



HEREFORDSHIRE
COUNCIL

***POPULATION PROJECTIONS AND FORECASTS
FOR THE COUNTY OF HEREFORDSHIRE***

*2006-based Herefordshire population forecasts:
Focus on births and fertility*

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Version 1

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INTRODUCTION

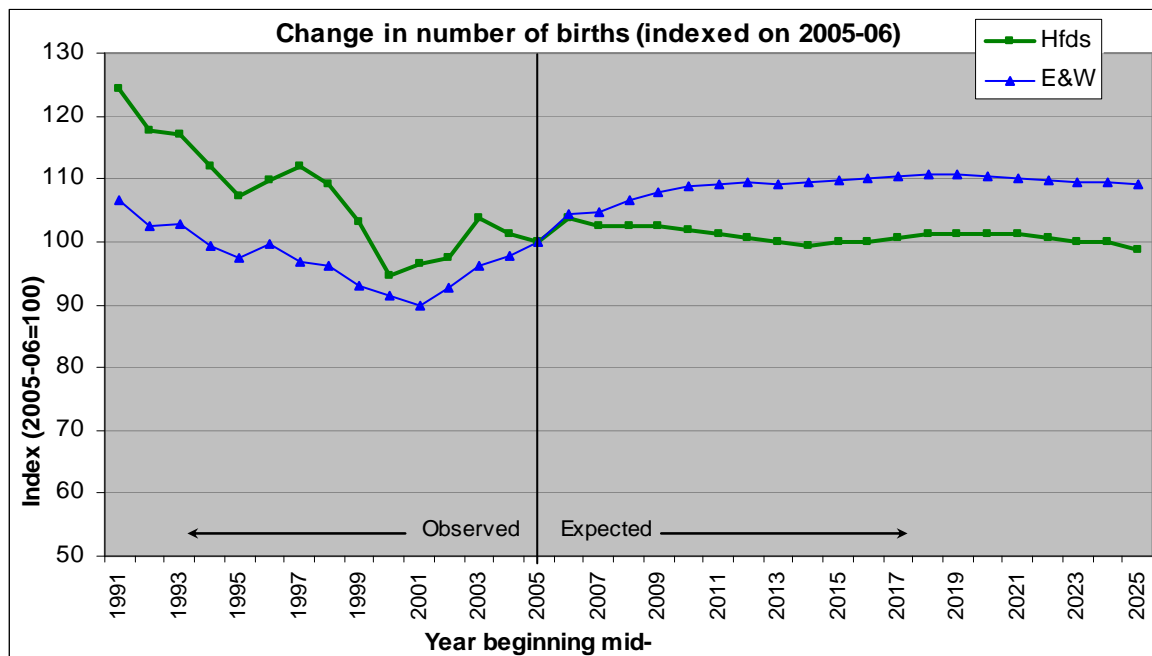
This paper complements the analysis in the *Overview of Results*, providing a detailed look at what is forecast to happen to the number of births in Herefordshire over the twenty years 2006 to 2026, and how this compares to recent years. The reasons behind the forecast numbers are explained by examining predicted fertility rates and the number of women of child-bearing age, and the sensitivity of the forecast numbers of births to changes in the underlying assumptions is considered.

RECENT AND EXPECTED TRENDS IN NUMBERS OF BIRTHS

Numbers of births in Herefordshire have generally been increasing over recent years (since mid-2000), but are still below levels seen in the early to mid 1990s. The left-hand side of the index Figure below (Figure 1) shows the changes in the annual number of births in Herefordshire and England & Wales since mid-1991, relative to the numbers observed in mid-2005-06. By setting the number of births in 2005-06 to the value of 100 for both geographies it is possible to directly compare the relative changes, as obviously there are far more births nationally than in Herefordshire in any one year.

The number of births to mothers resident in Herefordshire in 2005-06 (1,650) was 5.5% higher than in 2000-01 (1,590), but 24.2% below the number in 1991-92 (2,050). This generally reflects national trends, although the fall in England & Wales was less dramatic (a 14.4% decline between 1991-92 and 2000-01 compared to 23.9% over the same period in Herefordshire), with a more rapid increase since 2001-02.

Figure 1: Observed and expected change in numbers of births in Herefordshire and England & Wales, 1991-92 to 2025-26



Source: ONS – Components of Change & 2006-based national population projections; HC Research Team 2006-based population forecasts

The right-hand side of Figure 1 shows how the numbers of births in Herefordshire are forecast to change according to the principal 2006-based population forecast, relative to those observed in 2005-06 (1,650). The forecasts suggest 1,710 births to

Herefordshire mothers in 2006-07¹, with numbers remaining at similar levels to these two years over the rest of the forecast period (between 1,600 and 1,700 per year).

By contrast, the blue line shows that, according to the 2006-based national population projections, the annual number of births in England & Wales is projected to continue to increase before levelling off at around 9 to 11% higher than in 2005-06.

The key point to note when considering both recent and expected births is that the number of births in an area is dependent on two factors: patterns in fertility and the number of women of child-bearing age in the population. The following sections will consider these two components in detail, providing the reasons behind the forecasted number of births in Herefordshire.

UNDERSTANDING 'FERTILITY' – THE NATIONAL CONTEXT

There are two distinct ways of expressing demographic rates: period measures, which consider the events experienced by a group of people in one particular year, and cohort measures, which consider the events experienced by a particular cohort (e.g. all people born in a single year) throughout all years of their life.

These measures with respect to fertility are:

- Period measures: the *total fertility rate* (TFR) for a given year is the average number of children women would have if they experienced the age-specific fertility rates of that year throughout their child-bearing lifespan.
 - *Age-specific fertility rates* (ASFRs) are the number of live births to women of a particular age in a given year, per thousand women of that age in the population. When summed across all ages and divided by one thousand, the ASFRs give the TFR for that year.
- Cohort measure: the *completed family size* (CFS) of a cohort of women born in the same year is the average number of children each woman has had by the time they are 45.

The TFR is probably the most commonly quoted measure of fertility, as this provides a timely indication of current fertility – and it is this which has been reported nationally as rising consistently in recent years.² However, TFR can be affected by changes in the timing of women having children as well as real changes in fertility.

For instance, the low TFRs observed in the UK through the 1980s and '90s can be at least partly attributed to women then in their twenties delaying having children until later in life. The rises since 2001 have been influenced by these women starting to have children – as evidenced by a continuing increase in the average age of having a first child and increasing age-specific fertility rates for women in their thirties. This is not the only reason though, as fertility rates for women in their twenties have also been rising – which possibly suggests that younger women are not delaying their child-bearing as much as in previous years.

¹ This number, forecasted by applying fertility rates to the 2006 mid-year estimate of the number of women in Herefordshire, is very similar to the number of actual births according to provisional data from Herefordshire Primary Care Trust (1,720).

² From a record low of 1.63 children per woman in England & Wales in 2001 to 1.87 in 2006. Source: ONS News Release-*Fertility Rate is Highest for 26 Years*. 7th June 2007; available at: <http://www.statistics.gov.uk/pdfdir/frc0607.pdf>

These recent changes in the TFR and other measures of fertility, and their effects on the assumptions made for the 2006-based national population projections, are discussed in detail in an article in the spring 2008 edition of the ONS' *Population Trends*.³

The article explains that assumptions about future fertility are based on the expected completed family size (CFS) as it is more stable than TFR and only affected by real changes in fertility. The CFS for England & Wales has fallen steadily from 2.42 children per woman born in 1935 to 1.96 per woman born in 1961 (the most recent cohort to reach age 45).⁴ The 2004-based national population projections assumed that this decline would continue before stabilising at 1.75 children per woman.

However, the recent rises in period fertility at all ages (i.e. ASFRs and TFR) have had an impact on the family sizes achieved so far by women who have not yet reached the end of their child-bearing life. Therefore, for the 2006-based national population projections for England & Wales, the assumed level at which CFS will stabilise has been increased to 1.85 children per woman for women born in 1994 onwards. It is important to note that this does not imply an increase in the CFS in future, just that is assumed to fall more slowly – and stabilise at a higher value – than previously expected.

Underlying the assumed future CFS are the assumed age-specific fertility rates; these are projected to rise in the short-term for all ages except teenagers. The most notable change is in the highest rate nationally, that for 30-34 year-olds, which is projected to rise from 108 births per thousand women of this age in 2006-07 to 114 by 2010-11. It is then projected to fall again, to 105 births per thousand women by 2025-26. This subsequent fall is based on the assumption that women who are currently experiencing relatively high fertility in their twenties will experience slightly lower fertility in their thirties than women *currently* in their thirties – to compensate for the earlier higher fertility.

The ASFRs assumed for the 2006-based national population projections for England & Wales are shown in Figure 3 in the following section, where fertility in Herefordshire is compared to the national picture.

FERTILITY IN HEREFORDSHIRE COMPARED TO ENGLAND & WALES – THE ASSUMPTIONS FOR THE PRINCIPAL POPULATION FORECAST

The TFR in Herefordshire over recent years has been marginally higher than that of England and Wales.⁵ There are bigger differences between the local and national age-specific fertility rates: Herefordshire has had notably lower teenage pregnancy rates than nationally, but fertility of women in their twenties has been consistently higher in the county, whilst fertility at older ages has been lower.

These differences are illustrated in Table 2, which shows the actual number of births to women of each age in Herefordshire expressed as a percentage of the number of

³ Jefferies, J. *Fertility assumptions for the 2006-based national population projections*. Another article in the same edition: *2006-based national population projections for the UK and constituent countries*, explains the assumptions underling all components of population change, and the results of the projections.

⁴ Source: ONS, Series FM1: Birth Statistics, No. 35, 2006 (Table 10.2). Available at: http://www.statistics.gov.uk/downloads/theme_population/FM1_35/FM1_No35.PDF

⁵ 1.91 children per woman for Herefordshire in 2006; 1.86 for England & Wales. Please note that TFR can vary slightly due to methods of calculation (e.g. age-groups vs. single year of age). The E&W TFR has been re-calculated for comparison with Herefordshire so may be different to that published elsewhere.

births that would be expected if age-specific fertility rates had been the same in the county as nationally (averaged over the last three years for robustness).

Table 2: Observed births in Herefordshire as % of expected from E&W rates applied to county population, average 2004-2006

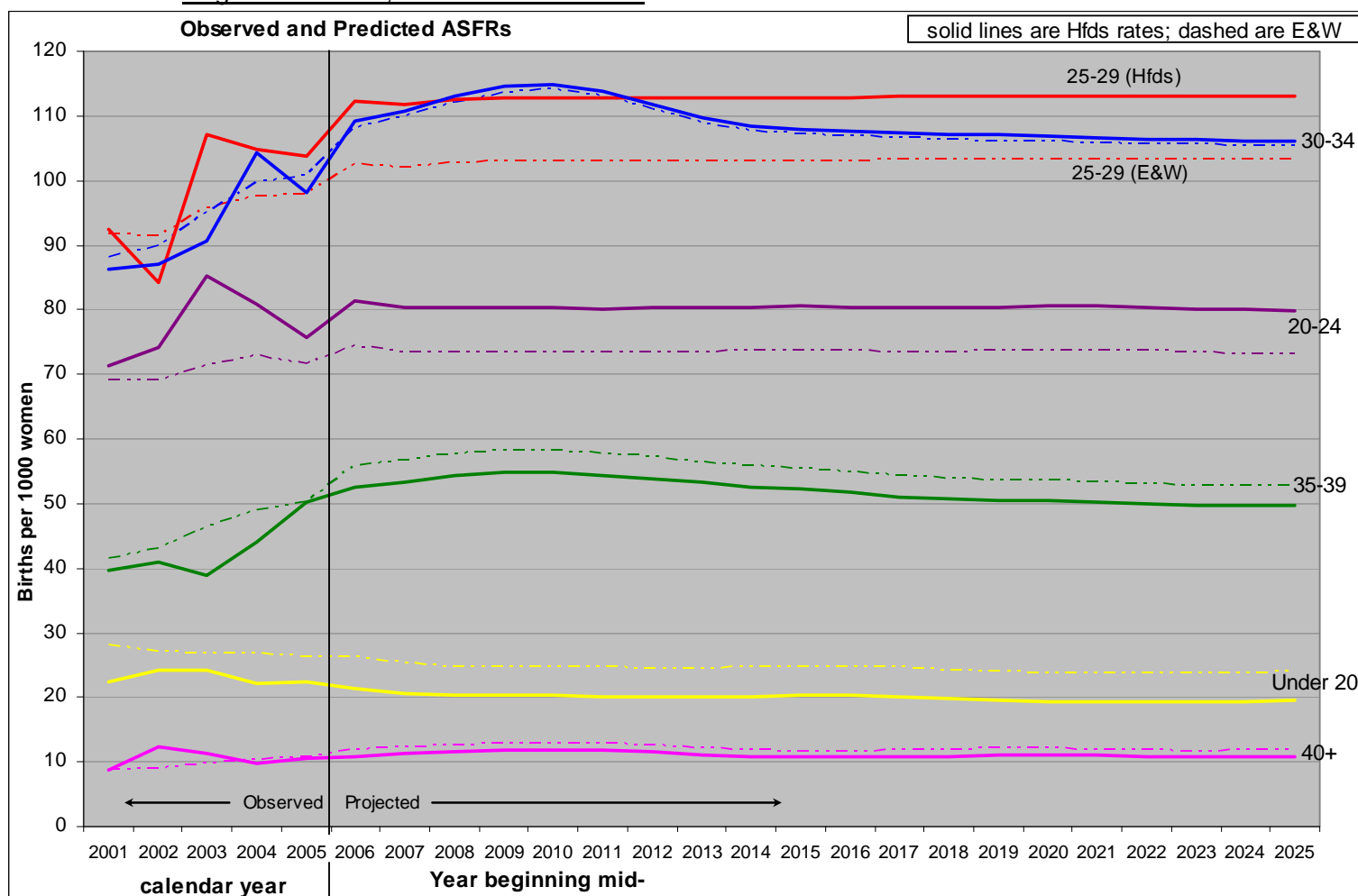
Age	Under 20	20-24	25-29	30-34	35-39	40+
%	81.6%	109.3%	109.5%	100.8%	94.2%	92.0%

The most appropriate way of predicting future fertility in Herefordshire is to assume that age-specific fertility rates will follow nationally predicted trends, but that these differentials will be maintained.

Therefore, the 2006-based population forecasts assume that fertility for women aged 25-29 and 30-34 in Herefordshire, the age-groups that contribute most to overall fertility (as they have the highest age-specific fertility rates), will be higher than in England & Wales over the course of the forecast period.

Figure 3 shows the ASFRs assumed for the Herefordshire 2006-based population forecasts, and how these compare with the assumed national rates. Rates observed in recent years are also shown, but it should be noted that these relate to calendar years and that the local rates are subject to large annual fluctuations due to the relatively small numbers of births.

Figure 3: Observed and projected age-specific fertility rates for Herefordshire and England & Wales, 2001 to mid-2025-26

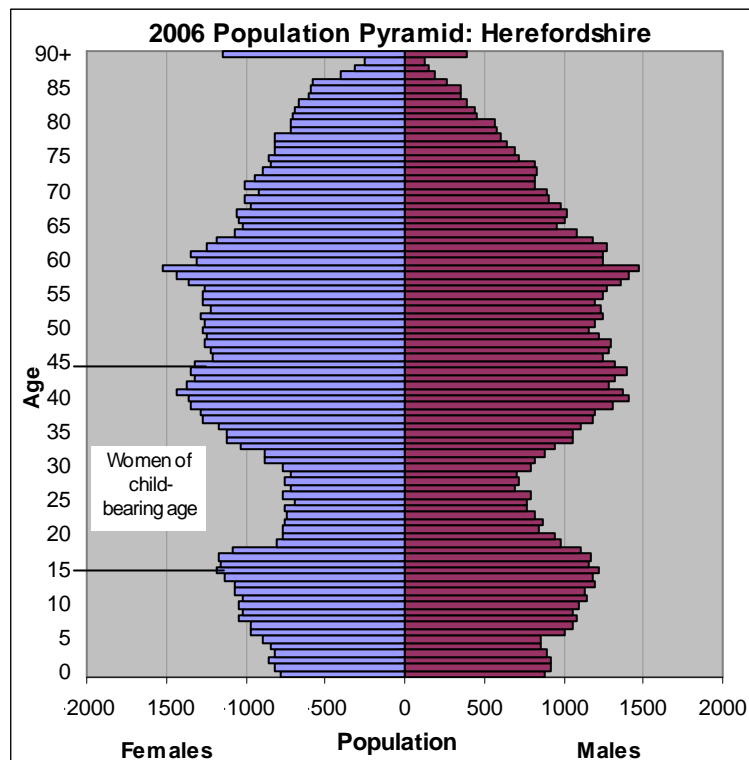


Source: HC Research Team using ONS Vital Statistics & FM1 Births Series; mid-year estimates; national population projections – all Crown copyright.

WOMEN OF CHILD-BEARING AGE IN HEREFORDSHIRE

As mentioned above, the expected number of births in an area in the future is not only dependent on predicted trends in fertility, but also on the number of women of child-bearing age (i.e. 15-44). This consideration is of particular importance in Herefordshire, as the women born in the baby-boom of the 1960s⁶ come to the end of their child-bearing years and will be replaced by a much smaller cohort – as illustrated by the pyramid of the current (i.e. mid-2006) population structure in Figure 4.

Figure 4: Age structure of Herefordshire's current population (numbers), mid-2006



Source: 2006 Mid-year estimates; Population Estimates Unit, ONS. Crown copyright.

The bars in Figure 4 show the number of people of each single year of age living in Herefordshire in 2006, and this forms the basis for the population forecasts. For every year of the forecast period, each bar becomes one year older and expected in-migrants are added whilst expected out-migrants and deaths are subtracted.

The population forecasts assume net in-migration from elsewhere in the UK for all female ages except 18-29 year-olds, and net immigration from overseas for all female ages 15-44 (an increase of just over 50 women of child-bearing age per year).⁷ The numbers of deaths in these age-groups are negligible; the overall effect of is of an increase of females of all child-bearing age-groups except 15-19s.

However, the impact of a net increase due to migration is not expected to be large enough to compensate for the ageing of the 'baby-boomers', with the consequence that Herefordshire's population of women aged 15-44 is expected to decline over the forecast period - from 30,500 in 2006 to 26,400 by 2021, although a small increase is then expected by 2026 (to 26,700).

⁶ http://www.tomorrowproject.net/pub/1_GLIMPSES/Life_course/-544.html

⁷ Full details of the underlying assumptions are given in the accompanying methodology document – see www.herefordshire.gov.uk/research.

This is best illustrated by considering each age-group separately, as in Table 5. The colour-coding tracks each cohort through the twenty year period – changes between each cell of the same colour across columns are due to migration and, to a lesser extent, deaths. Changes to the numbers in each age-group in 2006 and subsequent years are seen by looking across the relevant row. The three right-hand columns show differences between 2006 and 2026.

For example, consider that women who will be aged 40-44 in 2026 are aged 20-24 in 2006, and there are 3,000 fewer women of this younger age living in Herefordshire in 2006 (7th column of Table 5). Despite a forecast boost of 900 more women moving into Herefordshire than die or move out over the twenty year period (8th column), the effect of population ageing is expected to result in a fall of 2,100 in the number of females aged 40-44 between 2006 and 2026 (9th column).

By contrast, consider the 4,900 girls aged 5-9 living in Herefordshire in 2006; as they age through their older teens and early twenties, where more will move out of the county than move in, the size of this cohort is forecast to fall by 800 by the time they are aged 25-29 in 2026. However, this reduction is not enough to cancel out the fact that there are currently (i.e. in 2006) only 3,600 women aged 25-29 living in Herefordshire – 1,300 fewer than those girls aged 5-9 who will be this age in 2026. The net effect is an increase of 500 (1,300 minus 800) in the number of 25-29 year-olds over the twenty year period.

Table 5: Forecast numbers of women of child-bearing age in Herefordshire

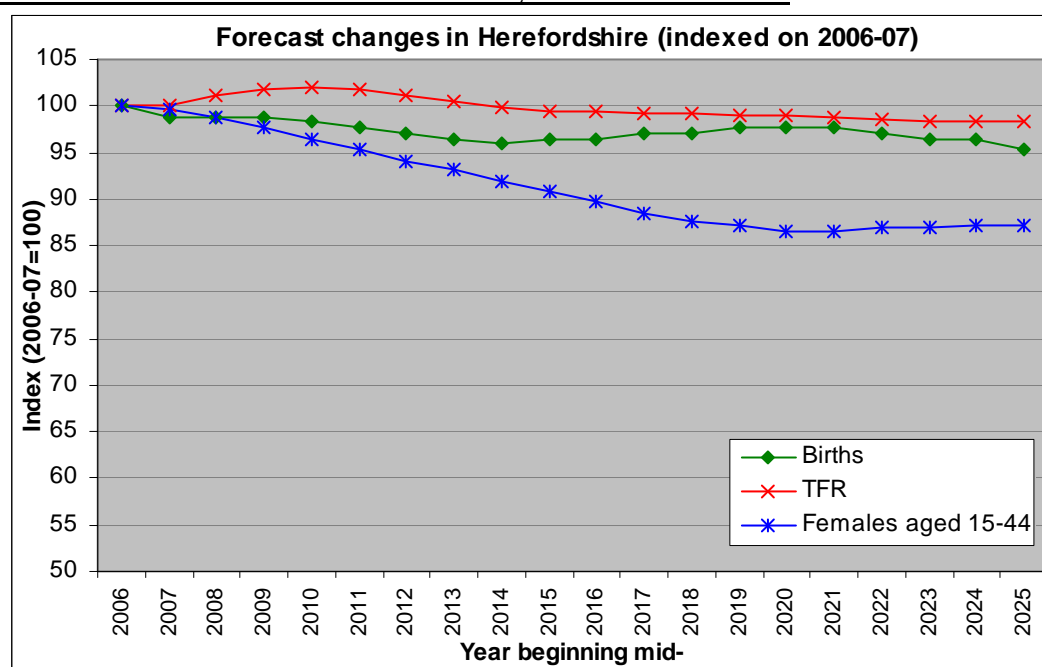
Age-group	Mid-yr estimate	Forecasts				Change 2006-2026		
		2006	2011	2016	2021	2026	Diff. btwn cohort of this age in '06 & cohort in '06 that will be this age in '26	Change to cohort due to death & migration over period
0-4	4,100	4,200	4,100	4,200	4,100	-	-	-
5-9	4,900	4,400	4,500	4,400	4,400	-	-	-
10-14	5,300	5,000	4,500	4,600	4,500	-	-	-
15-19	5,400	5,300	5,000	4,500	4,600	-	-	-
20-24	3,800	4,300	4,200	4,000	3,600	+300	-500	-200
25-29	3,600	3,900	4,400	4,300	4,100	+1,300	-800	+500
30-34	4,700	3,900	4,200	4,700	4,600	+600	-700	-100
35-39	6,200	5,100	4,200	4,500	5,000	-800	-400	-1,200
40-44	6,800	6,500	5,300	4,400	4,700	-3,000	+900	-2,100
15-44	30,500	29,100	27,400	26,400	26,700	*	*	-3,800
20-44	25,100	23,700	22,300	21,900	22,000	+1,600	-1,500	-3,100

* Note it is not possible to calculate these figures as those aged 15-19 in 2026 are not born until after 2006. Source: ONS mid-year estimates (Crown copyright) & 2006-based population forecasts, Herefordshire Council Research Team.

Any population forecast becomes less robust the further ahead it looks, but note the particular difficulty in forecasting the number of women of child-bearing age past 2021, when girls who have not even been born by 2006 will be aged 15-19. Not only are these numbers dependent on assumptions around mortality and migration into and out of the county, but also on births forecast for the five years 2006 to 2011 – which themselves are dependent on the shorter-term assumptions of fertility and migration of women currently of child-bearing age. Nonetheless, the principal population forecast is the best prediction that can be made of the future population of Herefordshire give recent local trends, national expectations, and anticipated housing supply.

As a summary, Figure 6 shows forecast changes for Herefordshire in the total fertility rate (TFR), number of women of child-bearing age and annual number of births; indexed on the respective values for 2006-07. It illustrates how an increase in fertility rates does not necessarily lead to an increased number of births, when the number of women of child-bearing age is expected to fall.

Figure 6: Forecast changes in TFR, number of women of child-bearing age and annual number of births for Herefordshire, 2006-07 to 2025-26



Source: HC Research Team 2006-based population forecasts, except number of women of child-bearing in 2006 (ONS mid-year estimate – Crown copyright).

SENSITIVITY AROUND THE PRINCIPAL POPULATION FORECAST

As explained in the *Overview of Results* paper, although the principal population forecast is the Research Team’s prediction of what is most likely to happen to the population of Herefordshire between 2006 and 2026, a range of variant projections and forecasts have also been produced to facilitate understanding of the sensitivity around this forecast.

Different demographic assumptions

The principal population *projection* forms the basis of the principal *forecast*; the projection is converted into a more realistic forecast by adjusting migration rates between Herefordshire and the rest of the UK (internal migration) to meet anticipated housing provision.

Variant *projections* of the county’s population were produced by altering one or more of the demographic assumptions – i.e. fertility, mortality and migration. Full details of the variant assumptions are discussed in the methodology document; they are in line with the alternative assumptions used for the Office for National Statistics’ 2006-based variant population projections for England & Wales.

However, whilst variant projections can illustrate the sensitivity around the demographic assumptions, only variant *forecasts* can provide a realistic alternative

picture of the possible future population. This is because future housing provision necessarily affects migration to the county.

Due to the amount of work involved, it is not feasible to convert every variant projection into a forecast, with migration constrained to the principal housing assumption of 16,600 new dwellings (net) between 2006 and 2026.

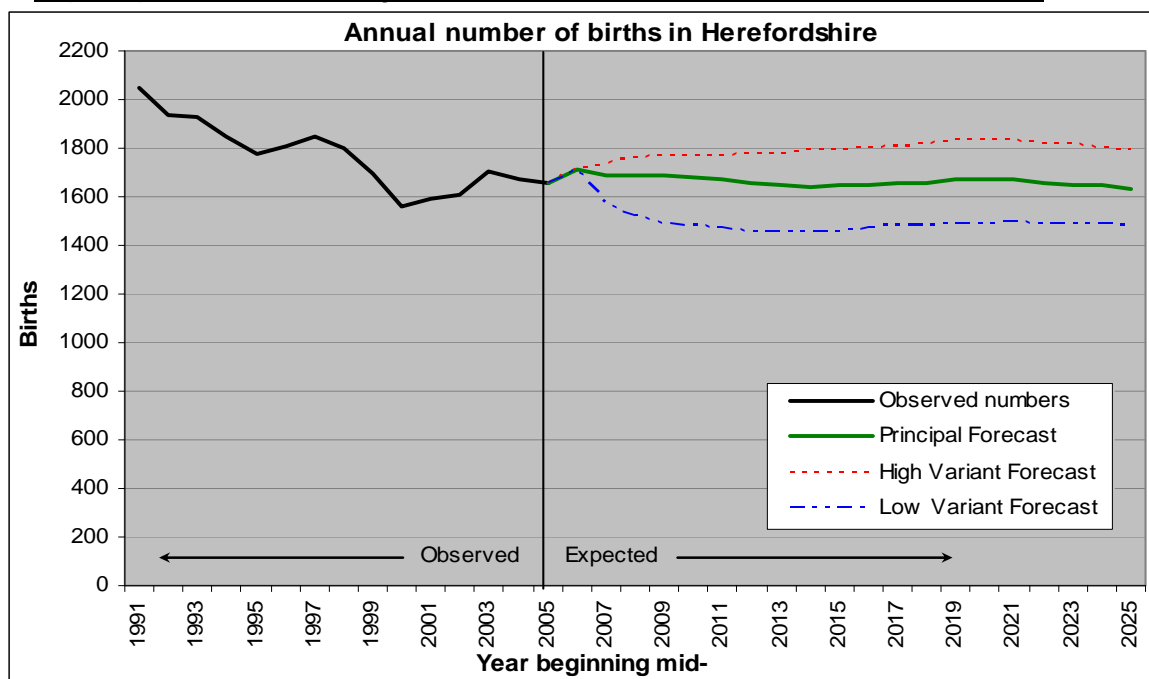
Therefore, a 'high' and a 'low' population forecast have been produced to give an indication of how sensitive the principal forecast is to changes in the demographic rates – although they are *not* intended to be upper or lower limits of what the future population might be. The former assumes high fertility rates and net immigration combined with low mortality rates; the latter the opposite. The starting point for internal migration is the principal assumption of average age-sex-specific rates observed over the last three years, but these are then adjusted to meet the anticipated housing supply.⁸

Figure 7 shows the annual number of births according to these 'high' and 'low' variant forecasts compared to the principal forecast; observed numbers from mid-1991 are included to put the figures over the forecast period into context.

Under the assumptions of the 'high' variant forecast the annual number of births in Herefordshire would be expected to continue to increase from the 1,710 observed in 2005-06 and then level off at around 1,800 per year. However, this would still be below the numbers observed in the early to mid-1990s.

If the assumptions underlying the 'low' variant forecast were realised, Herefordshire's annual number of births would be expected to fall after the first year of the forecast period (mid-2006-2007), to level off at around 1,500 per year.

Figure 7: Annual number of births in Herefordshire; observed and forecast according to principal forecast and high and low variant forecasts, mid-1991 to mid-2025



Source: ONS Components of Change, Crown copyright; HC Research Team 2006-based population forecasts using ONS mid-year estimates & rates.

⁸ Net international migration to Herefordshire is relatively low (see methodology paper and appendix to *Overview of Results*), so it is assumed not to be affected by housing supply.

Higher housing provision

The levels of new housing development in Herefordshire between 2011 and 2026, when the adopted Unitary Development Plan (UDP) comes to an end, will be determined in the West Midlands Regional Spatial Strategy (RSS).

The current (phase 2 revision) Preferred Option would see 16,600 new dwellings (net) built in Herefordshire between 2006 and 2026, and this is taken as the housing level to which migration is constrained for the principal population forecast.

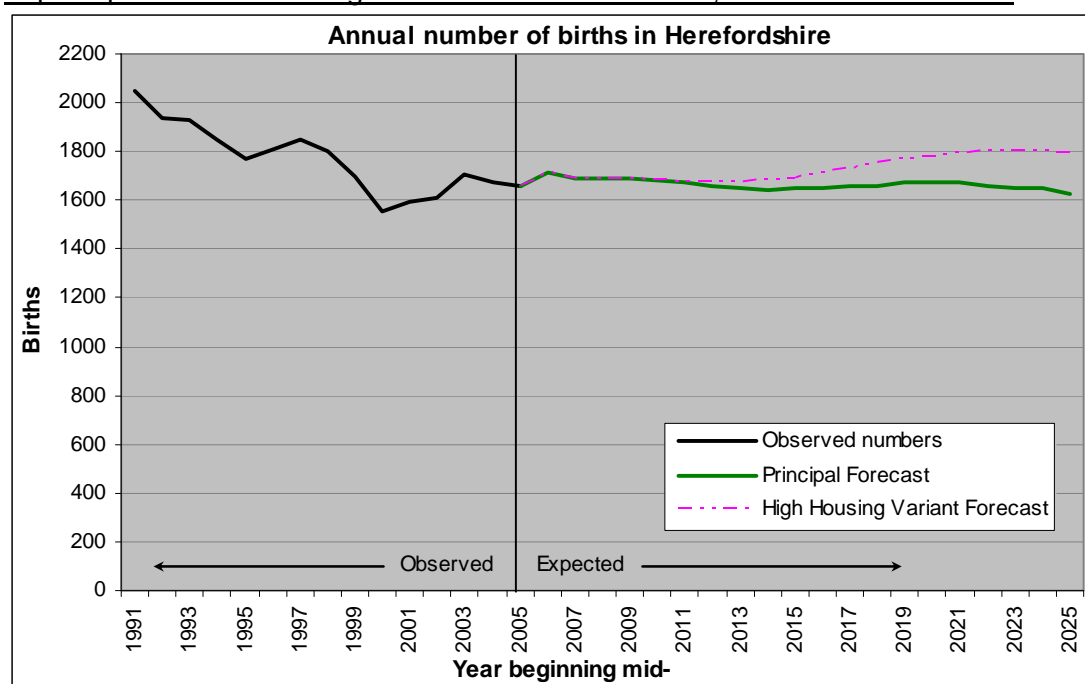
However, the Government are currently considering the feasibility of higher housing numbers in the West Midlands region, in response to a report by the National Housing and Planning Advice Unit (NHPAU). This work will not be completed until at least 2009, so it is impossible to know what this would mean for Herefordshire. Nevertheless, taking the NHPAU's "high point" target and distributing the extra across the region in the same proportions as the current allocations would suggest the county could have 20,880 new dwellings (net) over the twenty years of the RSS.

A 'high housing' forecast has been produced by adjusting the migration rates assumed for the principal population projection to meet this higher level of housing supply. Annual numbers of births according to this forecast, compared with the principal forecast and numbers observed since 1991 are shown in Figure 8.

There is no difference to 2011 because housing supply under the UDP is already determined, but the extra 4,280 dwellings under the 'high housing' variant forecast would suggest gradually increasing annual numbers of births from this point onwards, which would level off at around 1,800 from mid-2020.

The fertility, mortality and immigration assumptions for the 'high housing' variant are identical to those underlying the principal population forecast. Therefore the higher numbers of births forecast under this variant would be entirely driven by higher net in-migration of females of child-bearing age from elsewhere in the UK.

Figure 8: Annual number of births in Herefordshire; observed and forecast according to principal forecast and high and low variant forecasts, mid-1991 to mid-2025



Source: ONS Components of Change, Crown copyright; HC Research Team 2006-based population forecasts using ONS mid-year estimates & rates.