

National population projections, variant projections: 2022-based

The variant projections, a range of scenarios with alternative demographic assumptions, used in the 2022-based national population projections.

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1 . Purpose of variant projections

We produce population projections to understand possible changes in the future structure of the population. They are based on assumptions considered to best reflect demographic patterns at the time they are adopted. However, because of the uncertainty of demographic behaviour, any projection will differ to a greater or lesser extent from actual future population change.

The variant population projections we produce offer alternative projection scenarios to the principal projection. The variant projections are based on alternative assumptions of future fertility, mortality and migration, for the UK and its constituent countries. We produce the variants to give users of projections an indication of the uncertainty of demographic behaviour and to show the potential outcomes of different assumptions about future demographic change.

We determine our set of variants through engagement exercises with a range of users. For example, we recently identified [User needs from 2022-based national, subnational and household projections](#). These variants provide an indication of uncertainty and sensitivity to alternative assumptions, but they should not be interpreted as upper or lower limits of future demographic behaviour. Our [Variant national population projections for the UK and subnational population projections and household projections for England: user guide](#) provides fuller guidance and examples for those wishing to understand and use variant projections in policy and planning.

Every ten years, following the reconciliation and rebasing of population estimates and components of population change, we have published our [Comparing national population projections to estimates report](#) showing how national population projections releases compare with outcomes (estimates and components of change) over time. This helps to show the uncertainty in demographic trends and may help users assess their use of variant population projections.

2 . Range of variants

For the 2022-based national population projections (NPPs) we have published 14 variant projections alongside the principal projection. Some of these are single-component variants, which show the effect of varying one assumption (such as fertility, mortality or migration) while keeping other assumptions in line with the principal projection. Others are combination variants, which look at the effect of varying two or more assumptions. For example, the combination variant "Young age structure" contains the high fertility assumption, low life expectancy assumption and high migration assumption. Similarly, the "Old age structure" variant contains the low fertility assumption, high life expectancy assumption and low migration assumption.

We have created a [UK population projection explorer interactive tool](#). Users can adjust different factors and see the effect they have on what the population may look like in the future, and compared with our official projections.

The following list describes the accredited official statistics variants published in the 2022-based NPPs and the assumptions underlying each variant. Most of the variants use the principal, high and low assumptions for fertility, mortality and migration. These are summarised numerically in Table 1. The migration assumptions differentiate between internal and international migration. In the migration variants, internal migration is assumed to have the same rate in all variants, whereas net international migration changes between variants. Some variants use "special-case" assumptions, which are described in greater detail in [Section 3: Variants that use special-case assumptions](#).

List of variants available for the 2022-based national population projections, UK

Principal

- Geography: UK; Great Britain (GB); England (E), Wales (W), Scotland (S), Northern Ireland (NI)
- Fertility assumption: principal
- Life expectancy assumption: principal
- Migration assumption: principal

High fertility

- Geography: UK; E, W, S, NI
- Fertility assumption: high
- Life expectancy assumption: principal
- Migration assumption: principal

Low fertility

- Geography: UK; E, W, S, NI
- Fertility assumption: low
- Life expectancy assumption: principal
- Migration assumption: principal

High life expectancy

- Geography: UK; E, W, S, NI
- Fertility assumption: principal
- Life expectancy assumption: high
- Migration assumption: principal

Low life expectancy

- Geography: UK; E, W, S, NI
- Fertility assumption: principal
- Life expectancy assumption: low
- Migration assumption: principal

High migration

- Geography: UK; GB; E, W, S, NI
- Fertility assumption: principal
- Life expectancy assumption: principal
- Migration assumption: high

Low migration

- Geography: UK; GB; E, W, S, NI
- Fertility assumption: principal
- Life expectancy assumption: principal
- Migration assumption: low

High population

- Geography: UK; E, W, S, NI
- Fertility assumption: high
- Life expectancy assumption: high
- Migration assumption: high

Low population

- Geography: UK; E, W, S, NI
- Fertility assumption: low
- Life expectancy assumption: low
- Migration assumption: low

Zero net migration

- Geography: UK; E, W, S, NI
- Fertility assumption: principal
- Life expectancy assumption: principal
- Migration assumption: zero (zero internal UK migration and zero international net migration)

Young age structure

- Geography: UK; E, W, S, NI
- Fertility assumption: high
- Life expectancy assumption: low
- Migration assumption: high

Old age structure

- Geography: UK; E, W, S, NI
- Fertility assumption: low
- Life expectancy assumption: high
- Migration assumption: low

Replacement fertility

- Geography: UK; E, W, S, NI
- Fertility assumption: replacement
- Life expectancy assumption: principal
- Migration assumption: principal

Migration category variant

- Geography: UK; E, W, S
- Fertility assumption: principal
- Life expectancy assumption: principal
- Migration assumption: migration category variant

No long-term mortality improvement variant

- Geography: UK; E, W, S, NI
- Fertility assumption: principal
- Life expectancy assumption: zero long-term
- Migration assumption: principal

Some variants are not available for this round of projections. These are:

- constant fertility
- no mortality improvement
- constant fertility and no mortality improvement
- not accredited official statistics: 0% future EU migration
- not accredited official statistics: 50% future EU migration

We have excluded the constant fertility variant because, overall, we consider it to be inconsistent with current trends in childbearing. The no mortality improvement variant has been replaced by the no long-term mortality improvement variant.

Table 1: Long-term assumptions for the 2022-based national population projections, UK

	Low	Principal	High
Fertility (total fertility rate by mid-2047)	1.25	1.45	1.65
Mortality (improvement rate by 2047)	0.5%	1.1%	1.5%
Migration (year ending mid-2028 onwards)	120,000	340,000	525,000

Source: National population projections from the Office for National Statistics

3 . Variants that use special-case assumptions

The 2022-based national population projections (NPPs) have been produced using population and migration data sources that have shown substantial population change since mid-2020, following the coronavirus (COVID-19) pandemic. International immigration has also risen and fallen through the 2020 to 2024 period. There has also been a decrease in fertility. In the last decade, mortality improvements have slowed compared with previous decades. We have produced the following variants to offer different projection scenarios.

Migration category variant

We consult with independent advisory panels of experts working in the field of demography to help inform our assumption setting. In recent years, international migration to the UK has been high in the context of historical levels. While, in general, our expert advisory panel expects lower levels of international migration in the future, there is uncertainty about the timescales that a lower level will be reached. When estimated international migration is high, there is a higher degree of uncertainty in the short-term, including around potential future levels of emigration.

The migration category variant includes specific variant migration assumptions and projections to show what could arise from short-term change in international migration, based upon different types of immigration. Over the last few years, this method has been developed as an alternative for examining the potential implications for emigration and net migration arising from different types of immigration. More information on the assumptions for the migration category variant projections is available in Section 4 of [National population projections, migration assumptions: 2022-based](#).

Replacement fertility

Replacement fertility is the level of fertility required for the population to replace itself in size in the long term, given constant mortality rates and in the absence of migration. The replacement level is around 2.075 in the UK, meaning women would need to have, on average, 2.075 children each to ensure the long-term “natural” replacement of the population. The replacement fertility level has remained the same as in our 2018-based set of variant projections. The replacement fertility projection combines assumed replacement-level fertility with the principal assumptions of mortality and migration.

No long-term mortality improvement variant

The no long-term mortality improvement variant applies a 0% annual improvement in mortality rates for males and females from the target year of 2047 (25 years from the base year). It differs from the low mortality assumption, which converges to an improvement rate of 0.5% by 2047 for males and females aged between 0 and 90 years. This variant is different from the no improvement variant applied in the 2018-based projections, which applied a 0% annual improvement from the base year. This projection combines an assumption of no long-term mortality improvement, with the principal assumptions of fertility and migration.

4 . Summary of variant projections

In this section, we present an overview of the different variants and compare them with the principal projection. We focus on comparing projected population sizes for mid-2047 and growth rates over the period from mid-2022 to mid-2047.

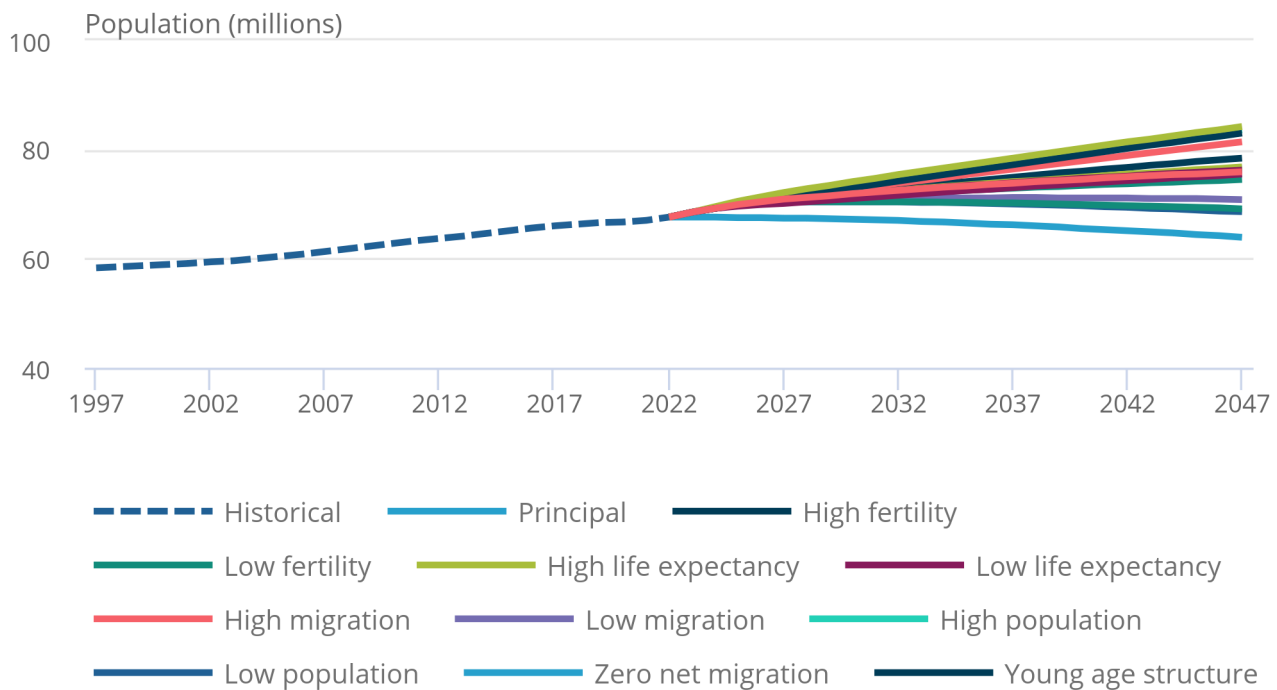
Figure 1 and Table 2 show the differences in projected population size for the UK for the principal projection and under the variant scenarios.

Figure 1: The variant population projections offer a range of future demographic scenarios

Estimated and projected total population for the 2022-based principal projection and variant projections, UK, mid-1997 to mid-2047

Figure 1: The variant population projections offer a range of future demographic scenarios

Estimated and projected total population for the 2022-based principal projection and variant projections, UK, mid-1997 to mid-2047



Source: Mid-year population estimates and national population projections from the Office for National Statistics

Table 2 shows the projected population change between mid-2022, the base year and mid-2047 for the principal projection and the variant projections.

Table 2: Projected population change, UK, mid-2022 to mid-2047

	Mid-2047 population (millions)	Population change (millions)	Percentage change
Principal	76.6	8.9	13.2
High fertility	78.4	10.8	16.0
Low fertility	74.5	6.9	10.2
High life expectancy	76.8	9.2	13.6
Low life expectancy	76.2	8.6	12.7
High migration	81.4	13.7	20.3
Low migration	70.8	3.2	4.8
High population	83.6	16.0	23.7
Low population	68.6	0.9	1.4
Zero net migration	63.9	-3.7	-5.5
Young age structure	83.0	15.4	22.8
Old age structure	69.1	1.5	2.3
Replacement fertility	84.2	16.6	24.6
Migration category variant	75.5	7.9	11.6
No long-term mortality improvement variant	75.9	8.3	12.2

Source: National population projections from the Office for National Statistics

5 . Further quality and methodology information

Our [National population projections Quality and Methodology Information \(QMI\) report](#) contains information about the quality characteristics of the projections as well as the methods used to generate the data. [National population projections, background, methodology and assumption setting: 2022-based](#), contains background information on how we set the demographic assumptions for the 2022-based national population projections. We have also published more detailed information on the decision-making for each variant's fertility, mortality and migration assumptions in:

- our [National population projections, fertility assumptions: 2022-based methodology](#)
- our [National population projections, mortality assumptions: 2022-based methodology](#)
- our [National population projections, migration assumptions: 2022-based methodology](#)

6 . Related links

[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 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.

[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.

[Variant national population projections for the UK and subnational population projections and household projections for England: user guide](#)

User guide | Released 4 November 2021

The aims of this user guide are to provide guidance and examples for those wishing to understand and use variant projections in policy and planning.

[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, for example, fiscal projections, health, education and pensions.

[National population projections QMI](#)

QMI | Released 28 January 2025

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

7 . Cite this methodology

Office for National Statistics (ONS), released 28 January 2025, ONS website, methodology, [National population projections variant projections: 2022-based](#)