

National population projections, fertility assumptions: 2022-based

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

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1 . Main points

- The long-term assumption for completed family size for the UK will be 1.45 children per woman by mid-2047; this is lower than previous rounds of projections.
- The long-term low-fertility variant is calculated as principal minus 0.2; the high-fertility variant is calculated as the principal plus 0.1 in the short-term, rising to the principal plus 0.2 in the longer term.
- The UK long-term total fertility rate (TFR) for the low variant is 1.25 children per woman and for the high variant is 1.65 children per woman by mid-2047; these projections are broader than those produced in the 2018-round of national population projections, when variants were last produced, where the UK variants were set as 1.58 children and 1.88 children around the principal (1.78 children), respectively.
- Age-specific fertility rates (ASFRs) have been projected to decline in the long term for women aged under 30 years and to increase for women aged 30 years and over.
- The methodology used to set the fertility assumptions is broadly similar to the method used to set previous rounds of projections.

2 . Overview of fertility rates

This methodology details the principal and variant fertility assumptions used in our 2022-based national population projections (NPPs). It includes the rationale behind our assumptions-setting process, a summary of recent fertility trends in the UK, and details input from the devolved administrations and the expert advisory panel that we convened.

We have presented fertility rates on a calendar-year basis, unless otherwise stated. There may be small differences between the figures presented in this methodology and our published [National population projections table of contents dataset](#). This is because the underlying data used in setting the assumptions are available on a calendar-year basis.

The short-term (five years from the base year) and long-term (25 years from the base year) fertility assumptions underlying the population projections presented in Table 1 are on a mid-year basis.

Table 1 shows the total fertility rate (TFR) for 2022 and the principal projected TFR five years and 25 years from the start of the projections.

Table 1: Principal projected short-term and long-term total fertility rates
2022-based fertility assumptions, UK and constituent countries, 2022 and years ending mid-2027 and mid-2047

	2022		2027 (projected)	2047 (projected)
England	1.49	1.42		1.46
Wales	1.46	1.37		1.40
Scotland	1.33	1.27		1.29
Northern Ireland	1.71	1.63		1.65
United Kingdom	1.48	1.41		1.45

Source: National population projections, fertility assumptions from the Office for National Statistics

Notes

1. The figures for 2022 are based on the published fertility rates for each country.
2. Fertility rates for 2023 have been published for each country and have been accounted for in setting the fertility assumptions.

3 . Recent trends in fertility

Total fertility rate

Total fertility rate (TFR) is the average number of live children that a group of women would have if they experienced the age-specific fertility rates (ASFR) for the calendar year in question throughout their childbearing lifespan.

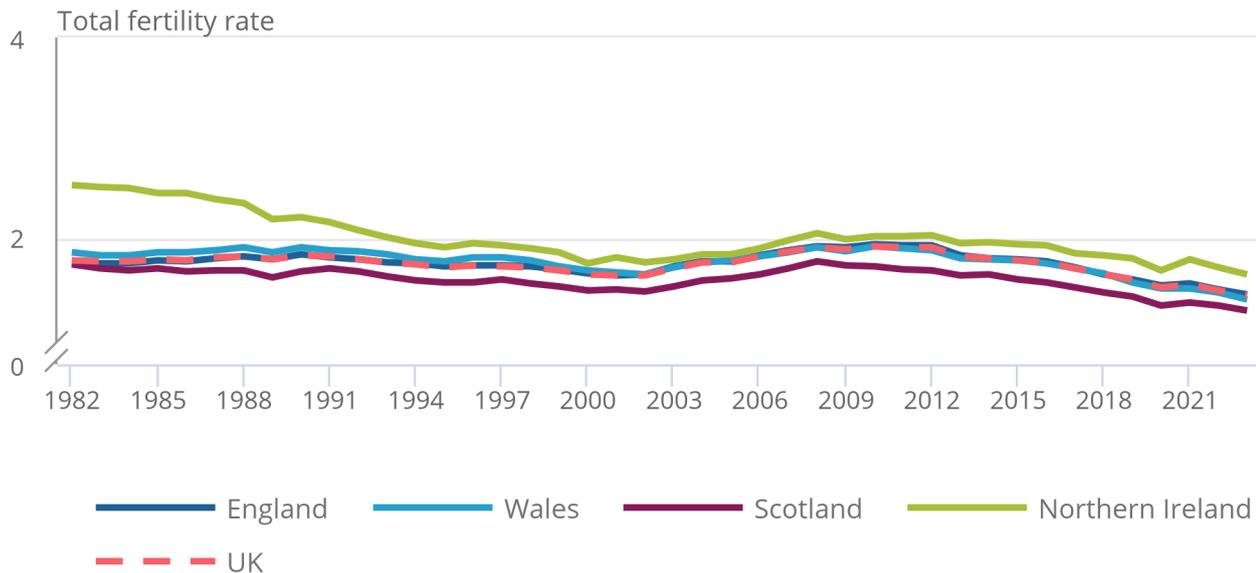
Period fertility rates like the TFR will rise or fall if births are brought forward or delayed for any reason. This contrasts with cohort measures of fertility, which are affected only by changes in the number of children women have and not by the timing of births within women's lives.

Figure 1: Total fertility rates have generally been declining since around 2012

Total fertility rates, UK and constituent countries, 1982 to 2023

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Total fertility rates, UK and constituent countries, 1982 to 2023



Source: National population projections, fertility assumptions from the Office for National Statistics

The UK TFR has generally been declining since 2012, from 1.91 children per woman to 1.43 children in 2023. There was a small increase in 2021 when the TFR rose to 1.54 children before falling again to 1.48 children in 2022.

Figure 1 shows the TFR for the UK and for its constituent countries. Northern Ireland has always experienced the highest TFR and Scotland has the lowest levels of the constituent countries.

Completed family size

We formulate long-term fertility assumptions considering both the TFR and the average number of children for women born in different years, known as completed family size (CFS). The TFR and CFS converge to the same value when projecting fertility in the long term.

Replacement fertility is the level of fertility required for the population to replace itself in size in the long term. Women in the UK would need to have 2.075 children on average to ensure long-term natural replacement of the population.

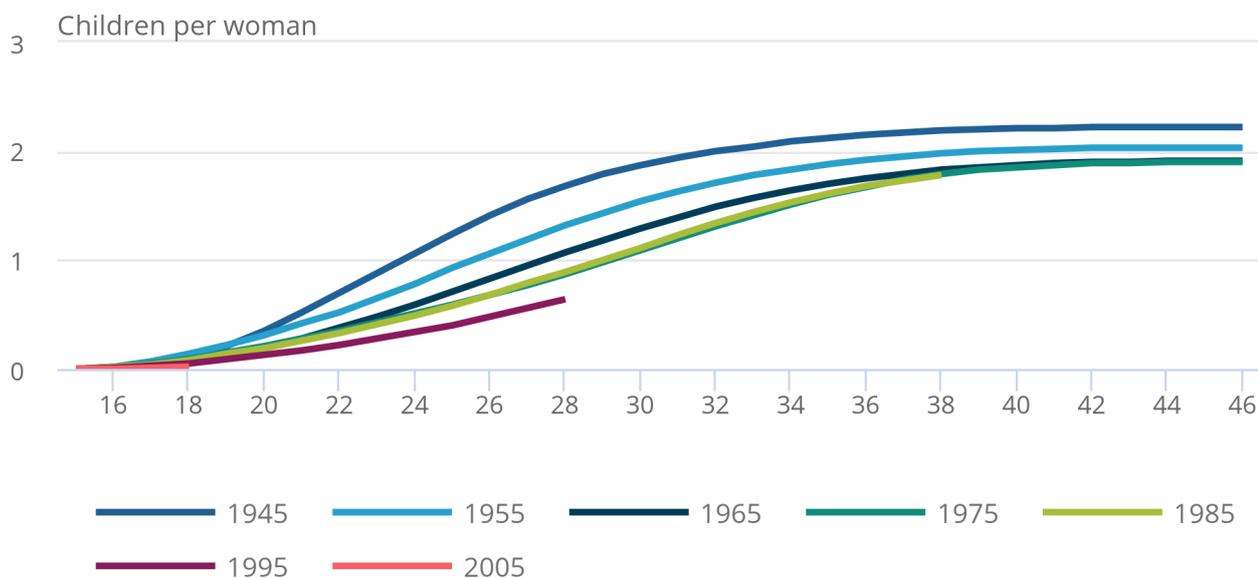
Figure 2 shows that CFS has declined gradually. The average number of children per woman was 2.22 in the 1945 cohort, whereas the cohort of women born in 1975 had a CFS of 1.90 children. More recent cohorts, like the 1995 cohort, have so far shown signs of lower fertility in their 20s than previous cohorts.

Figure 2: More recent cohorts have lower achieved family size in their 20s

Achieved family size by birth cohort of mother, UK, 1945 to 2005 birth cohorts

Figure 2: More recent cohorts have lower achieved family size in their 20s

Achieved family size by birth cohort of mother, UK, 1945 to 2005 birth cohorts



Source: National population projections, fertility assumptions from the Office for National Statistics

4 . Principal fertility assumptions

We have set the UK principal total fertility rate (TFR) for the 2022-based round of projections as 1.41 children in the short-term at five years from the base year in 2027 and as 1.45 children in the long term at 25 years from the base year in 2047. The short-term figure is below the 2022 UK TFR of 1.48 children. This is because we have accounted for the latest TFR data for 2023, which show a marked decline from 2022.

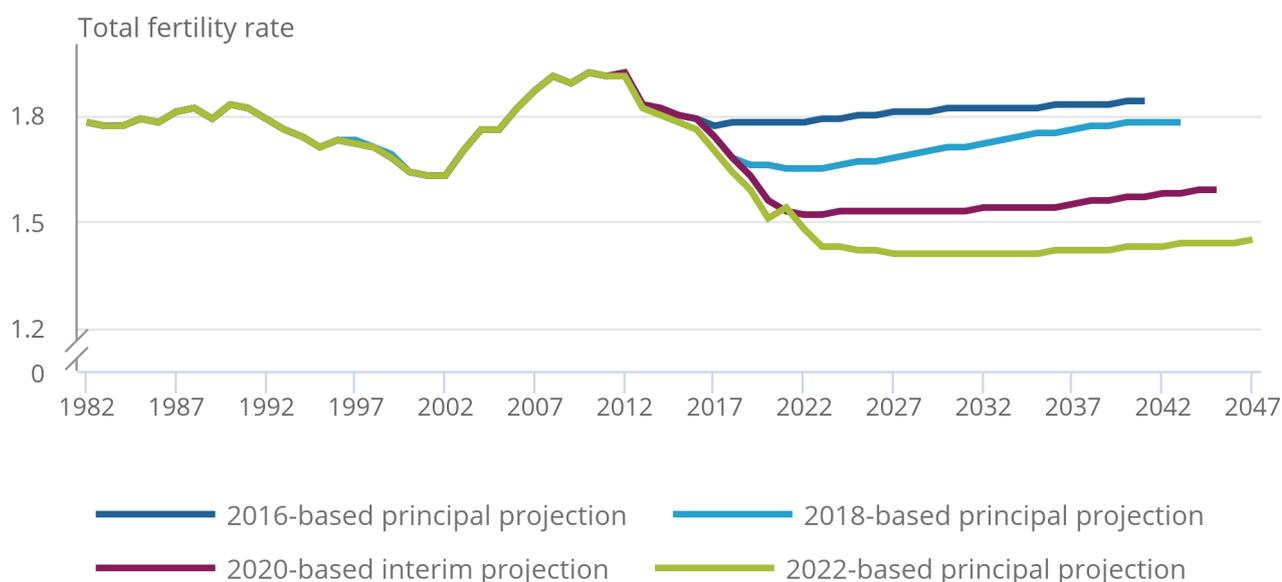
The long-term fertility assumption for the UK is below the long-term figures produced in our previous round of projections, as shown in Figure 3. Each set of fertility assumptions has been lower than the last for recent projection rounds.

Figure 3: The 2022-based principal assumption projects a lower total fertility rate than in previous rounds of projections

Past and projected total fertility rate (TFR), UK, 2016-based to 2022-based principal projections, 1982 to 2047

Figure 3: The 2022-based principal assumption projects a lower total fertility rate than in previous rounds of projections

Past and projected total fertility rate (TFR), UK, 2016-based to 2022-based principal projections, 1982 to 2047



Source: National population projections, fertility assumptions from the Office for National Statistics

Notes:

1. Historical TFRs are lower in the 2022-based assumptions because of census rebasing.

Figure 4 shows the age-specific fertility rates (ASFRs) for the UK for the principal scenario. This broadly reflects the advice on trends for each age group provided by the fertility expert panel. More information on the fertility expert panel is in [Section 7: Expert views on future fertility](#).

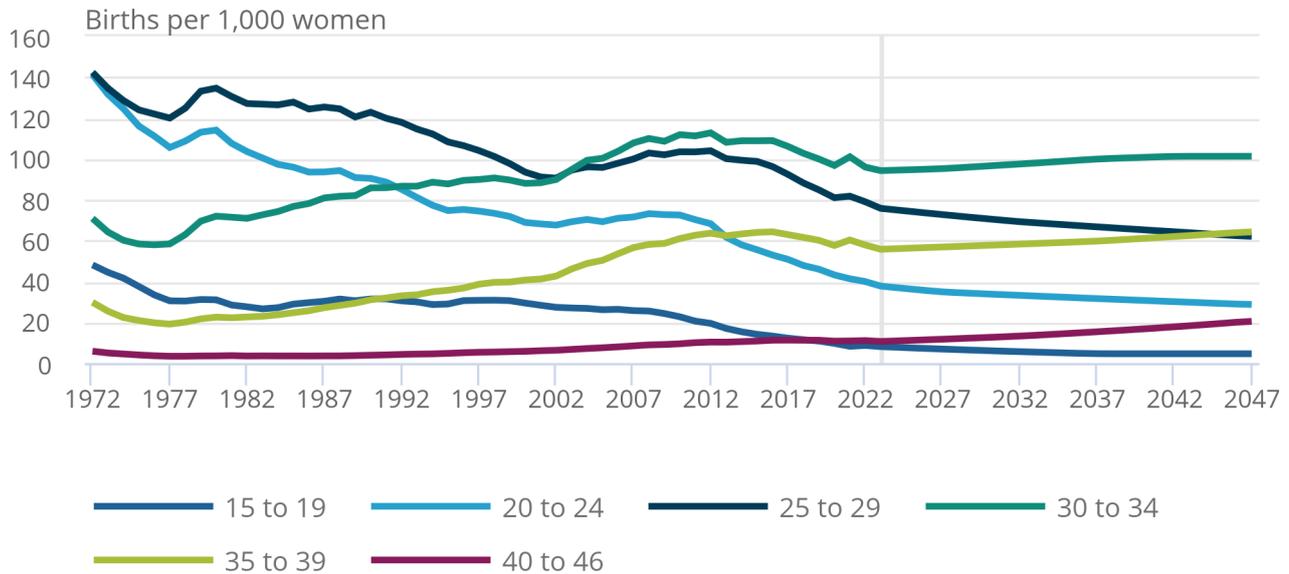
We applied a decline for age groups under 30 years and an increase for ages over 35 years, in line with expert opinion. We also applied a small increase for those aged 30 to 34 years. This does not follow the experts' expectation that fertility for this age group is likely to remain stable. However, experts agreed that we may need to slightly increase fertility rates for this age group to achieve the long-term trend in target TFR without overinflating fertility rates for those aged 35 years and over.

Figure 4: Fertility rates for women in all age groups under 30 years are projected to decrease, while age groups over 30 years are projected to increase

Past and projected age-specific fertility rates (ASFR), UK, 1972 to 2047

Figure 4: Fertility rates for women in all age groups under 30 years are projected to decrease, while age groups over 30 years are projected to increase

Past and projected age-specific fertility rates (ASFR), UK, 1972 to 2047



Source: National population projections, fertility assumptions from the Office for National Statistics

Notes:

1. Figures up to 2023 are based on published data.

Constituent countries of the UK

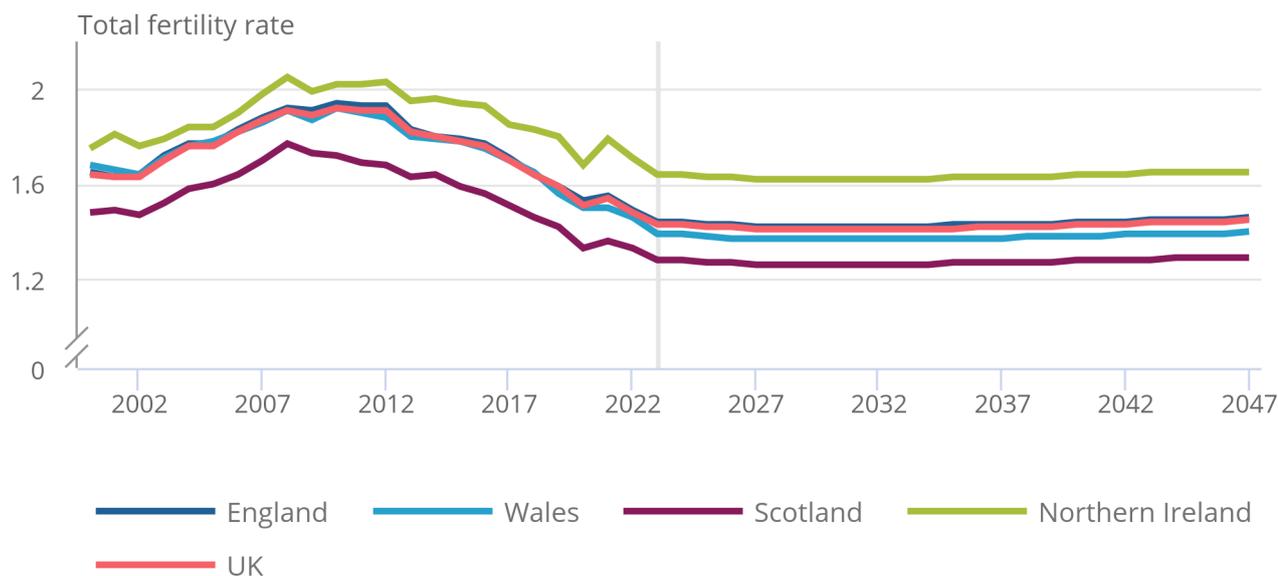
Figure 5 shows the principal projected TFRs for the UK and its constituent countries. These are in line with our desired trends, based on expert opinion.

Figure 5: Northern Ireland continues to have the highest total fertility rate, while Scotland has the lowest

Past and projected total fertility rate (TFR), UK constituent countries, 2000 to 2047

Figure 5: Northern Ireland continues to have the highest total fertility rate, while Scotland has the lowest

Past and projected total fertility rate (TFR), UK constituent countries, 2000 to 2047



Source: National population projections, fertility assumptions from the Office for National Statistics

Notes:

1. Figures up to 2023 are based on published data.

Each country's TFR has maintained a similar position in the projection as shown in the 2023 data, in comparison with the UK TFR. These are within the range of expected differences between the UK and constituent countries' TFRs, based on expert opinion. The TFR deviated from the UK when we applied the principal scenario to Wales. To reduce this, we applied an adjustment to Wales.

Age-specific fertility rates for Wales

The UK trend applied to each constituent country generally increases fertility for the older age groups and decreases rates for younger women. Women in Wales tend to have children at younger ages, compared with the other countries of the UK. This resulted in the TFR for Wales diverging from the UK average in the long term, which was contrary to expert opinion.

To address this, we reduced the rate of decline in ASFRs for women aged 20 to 24 years and 25 to 29 years. This brought the TFR for Wales closer to the UK average in the long term. We applied a similar adjustment for Wales for our 2020-based national production projections.

5 . Assumptions for fertility variants

We produced variant projections to show the impact of fertility rates above or below that of the principal projection. The variants are designed to provide plausible alternative future fertility scenarios.

We have developed high- and low-variant assumptions for the 2022-based national population projections (NPPs). The last time we produced variant projections was for the 2018-based NPPs. This is because the 2020-based interim projections only included the principal assumptions.

Variants have been developed based on discussions with the fertility expert panel and with National Records of Scotland (NRS), Northern Ireland Statistics and Research Agency (NISRA), and the Welsh Government.

The low-variant fertility rate for the 2022-based NPPs has been set as the principal minus 0.2. The high-variant fertility rate has been set as the principal plus 0.1 in the short-term, rising to the principal plus 0.2 in the longer term. The fertility variants have a short-term transition from the current rate to reach these levels and the trend has been smoothed.

The variant widths were applied to the UK and constituent countries as shown in Table 2.

We also produced a "replacement rate" fertility variant with a long-term total fertility rate (TFR) of 2.075. Replacement fertility is the level of fertility required for the population to replace itself in size in the long term, in the absence of migration.

Table 2: High and low variants were set as 0.2 above and below the principal projection in the long term
Principal and variant long term (2047) total fertility rates, UK and constituent countries

	Principal	Low variant	High variant
England	1.46	1.26	1.66
Wales	1.40	1.20	1.60
Scotland	1.29	1.09	1.49
Northern Ireland	1.65	1.45	1.85
United Kingdom	1.45	1.25	1.65

Source: National population projections, fertility assumptions from the Office for National Statistics

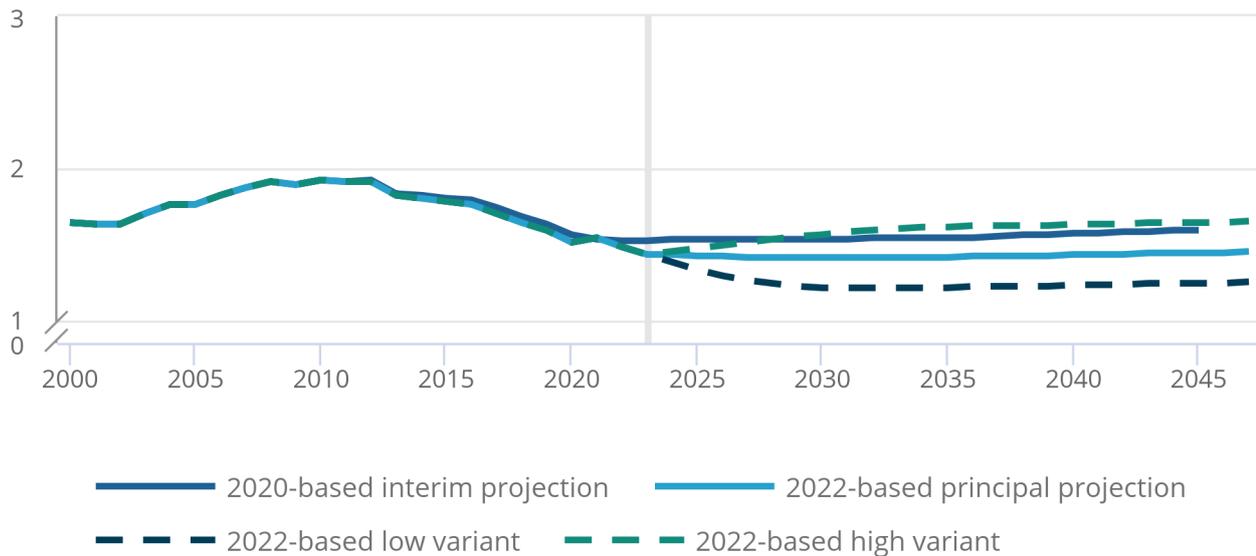
Figure 6 shows the principal, low, and high variants, in comparison with the 2020-based principal assumption. The 2020-based principal assumption was broadly in line with the 2018-based low-variant assumption.

Figure 6: High and low variants were set as 0.2 above and below the principal projection in the long term for the 2022-based fertility assumptions

Past and projected total fertility rates (TFR), 2020-based principal projection and 2022-based principal, low and high fertility variant assumptions, UK, 2000 to 2047

Figure 6: High and low variants were set as 0.2 above and below the principal projection in the long term for the 2022-based fertility assumptions

Past and projected total fertility rates (TFR), 2020-based principal projection and 2022-based principal, low and high fertility variant assumptions, UK, 2000 to 2047



Source: National population projections, fertility assumptions from the Office for National Statistics

Notes:

1. High and low fertility variants were not produced for the 2020-based interim projections.
2. Figures up to 2023 are based on published data.
3. Historical TFRs are lower in the 2022-based assumptions because of census rebasing.

6 . Methodological approach

Principal fertility assumptions

The principal fertility assumptions are set for the short-term (five years from the base year) and the long-term (25 years from the base year).

We started the fertility assumption-setting process by updating our historical period and cohort fertility rates with data up to the base year of the projection. For the 2022-based national population projections (NPPs), we used births data up to 2022 (on a calendar year basis) and the latest available rebased mid-year population estimates up to mid-2022.

A group of fertility experts gave their views on the future trends in fertility via a questionnaire and through discussion at an expert panel meeting. We compiled a list of desired goals for setting the fertility assumptions from the information provided. Our final goals were modified to incorporate the latest fertility rate information for 2023. Further information on the expert panel and desired goals can be found in [Section 7: Expert views on future fertility](#).

Our primary focus was setting the principal fertility assumptions at the UK level. We looked at past trends in the TFRs and age-specific fertility rates (ASFRs), and tried various ways of projecting this forward. After looking at many different options, we decided which scenario was the most plausible, best met our desired goals, and was best supported by the evidence, including the latest fertility rates, and this then became our final approach. We then converted the ASFRs to mid-year by averaging data across two years, before being input into the projections system.

Our final scenario was applied through the projections system. This included constraining the fertility rates in the first year of the projection (year to mid-2023). This ensured that the total number of births for each country matched actual births data provided by the Office for National Statistics (ONS) and the devolved administrations.

The lower number of actual births in the year to mid-2023 resulted in a lower TFR than the expert panel had projected it would decline to by 2027, based on data up to 2022. We mitigated this by incorporating the latest published fertility rates for 2023 into the final scenario.

This scenario for the UK was then applied to each country's data to determine the long-term assumptions for England, Wales, Scotland, and Northern Ireland. National Records of Scotland (NRS), the Northern Ireland Statistics and Research Agency (NISRA), and the Welsh Government reviewed and provided feedback on the assumptions for their respective country via correspondence and committee meetings.

The TFR for Wales diverged from the UK average in the long term when we applied the scenario, against expert opinion. We made an adjustment to reduce the rate of decline in fertility for the 20 to 24 years and 25 to 29 years age groups, with the agreement of Welsh Government. This increased the TFR for Wales in the long term, and better aligned it with the UK average and the 2023 TFR for Wales.

Fertility variant assumptions

We developed potential variant options based on feedback from the fertility expert panel and we presented them to the NPP committee.

Following feedback and further discussions on the potential variants, we selected our final variants. The low variant was set as the principal TFR minus 0.2. The high variant was set as the principal TFR plus 0.1 in the short term, rising to the principal TFR plus 0.2 in the longer term. We applied some smoothing and a short-term run-in to reach these levels.

In the 2016-based and 2018-based rounds of the NPPs, we set the variants as 0.2 below the principal TFR for the low-fertility variant and 0.1 above the principal TFR for the high-fertility variant. We have selected a similar low variant for the 2022-based NPPs. However, the high variant rises in the longer term, which reflects experts anticipating a recuperation of fertility in the long term.

At the UK level, factors were calculated and applied to the principal assumption to achieve each of the high and low variants. These factors were then applied to the projected ASFRs, inflating or deflating these rates by the same proportion for each age within a particular year. We applied these proportions to the UK constituent countries and scaled to meet the target TFRs shown in Table 2. This process is consistent with the method used for setting variants in previous years.

NRS, NISRA and the Welsh Government reviewed and provided feedback on the principal and variant assumptions for their respective country via correspondence and committee meetings. The final principal and variant assumptions for the UK and each country were signed off by the NPP committee in December 2024.

7 . Expert views on future fertility

We convened a panel of UK fertility experts to provide their views on future fertility rates via a questionnaire and at an expert panel virtual meeting.

The questionnaire asked for their views on:

- projected short-term and long-term UK total fertility rates (TFR)
- expected fertility trends between the short-term and long-term TFR
- projected patterns in age-specific fertility rates (ASFRs) for the UK in the short-term and long-term
- low and high variants
- differences in TFRs between the UK and each constituent country
- any factors that may affect fertility (for more information, see the subsection Underlying factors that may influence future fertility)

During the virtual meeting in May 2024, we outlined the method used to set the fertility assumptions, recent fertility trends up to 2022 using the latest published data at the time, and briefly covered the expert's questionnaire responses before discussing future fertility further.

Expected future fertility

We developed our desired goals to use for assessing different projection scenarios based on the fertility experts' questionnaire responses and discussion from the expert panel virtual meeting.

Our initial desired goals, following expert opinion based on data up to 2022, were:

- to aim for 1.46 TFR in the short-term (2027) and for 1.50 in the long-term (2047) at the UK level
- that fertility may decline in the short term as women delay having children, followed by a rise from the late 2020s/early 2030s, reflecting an expected recuperation in fertility as women have children at older ages
- that completed family sizes (CFSs) for the 1980 and 1985 cohorts will exceed CFS levels of the 1965, 1970, and 1975 cohorts
- that age-specific fertility rates (ASFRs) for age groups under 20 years would decline in the short term and stabilise in the long term
- that ASFRs for women in their 20s would decline in the short and long term
- that ASFRs for women aged 30 to 34 years would remain stable throughout the projection
- that ASFRs for women aged 35 years and over would increase in both the short and long term
- that the differences in the TFR of each country, compared with the UK TFR for 2027 and 2047, should remain broadly similar to the differences experienced in 2022

After developing our initial scenarios based on expert opinion, we were able to incorporate the latest fertility data for 2023 in late 2024, which showed a decline. We adjusted the short- and long-term assumptions considering this. We maintained the trends based on expert opinion, while short- and long-term rates were adjusted accordingly. We sought further expert input to ensure the final scenario was the most plausible.

Underlying factors that may influence future fertility

We also asked the fertility experts on their views on the impact of several factors on future levels of fertility. They suggested that:

- the cost-of-living crisis will reduce period fertility in the short term
- climate change will either have a negligible impact on fertility or may reduce fertility, resulting in reduced CFS in the long term
- change to childcare funding will have a limited impact in the short term
- conflicts put a downwards pressure on fertility or have a negligible effect
- there will be minimal or no further impact on fertility levels because of the COVID-19 pandemic in the future
- international migration patterns may influence future fertility levels

8 . Related links

[Births in England and Wales: summary tables](#)

Dataset | Released 23 February 2024

Live births and stillbirths annual summary statistics, by sex, age of mother, whether within marriage or civil partnership, percentage of non-UK-born mothers, birth rates and births by month and mothers' area of usual residence.

[User guide to birth statistics](#)

Article | Last revised 28 October 2024

Supporting information for birth statistics, which present figures on births that occur and are then registered in England and Wales. Figures are based on information collected at birth registration.

[Births in Scotland](#)

Dataset | Released 30 July 2024

National Records of Scotland's births time series data.

[Births in Northern Ireland](#)

Webpage | Updated as new data become available

Northern Ireland Statistics and Records Agency's birth statistics from 1887 onwards.

[Births QMI](#)

Methodology | Last revised 28 October 2024

Quality and Methodology Information (QMI) for live births occurring and registered in England and Wales, detailing the strengths and limitations of the data, methods used, and data uses and users.

[Childbearing for women born in different years QMI](#)

Methodology | Last revised 1 February 2024

QMI for childbearing in England and Wales, detailing strengths and limitations of the data, methods used, and data uses and users.

9 . Cite this methodology

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