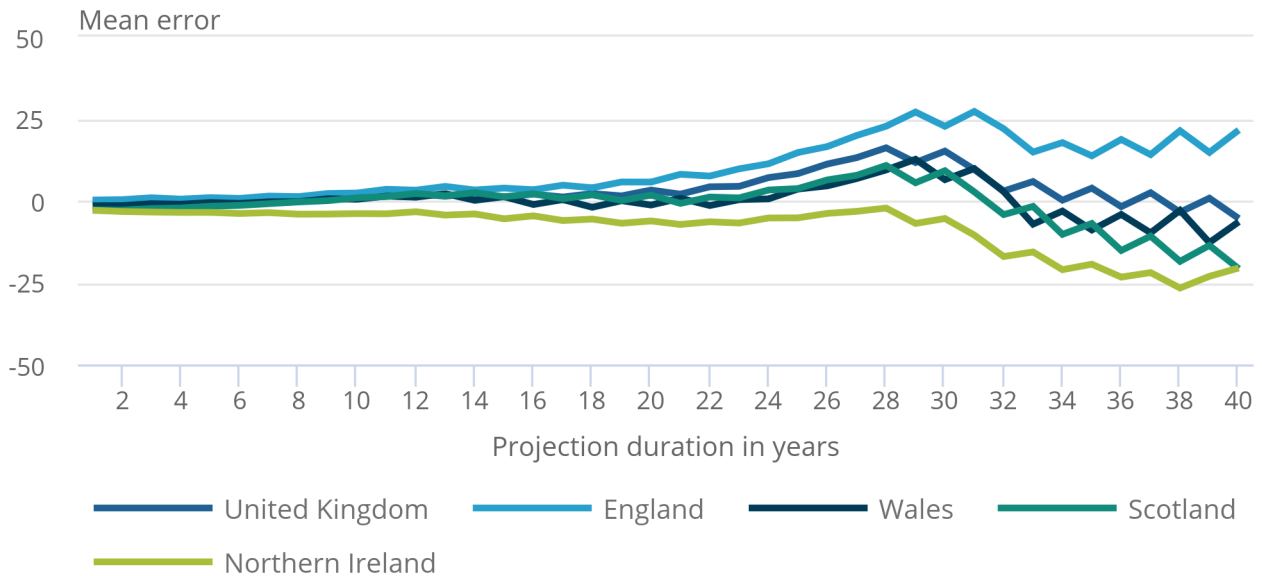
It is likely that this trend is partially explained by the specific projection years that we have between 30 to 40 years' worth of projection comparison data for. The first 5 to 10 projections from 1971 onwards were significantly lower than the estimates. After 2000 the projections were no longer lower than the estimates, but we do not yet have 40 years' worth of comparisons between projections and estimates to feed into the mean error calculations.

Figure 14: Country differences in the relationship between projected and estimated OADR generally occur 20 years after the start of a projection

Mean error of old age dependency ratios (OADR) projections for the UK and constituent countries

Figure 14: Country differences in the relationship between projected and estimated OADR generally occur 20 years after the start of a projection

Mean error of old age dependency ratios (OADR) projections for the UK and constituent countries



Source: Calculations based on OADR estimates and national population projections from the Office for National Statistics

8 . Related links

[National population projections: 2022-based](#)

Bulletin | Released 28 January 2025

The potential future population size of the UK and its constituent countries. These statistics are widely used in planning, including fiscal projections, health, education and pensions.

[National population projections, background, methodology and assumption setting: 2022-based](#)

Methodology | Released 28 January 2025

Information on the data, methods and assumption setting process used to produce the 2022-based national population projections

[National population projections, fertility assumptions: 2022-based](#)

Methodology | Released 28 January 2025

The data sources and methodology used to produce fertility assumptions in the 2022-based national population projections.

[National population projections, mortality assumptions: 2022-based](#)

Methodology | Released 28 January 2025

The data sources and methodology used to produce mortality assumptions in the 2022-based national population projections.

[National population projections, migration assumptions: 2022-based](#)

Methodology | Released 28 January 2025

The data sources and methodology used to produce migration assumptions in the 2022-based national population projections.

9 . Cite this methodology

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