

Compendium

# Fertility assumptions



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Release date:  
26 October 2017

Next release:  
To be announced

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# 1 . Introduction

This article provides detailed information on the principal and variant fertility assumptions used in the 2016-based national population projections. For England and Wales the long-term average completed family size is assumed to be 1.85 children per woman, a decrease of 0.05 from the 2014-based projections. Northern Ireland has seen no change from the 2014-based projections; it is still assumed to be 2.00 children per woman. The assumption for Scotland has been reduced from 1.70 to 1.65, a difference of 0.05 from the 2014-based projections.

Completed family size (CFS) is the average number of live-born children per woman which a group of women born in the same year have had by the end of their childbearing years. In general, measurement and analysis of fertility in terms of women born in a particular year is referred to as cohort fertility.

The age-specific fertility rate (ASFR) is the average number of children per woman, born to a group of women of a particular age in a particular year, normally expressed per thousand women.

The total period fertility rate (TFR) is the average number of children per woman that would be born to a group of women if they experienced the current year's age-specific fertility rates for each year of their childbearing years. This measure is referred to as the total fertility rate, or TFR, in this article.

## 2 . Principal assumptions

The numbers of births for the projections are obtained by applying the appropriate fertility rate to the number of women at each age during each year of the projection period. Because cohort fertility rates are more stable than period rates, the fertility rates used in the projections are derived from assumptions relating to the year in which women were born. Cohort fertility rates are more stable because they are affected only by changes in the total number of children women have and not by the timing of births within women's lives. Period rates, the total fertility rate, in contrast, may rise or fall if births are brought forward or delayed for any reason.

The assumptions about completed family size are based on family-building patterns to date and other relevant evidence. Discussion papers showing the background information used in setting the fertility assumptions are available. [Consultation papers](#)

Tables 3.1 to 3.3 show estimated and assumed: average completed family size, births per 1,000 women, achieved family size and average age at motherhood, by year of birth of woman.

**Table 3.1: Estimated and assumed average completed family size for the constituent countries of the UK, women born 1950 to 2020**

	Year of birth of woman														
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	
England	2.06	2.02	1.98	1.91	1.91	1.92 *	1.99 *	2.00 *	1.98 *	1.89 *	1.85 *	1.85 *	1.85 *	1.85 *	
Wales	2.10	2.05	1.99	1.96	1.94	1.92 *	1.95 *	1.99 *	1.98 *	1.88 *	1.85 *	1.85 *	1.85 *	1.85 *	
Scotland	2.08	1.95	1.87	1.80	1.74	1.72 *	1.75 *	1.74 *	1.69 *	1.62 *	1.62 *	1.62 *	1.64 *	1.65 *	
Northern Ireland	2.87	2.65	2.42	2.22	2.11	2.00 *	2.13 *	2.07 *	2.04 *	1.99 *	1.99 *	1.99 *	2.00 *	2.00 *	
United Kingdom	2.09	2.03	1.98	1.91	1.91	1.91 *	1.97 *	1.98 *	1.96 *	1.87 *	1.84 *	1.84 *	1.84 *	1.84 *	

Source:Office for National Statistics

Note :

1. \* Figures are partly or wholly projected

**Table 3.2: Estimated and assumed births per 1,000 women by age and year of birth, UK, women born 1950 to 2020**

Ages	Year of birth of woman														
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020 & later
Under 20	231	221	156	133	152	147	154	135	127	88	64 *	60 *	59 *	58 *	58 *
20 - 24	699	561	527	457	418	361	346	357	338	266 *	246 *	240 *	238 *	238 *	238 *
25 - 29	634	650	630	594	522	469	498	513	492 *	483 *	483 *	483 *	484 *	485 *	485 *
30 - 34	365	403	438	454	466	533	556	554 *	572 *	591 *	599 *	602 *	606 *	606 *	606 *
35 - 39	132	163	190	216	276	316	332 *	336 *	344 *	353 *	357 *	361 *	361 *	361 *	361 *
40 & over	28	36	43	57	71	80 *	86 *	87 *	88 *	90 *	91 *	91 *	91 *	91 *	91 *
Average Completed Family Size	2.09	2.03	1.98	1.91	1.91	1.91 *	1.97 *	1.98 *	1.96 *	1.87 *	1.84 *	1.84 *	1.84 *	1.84 *	1.84 *

Source:Office for National Statistics

Note :

1. \* Figures are partly or wholly projected

**Table 3.3: Estimated and assumed achieved family size by exact age, and average age at motherhood, UK**

Ages	Year of birth of woman														2020 lat
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	
20	0.23	0.22	0.16	0.13	0.15	0.15	0.15	0.14	0.13	0.09	0.06 *	0.06 *	0.06 *	0.06 *	0.06 *
25	0.93	0.78	0.68	0.59	0.57	0.51	0.50	0.49	0.47	0.35 *	0.31 *	0.30 *	0.30 *	0.30 *	0.30 *
30	1.56	1.43	1.31	1.18	1.09	0.98	1.00	1.01	0.96 *	0.84 *	0.79 *	0.78 *	0.78 *	0.78 *	0.78 *
35	1.93	1.84	1.75	1.64	1.56	1.51	1.55	1.56 *	1.53 *	1.43 *	1.39 *	1.38 *	1.39 *	1.39 *	1.39 *
40	2.06	2.00	1.94	1.85	1.83	1.83	1.89 *	1.90 *	1.87 *	1.78 *	1.75 *	1.74 *	1.75 *	1.75 *	1.75 *
45	2.09	2.03	1.98	1.91	1.90	1.90 *	1.97 *	1.98 *	1.96 *	1.86 *	1.83 *	1.83 *	1.83 *	1.83 *	1.83 *
Average completed family size	2.09	2.03	1.98	1.91	1.91	1.91 *	1.97 *	1.98 *	1.96 *	1.87 *	1.84 *	1.84 *	1.84 *	1.84 *	1.84 *
Mean age at motherhood (years)	26.4	27.1	27.8	28.4	28.9	29.49 *	29.61 *	29.69 *	29.89 *	30.52 *	30.80 *	30.88 *	30.89 *	30.90 *	30.90 *

Source: Office for National Statistics

Note :

1. \* Figures are partly or wholly projected

2. The ages of women are presented in 'exact age'. Therefore figures should be interpreted as the average number of children a woman has had up to that actual birthday.

### 3 . Trends in fertility

For the UK as a whole, completed family size showed a sharp decline from an average of around 2.45 children for women born in the mid-1930s to just over 2 for women born in the 1950's. Since then, the completed family size has declined gradually, with women born in 1970, effectively the most recent cohort to have completed their fertility, achieving an average of 1.91 children per woman. Completed family size has decreased similarly across all constituent countries. For the 1970 cohort, Scotland had the lowest completed family size at 1.74 with Northern Ireland recording the highest at 2.11.

For the UK, the family sizes to be achieved by women currently in their twenties or younger are highly conjectural, but there is some evidence that suggests falls in cohort fertility could be slowing down. Women born in 1980 have had more children on average by age 30 than those born in 1975 and, because fertility rates at older ages are projected to remain high, the 1980 cohort is projected to have 1.97 children on average, a higher completed family size than women born in the 1970s. It has been assumed that average completed family size for the UK as a whole will fluctuate and fall gradually for women born after 1980, stabilising at 1.84 children for women born from 2000 onwards.

For England, and for Wales, the long-term average completed family size is assumed to be 1.85 children per woman. A higher level of 2.00 is assumed for Northern Ireland and a lower level of 1.65 is assumed for Scotland. These assumptions have reduced by 0.05 for England, Wales and Scotland compared with the 2014-based projections. Northern Ireland has seen no change from the 2014-based projections.

Between 2002 and 2008, total fertility rates increased in all constituent countries of the UK, followed by a dip in 2009 (see Figure 3.1). England, Wales and Northern Ireland showed some recovery from 2010 until 2013, when all the UK countries saw a large decline in total fertility rates. For England, Wales and Northern Ireland total fertility rates continued to decline from 2013 levels.

The Total fertility rate for Scotland continued to decline after 2009 to 1.52 in 2016, the lowest level since 2003.

In 2016 the total fertility rate was 1.81 in England, 1.74 in Wales and 1.95 in Northern Ireland.

For the UK as a whole the total fertility rate reached 1.79 in 2016, a small decline from 1.80 in 2015.

For the latest projections, it is assumed that there will be a gradual upward trend in the UK total fertility rate, following a small short-term decline before it levels out at 1.84 in the long-term.

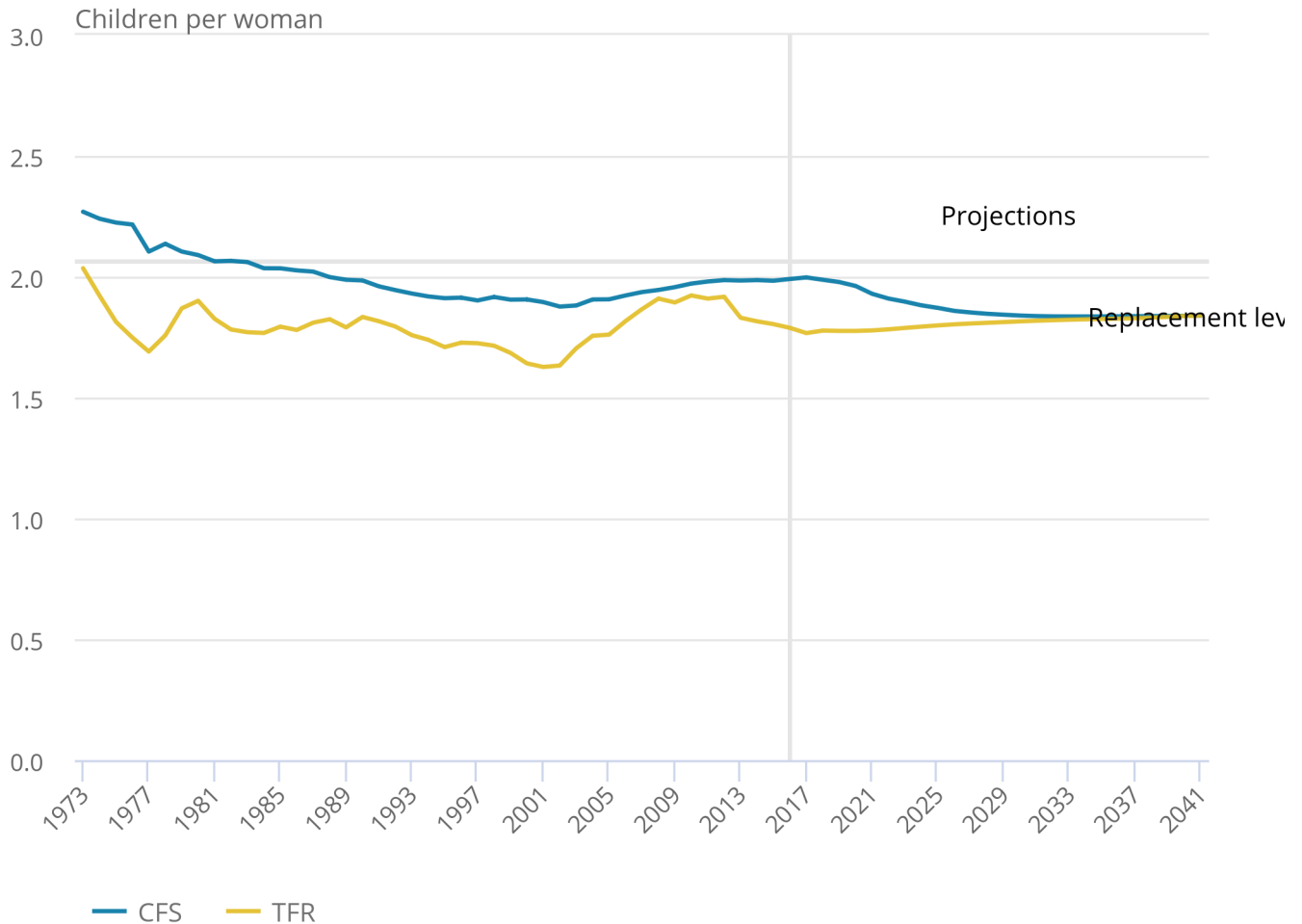
Figure 3.1 shows that for the UK, the total fertility rate in 2017 (the first year of the projection period, which is controlled using the provisional estimates) is not in line with the projection trajectory into the future. This can also be seen for the constituent countries in Figure 3.4. This pattern has occurred because total fertility rates calculated for 2017, which incorporate the latest observed births data, are lower than originally assumed in the projections. The total fertility rate for 2018 comes back into line with the assumed projection trajectory.

Births per 1,000 women have shown declines for all women aged under 30; this trend is assumed to continue, especially at the youngest ages, for future cohorts. Conversely, births per 1,000 women for women aged 30 and over have increased for each cohort and this is projected to continue for future cohorts (Table 3.2).

Over the past fifteen years, fertility rates have generally been rising faster among women in their thirties and forties than for women in their twenties, so mean age at childbirth has continued to rise. The average age at motherhood for the UK is projected to increase from 28.9 years for women born in 1970 to a long-term level of 30.9 for women born from 2002 onwards (Table 3.3)

**Figure 3.1: Total fertility rate (TFR) and average completed family size (CFS) for the, UK, 1973 to 2041**

Figure 3.1: Total fertility rate (TFR) and average completed family size (CFS) for the, UK, 1973 to 2041



Source: Office for National Statistics

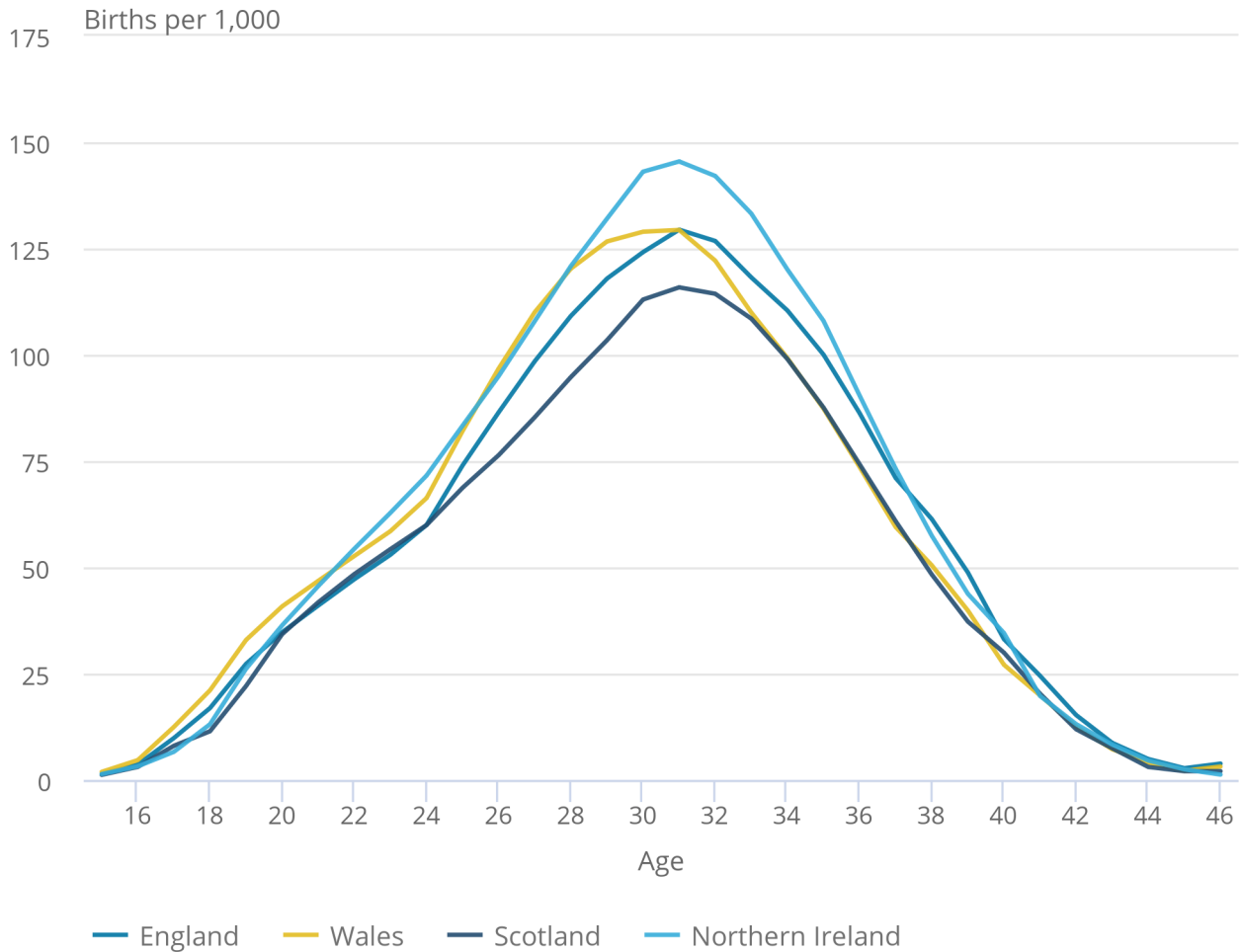
**Source: Office for National Statistics**

**Notes:**

1. All fertility data are displayed on a calendar year basis.
2. Completed family size (CFS) relates to cohort born 30 years earlier, 30 years being the approximate mid-point of the childbearing ages. Projected CFS is given for cohorts who have not yet completed childbearing.
3. Replacement fertility is the level of fertility required for the population to replace itself in size in the long term. In the UK, women would need to have, on average, 2.075 children to ensure long-term “natural” replacement of the population.

**Figure 3.2: Assumed ultimate (long-term) age-specific fertility, UK constituent countries**

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Source: Office for National Statistics

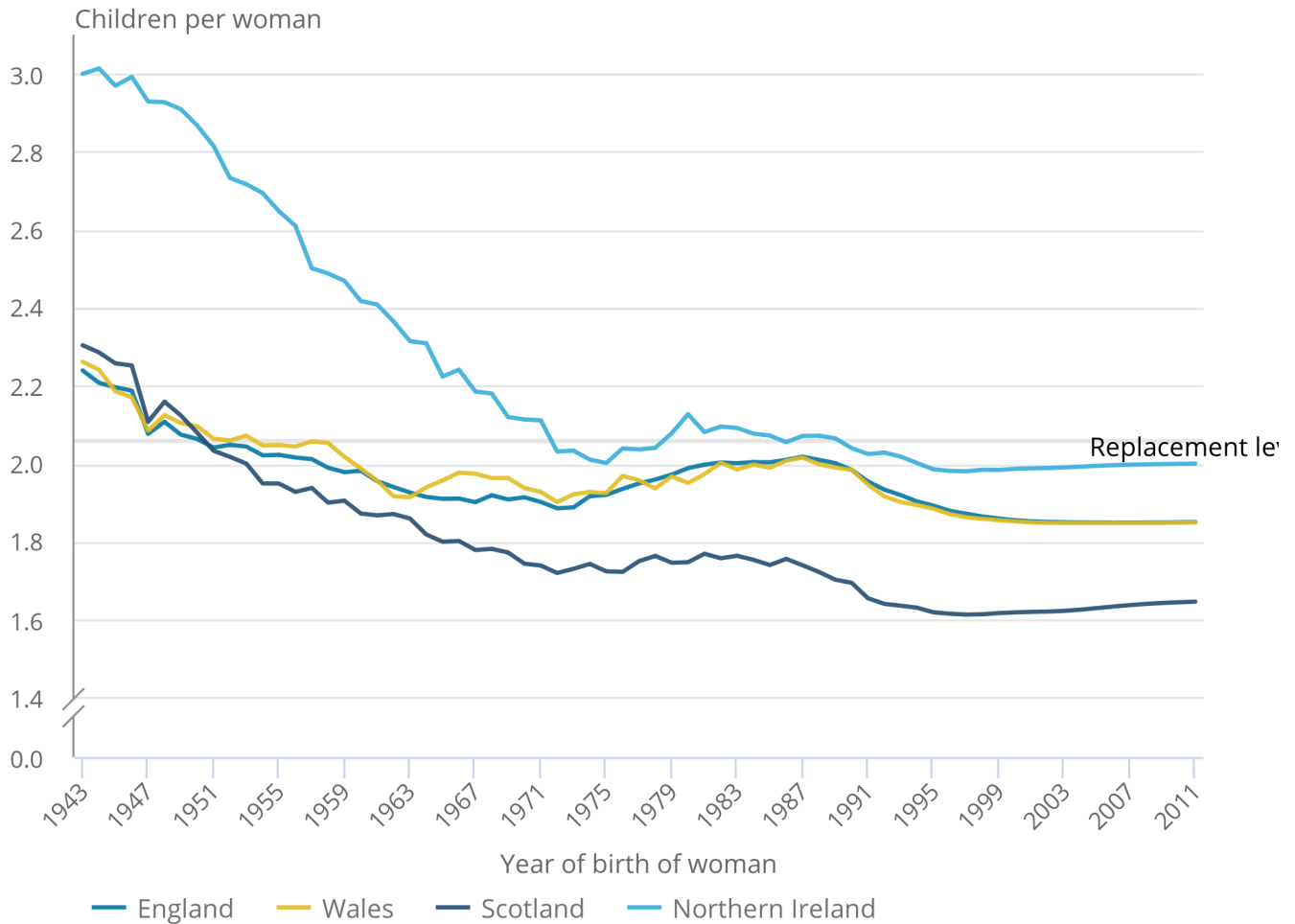
**Source: Office for National Statistics**

**Notes:**

1. All fertility data are displayed on a calendar year basis.

**Figure 3.3: Estimated and assumed average completed family size, women born 1943 to 2011, UK constituent countries**

Figure 3.3: Estimated and assumed average completed family size, women born 1943 to 2011, UK constituent countries



Source: Office for National Statistics

Source: Office for National Statistics

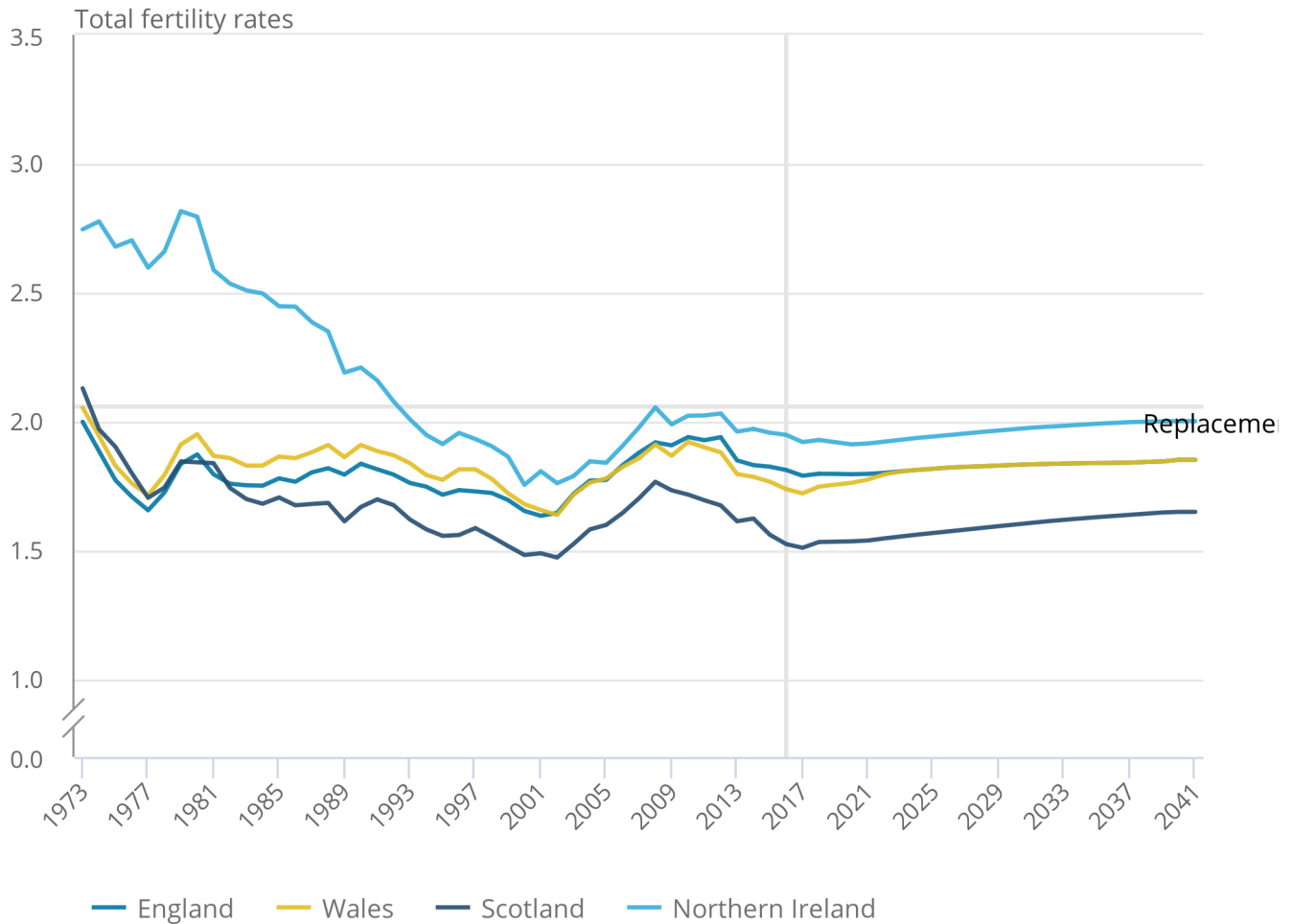
**Notes:**

1. All fertility data are displayed on a calendar year basis.
2. Replacement fertility is the level of fertility required for the population to replace itself in size in the long term. In the UK, women would need to have, on average, 2.075 children to ensure long-term “natural” replacement of the population.



**Figure 3.4: Estimated and assumed total fertility rates, 1973 to 2041, UK constituent countries**

Figure 3.4: Estimated and assumed total fertility rates, 1973 to 2041, UK constituent countries



Source: Office for National Statistics

Source: Office for National Statistics

**Notes:**

1. All fertility data are displayed on a calendar year basis.
2. Replacement fertility is the level of fertility required for the population to replace itself in size in the long term. In the UK, women would need to have, on average, 2.075 children to ensure long-term “natural” replacement of the population.

**Table 3.4: Assumed long-term total fertility rates for the standard variants**

Country	Standard variants		
	High	Principal	Low
England	1.95	1.85	1.65
Wales	1.95	1.85	1.65
Scotland	1.75	1.65	1.45
Northern Ireland	2.10	2.00	1.80
UK	1.94	1.84	1.64

Source: Office for National Statistics

## 4 . Assumptions for fertility variants

Standard variants look at the effect of varying one assumption at a time from the principal projection.

For example, the high fertility variant uses mortality and migration assumptions consistent with the principal projections, but assumes a higher rate of fertility.

History shows that there can be quite sudden changes in period fertility. It is therefore important to demonstrate the effect of significant short-term changes, as well as the long-term effects that would result from sustained levels of fertility significantly above or below that assumed in the principal projection.

For the standard variants, fertility rates are generally assumed to move gradually from current levels to those assumed for the long term.

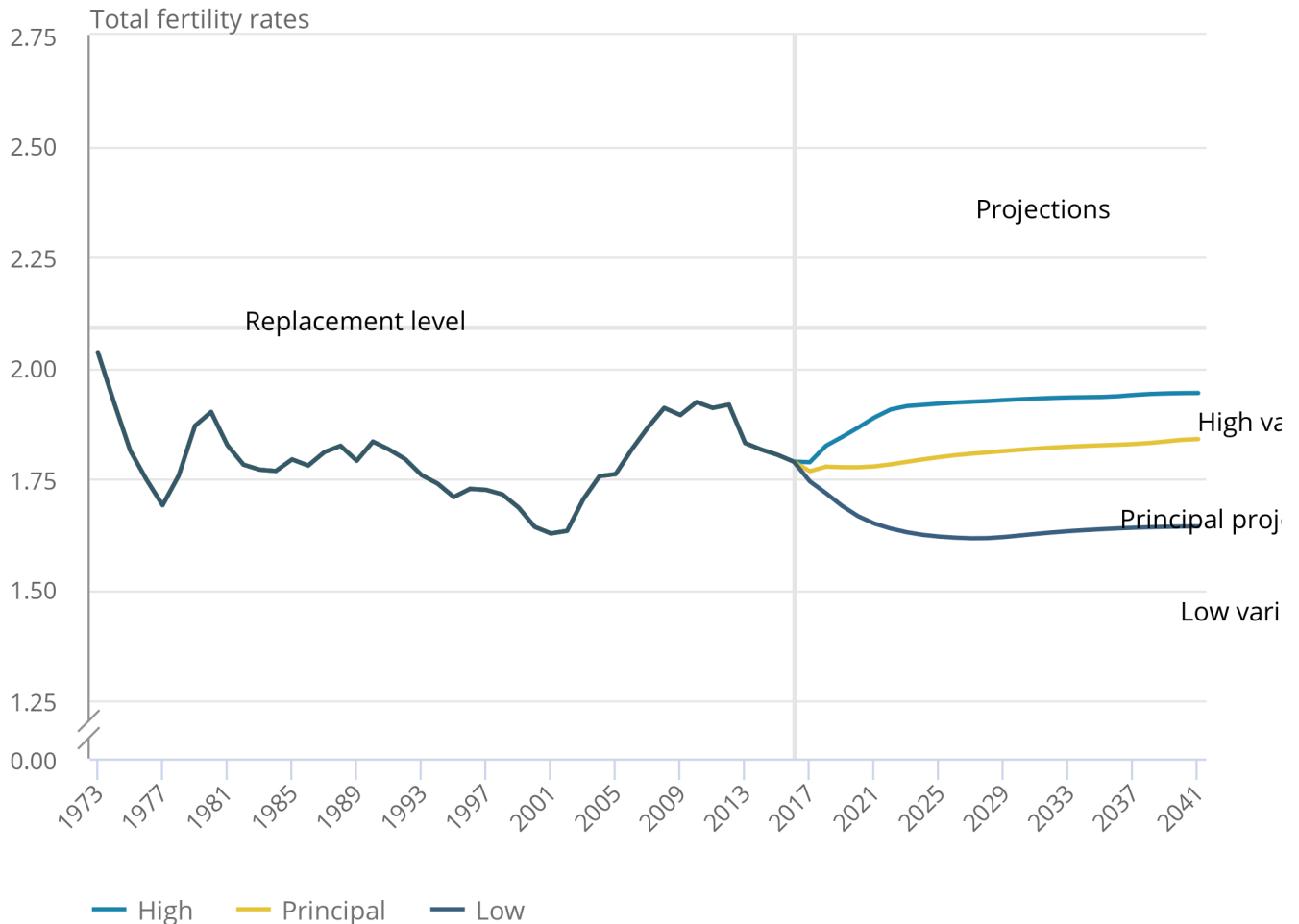
The 2016-based projections are the first to use asymmetric variants for the fertility assumptions.

Figure 3.5 shows that the principal projection assumes the total fertility rate for the UK decreases in the short term from the 2016 level of 1.79 to 1.77 in 2017, then increases gradually over the years. In the long term, the high and low fertility variants assume total fertility rates of 1.94 and 1.64 children per woman for the UK.

Figure 3.5 shows estimated and assumed total fertility rates for the UK between 1973 and 2041 for the principal projection and high and low variants.

**Figure 3.5: Estimated and assumed total fertility rates for the standard variants, UK, 1973 to 2041**

Figure 3.5: Estimated and assumed total fertility rates for the standard variants, UK, 1973 to 2041



Source: Office for National Statistics

Source: Office for National Statistics

**Notes:**

1. All fertility data are displayed on a calendar year basis.
2. Replacement fertility is the level of fertility required for the population to replace itself in size in the long term. In the UK, women would need to have, on average, 2.075 children to ensure long-term “natural” replacement of the population.

## 5 . Background notes

1. Discussion papers showing the background information used in setting the fertility assumptions are available on our website.
2. Details of the policy governing the release of new data are available from the UK Statistics Authority website.
3. These National Statistics are produced to high professional standards and released according to the arrangements approved by the [UK Statistics Authority](#).