



HEREFORDSHIRE
COUNCIL

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

Full methodology for the 2006-based projections and forecasts
of Herefordshire's population to 2026

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INTRODUCTION

Herefordshire Council's Research Team produces population projections and forecasts for the county of Herefordshire using the cohort survival method, with calculations performed by Manchester University's POPGROUP software.

Population *projections* are based on recent local and nationally predicted trends in births, deaths and migration – i.e. estimates of what could reasonably be expected to happen to the population of an area if recent trends were to continue, without taking into account any known local factors that may affect these trends in future.

Population *forecasts* for Herefordshire use these same assumptions, but also take into account anticipated housing provision over the course of the forecast period. Prior to these 2006-based forecasts, it has not been possible to forecast past 2011 – the end of the existing Unitary Development Plan. Emerging figures from the Regional Spatial Strategy have enabled the 2006-based forecast period to be extended to 2026.

Since the local population projections are used as the basis for the forecasts, the former have not been published in previous years. The forecasts are still the “best estimate” of what is expected to happen to Herefordshire's population, but a range of “variant” projections and forecasts have also been produced to provide an indication of how sensitive these are to changes in the underlying assumptions – both in terms of future changes in fertility and mortality and policy decisions regarding housing supply.

This paper presents the methodology involved in producing population projections first, and then forecasts, for the county of Herefordshire. The processes involved are presented in flowcharts (Flowcharts A & B), followed by numbered sections detailing the considerations made and data used in determining assumptions and rates at particular stages. The numbers on the flowcharts correspond to these sections.

All counts and rates used in the modelling process are either published by the Office for National Statistics (ONS) or the Department for Communities and Local Government (CLG), or are derived from such data.

The projections and forecasts are based on the concept of ‘usual residence’ used for all ONS population estimates and projections, where a person is counted in the population of the area in which they usually live. As population estimates are based on the national census, this is self-defined to some extent, but of particular interest for Herefordshire is that:

- Students are counted at their term-time address rather than their family home; and
- An international migrant is defined, as per the UN definition, as someone who changes their country of residence for at least a year.

ONS also produce sub-national population *projections* (SNPPs) for local authority districts. When the 2006-based Herefordshire Council forecasts were produced the most recent SNPPs were based on the revised 2004 mid-year estimates of population.¹ These 2004-based SNPPs used assumptions based on observations in fertility, mortality and migration in the five years prior to 2004 and future trends predicted by the Government Actuary's Department (GAD) in their 2004-based national population projections.² The 2004-based projection of Herefordshire's population in 2006 was 178,500; 700 higher than the mid-2006 *estimate* of the population of the county.

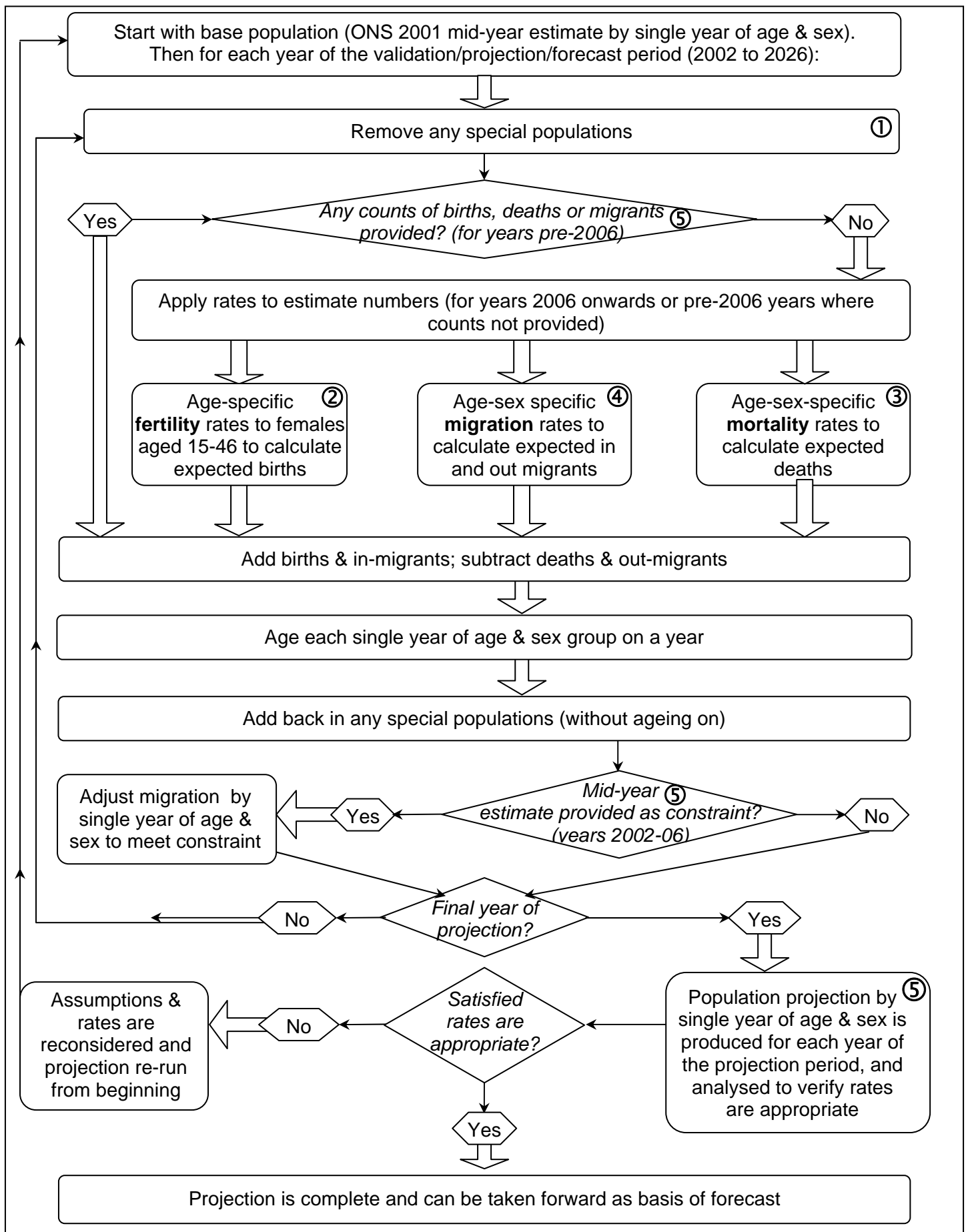
The Research Team methodology described in this paper takes account of trends predicted in the more up-to-date, 2006-based national population projections and gives more weight to recent observations in births, deaths and migration in Herefordshire by using data for the three years prior to 2006.

¹ The population estimates from mid-2001 onwards were revised in Aug-07; the 2004-based SNPPs (originally published in Oct-06) were revised a month later for consistency with the revised estimates for mid-2004. A new set of SNPPs (2006-based) were published in Jun-08. Details of all SNPPs can be accessed from: <http://www.statistics.gov.uk/statbase/Product.asp?vlnk=997>.

² These were the last projections produced by GAD; as of Jan-06 the responsibility passed to ONS.

POPULATION PROJECTIONS FOR HEREFORDSHIRE

Flowchart A: Process of producing county level population projections



SECTION 1: SPECIAL POPULATIONS

A 'special population' is a group for whom it is not appropriate to apply the standard fertility, mortality and migration rates and/or age on. The most common special populations are students in areas with higher education establishments (unlike Herefordshire) or Armed Forces in areas with military bases (like Herefordshire).

Although not necessary in a county such as Herefordshire with no large higher education establishment, the case of a student population illustrates well the reasoning behind modelling special populations separately. If the starting population contains a disproportionately large number of 18-21 year-olds due to a university, it would not be appropriate to age this group through the period of the projections, as this would result in a disproportionately large number of 38-41 year-olds in twenty years. Rather, it is assumed that these 18-21 year-olds will be replaced with the same number (or different if such information is known) of 18-21 year-olds each year.

Armed Forces

Armed Forces personnel are often treated as special populations, and have been in previous Herefordshire population forecasts. However, this was decided to not be appropriate for the 2006-based population forecasts. The reasons why are explained below.

The 2001 Census indicated that there were 950 residents of Herefordshire employed in the Armed Forces (AF), and 719 of these were a Household Representative Person (HRP). These 950 AF personnel had 1,421 'associated persons'³ living in their households.

The personnel living in communal establishments at Hereford Garrison at the time of the census (around 70) were not included in the census, and therefore do not feature in subsequent population estimates. As this number has minimal impact on the total population of the county, they are not considered further for forecasting purposes.

Those personnel and associated persons living in around 55 married quarters households were included in the census. Earlier forecasts⁴ estimated the age-sex structure of personnel and their dependents living in these households, using the assumption that they have the same structure as all 719 AF-headed households in the county. The resulting 164 people⁵ were treated as a 'special population' in the forecasting model, i.e. they were removed from the starting population each year, and then added back in at the same age once the remainder of the population had been aged on and appropriate rates applied. This is done on the basis of the assumption that people with broadly the same characteristics would be likely to move in and out of this accommodation.

In the earlier forecasts, the view was taken that the remaining 895 personnel and their 1,312 associated persons should not be treated as a special population; this would assume a rapid turnover of this entire group, which isn't considered appropriate in Herefordshire. Instead they were left in the base population and aged on, with the standard rates applied.

The Components of Change supplied by ONS gives the annual change in the number of UK and foreign AF resident in Herefordshire, as supplied by the Defence Analytical Services Agency (DASA). This includes the dependants of foreign AF, but not UK AF, as moves by the latter should be captured in the internal migration estimates based on GP registrations. There was little change in the number of AF resident in Herefordshire between 2001 and mid-2004, but an increase of 250 between mid-2004 and mid-2006.

³ An associated person is a spouse, partner, child or step-child of a member of the AF living in a household with them; they are not classified as 'dependents' as the AF member is not necessarily the 'Household Representative Person' for Census purposes.

⁴ 2002, 2004 and 2005 based.

⁵ 55 AF personnel and 109 associated persons.

No detail is known about the age-sex structure of these 250, or whether they live in married quarters or in private households. Attempting to model them into the special population would require either:

- further information about any changes in the numbers of married quarters (which was not feasible for the timescales for the 2006-based forecasts), then assuming that the AF personnel in any new units have the same age-sex distribution as all AF household heads in the county in 2001 (recall the extra 250 does not include dependents – these should have been counted in the population estimates in the estimates of in-migrants to Herefordshire);
- extending the previously used special population to include the extra 250 AF and those AF and ‘associated persons’ living in private households in 2001, and using the census age-sex distribution to estimate their structure.

Either of the above would involve making several potentially inappropriate assumptions so, for simplicity, it was decided to not treat any of the AF as a special population for the 2006-based forecasts. This has the effect of allowing an estimated 52 under 16s living in the married quarters in 2001 to move up through the school system and be subject to mortality, fertility (when appropriate) and migration rates. It also allows an estimated 44 16-44 year-old women to be aged on, and subjected to the appropriate fertility rates.

Other special population

Analysis of the 2001 census showed that the imputation process⁶ used in the compilation of the data had added 40 21-year-old and 81 23-year-old non-existent males to a very rural part of Herefordshire. These males will be included in all ONS population estimates up to 2011 (the time of the next census).

As they don't exist, they cannot die or migrate, so have been treated as a special population for the life of the previous and 2006-based forecasts. For each year of the forecast, these extra males are removed from the starting population, aged on a year and then added back in once the appropriate rates have been applied to the remainder of the population.

They were also removed from the base population (i.e. mid-year estimates) when calculating age-specific internal migration rates. There was no need to consider them separately in the calculation of mortality rates as the standard England and Wales mortality rates are used for all ages under 55 due to the small numbers of deaths in Herefordshire at younger ages.

⁶ Because some people and households were missed by the Census, details about them were estimated (“imputed”) using information about similar types of people and households: <http://www.statistics.gov.uk/census2001/basics.asp>. A more detailed account of Census coverage can be found at: <http://www.statistics.gov.uk/CCI/article.asp?ID=565&Pos=&ColRank=1&Rank=224>
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SECTION 2: FERTILITY RATES

The births expected in each year of the projections/forecasts are calculated by applying age-specific fertility rates (by single year of age) to the expected number of females of child-bearing age⁷ in that year.

The age-specific fertility rates used in the Herefordshire projections follow current (i.e. 2006-based) national assumptions regarding future trends in fertility, but local age-specific differentials are applied to reflect slightly different patterns of births in Herefordshire (i.e. slightly more births to women of younger ages – except teenagers – and slightly fewer to older women).

The proportion of projected births each year that are boys is the average ratio of boys to girls in Herefordshire since 1991, i.e. 1,070 boys for every 1,000 girls born (rounded to the nearest ten).

Source of rates:

- Age-specific fertility rates from ONS 2006-based national population projections for England & Wales (rates provided for single-year ages 15-46).
- Local age-specific differentials calculated using:
 - Births by age of mother by 5-year age-groups; calendar years 2004-06 (ONS: 'Vital Statistics 4' for Herefordshire, FM1: Births Series for E&W);
 - ONS mid-year estimates of population for 2004-2006, for Herefordshire and E&W

Basis of assumptions for future: As there is no evidence to suggest that age-specific fertility in Herefordshire will not follow national trends, ONS (2006-based) projected age-specific trends in fertility for England & Wales are assumed. Also, as there is no evidence to suggest otherwise, the local age-specific differentials are assumed to remain constant throughout the projection period.

Determination of differential(s):

The detailed stages in determining whether to apply a differential are:

- Calculate observed annual age-specific fertility rates for E&W by dividing number of births by number of women, 2001-2006;
- Apply these rates to Herefordshire's female population of child-bearing age to calculate the number of births that would be expected in Herefordshire each year 2001-2006 if E&W rates were appropriate;
- Over 3-year periods (for robustness), calculate the ratio of these expected numbers to the actual number of births that occurred within each age-group;
- If there were consistently more or fewer births than would be expected given the national rates, use the ratio of observed to expected for each age-group over the most recent 3-year period (i.e. 2004-2006) as the differential to apply to the national rates.

For the 2006-based Herefordshire population projections, the above analysis showed that births to younger women (with the exception of those under 20) in Herefordshire were consistently higher between 2001 & 2006 than would be expected given national rates; and births to older women consistently lower. Therefore the weights shown in Table 1 were applied to the national rates.

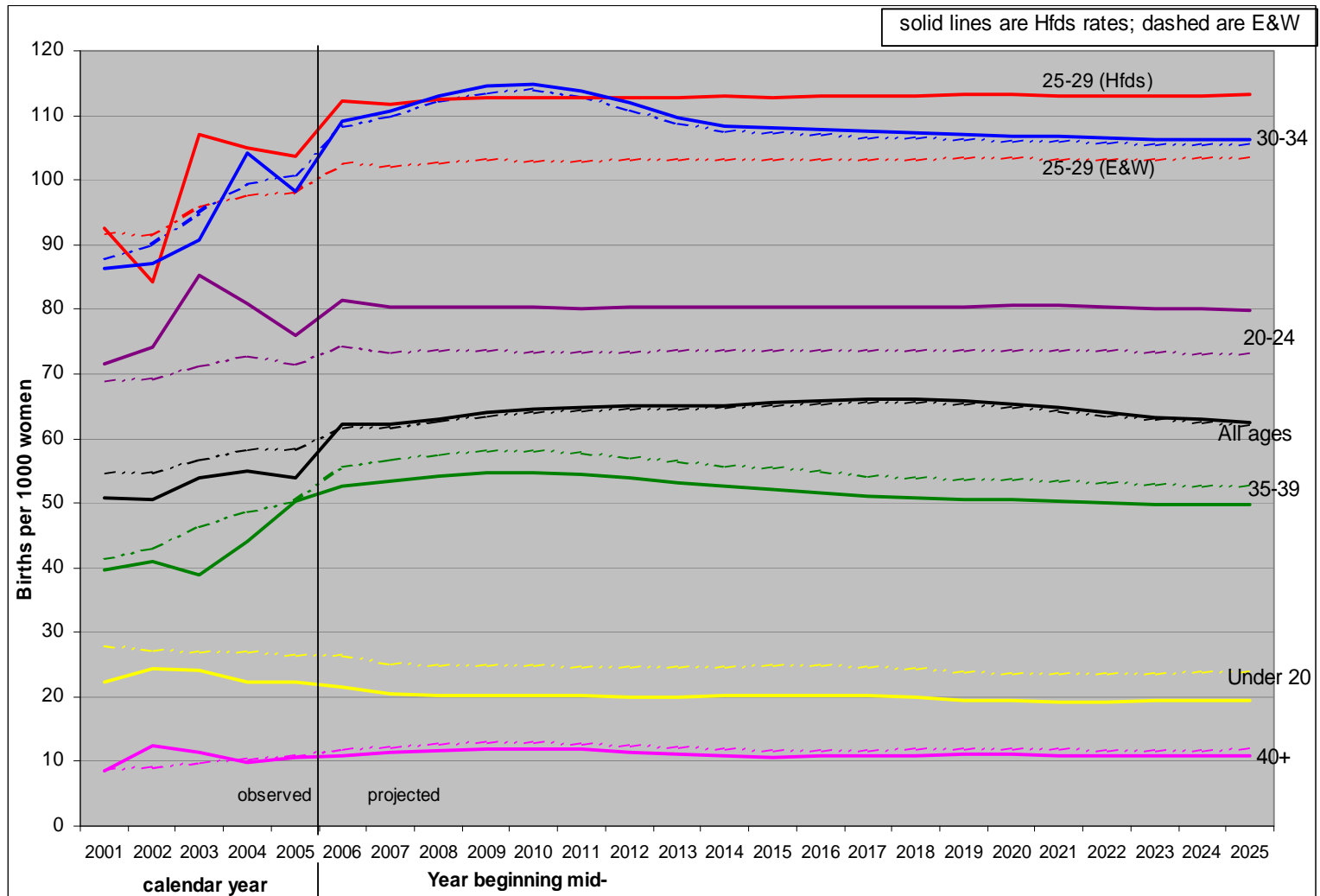
Table 1: Observed births in Herefordshire as % of expected from E&W rates applied to county population, average 2004-2006

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

⁷ Rates are provided for ages 15-46, but it is standard practice to define 'child-bearing age as 15-44.
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Figure 2 illustrates the recent and assumed future age-specific fertility rates, and shows the relative effect that the differentials have on the assumed fertility rates for Herefordshire when compared to the standard rates for England and Wales as a whole.

Figure 2: Observed & projected age-specific fertility rates, Herefordshire and Eng. & Wales



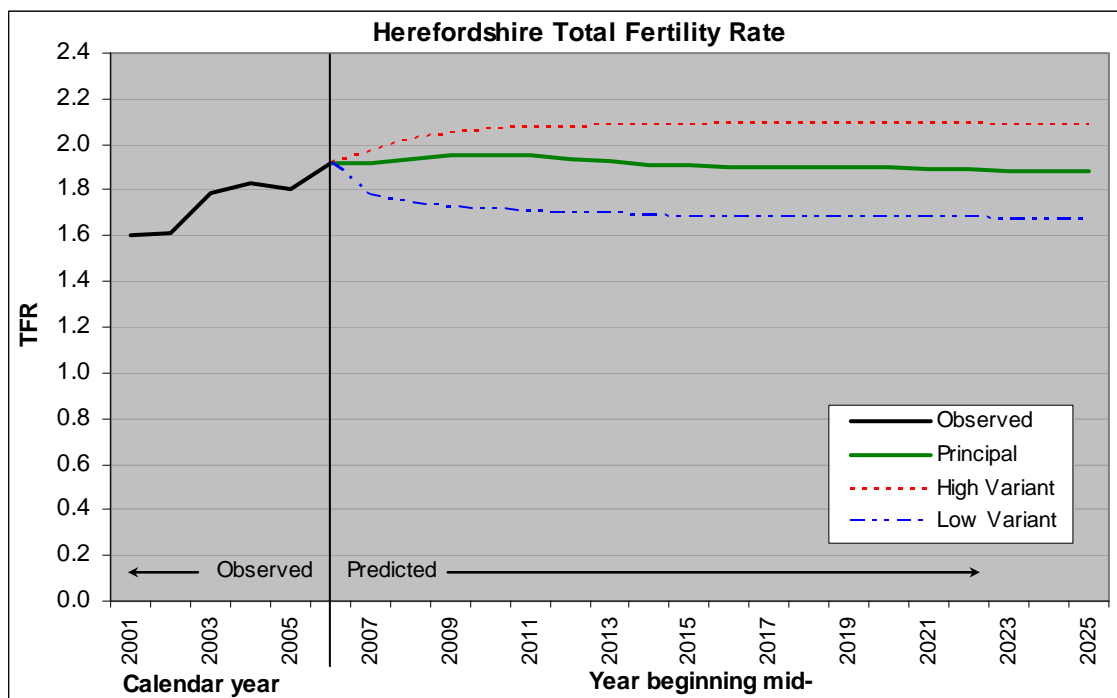
Source: HC Research Team using ONS Vital Statistics & FM1 Births Series; mid-year estimates; national population projections – all Crown copyright.

Variant fertility assumptions: ‘High’ and ‘low’ variants of the projected age-specific fertility rates follow the trends assumed in the variants for England & Wales (supplied by ONS on request), with the local differentials discussed above applied throughout the projection period.

Figure 3 shows the differences in the annual total fertility rate (TFR) between the high, principal and low variant assumptions for Herefordshire along with those observed in recent years. The TFR for a given year is the average number of children that would be expected per woman if they experienced the fertility rates of the year in question throughout their child-bearing lifetime. Although it is a useful summary statistic, it can be affected by changes in the timing of women having children rather than a real change in fertility levels.⁸

The effect of the local differentials is that the assumed TFRs for Herefordshire are between 0.01 and 0.05 children per woman higher than the comparable rates for England & Wales over the twenty years.

Figure 3: Observed & projected (high, principal and low variants) Total Fertility Rate, Herefordshire



Source of data: Herefordshire Council Research Team, using data from ONS' National Population Projections Unit (supplied on request); Population Estimates Unit; Vital Statistics Output Branch. ONS data is Crown copyright.

⁸ The TFR and other fertility measures are discussed in the following ONS article: Smallwood, S (2003) Fertility assumptions for the 2002-based national population projections. *Population Trends* 114. Available at: http://www.statistics.gov.uk/downloads/theme_population/PT114.pdf

SECTION 3: MORTALITY RATES

The deaths expected in each year of the projections/forecasts are calculated by applying age-sex-specific mortality rates (by single year of age) to the expected number of males and females of each age in that year.

Assumed age-sex-specific mortality rates used in the Herefordshire projections follow current national assumptions regarding future trends in mortality, but local differentials are applied to the rates for ages 55+ to reflect slightly different patterns of deaths by age and sex in Herefordshire (i.e. fewer deaths than would be expected from national rates for all age-sex groups except males aged 85+).

Source of rates:

- Age-sex-specific mortality rates from ONS 2006-based national population projections for England & Wales.
- Local age-specific differentials calculated using:
 - Deaths by age, calendar years 2004-06 (ONS: Vital Statistics 4 for Herefordshire, Mortality Series DH2 (Cause) for E&W);
 - ONS mid-year estimates of population for 2004-2006, for Herefordshire and E&W

Basis of assumptions for future: As there is no evidence to suggest that age-sex-specific mortality in Herefordshire will not follow national trends, ONS (2006-based) projected age-specific trends for England & Wales are assumed. Also, as there is no evidence to suggest otherwise, the local age-sex-specific differentials for ages 55+ are assumed to remain constant throughout the projection period.

Determination of differential(s):

The numbers of deaths in Herefordshire are too small for ages below 55 to be able to draw conclusions about how rates may differ from nationally, and given the very small numbers there would be no substantial impact on the population projections even if the national rates were slightly different.

Therefore, age-sex-specific differentials are calculated for ages 55+ in the following way:

- Calculate annual (from 2001) age-sex-specific mortality rates for E&W by dividing number of deaths by number of people;
- Apply these rates to Herefordshire's population to calculate expected number of deaths in Herefordshire, should E&W rates apply;
- Over 3-year periods (for robustness), compare these expected numbers to the actual number of deaths that occurred within each age-group;
- If there were consistently more or fewer deaths than would be expected given the national rates, use the ratio of observed to expected over the most recent 3-year period (i.e. 2004-2006) as the differential to apply to the national rates.

For the 2006-based Herefordshire projections, the above analysis showed that female deaths at all ages from 55 were consistently lower than would be expected given national rates, particularly at the younger end of this range. The number of male deaths was also consistently lower than would be expected for all ages from 55 to 84 – although the differentials were not as large as for females. The number of male deaths aged 85+ was consistently slightly higher than would be expected from national rates. Therefore the weights shown in Table 4 were applied to the national rates.

Table 4: Observed deaths in Herefordshire as % of expected from E&W rates applied to county population, average 2004-2006

Age	Male %	Female %
55-64	84.7%	73.9%
65-74	84.5%	86.4%
75-84	93.6%	84.4%
85+	104.5%	97.2%

As 'summary' mortality rates are not published in the same way as for fertility it is not feasible to plot assumed trends in age-sex-specific mortality rates. In short, the 2006-based ONS population projections for England & Wales assume that mortality rates at all ages will continue to decline. Although the rate of decline varies by age, overall mortality rates for England & Wales are assumed to fall by 2.1% for males and 2.2% for females over the twenty-four years from 2006 to 2030. Full explanations are given on the GAD website (www.gad.gov.uk) and in an article in the Spring 2008 edition of *Population Trends*.⁹

Variant mortality assumptions: 'High' and 'low' variants of the projected age-sex-specific mortality rates follow the trends assumed in the variants for England & Wales (supplied by ONS on request), with the local differentials discussed above applied throughout the projection period.

Again, it is not feasible to show variant mortality assumptions on a graph in the same way as for fertility. The differences between the principal and 'high' and 'low' mortality rates for the UK and individual constituent countries are explained in detail on the GAD website, at: http://www.gad.gov.uk/Demography_Data/Population/2006/methodology/varmortass.asp.

⁹ Bray, Helen (2008) *2006-based national population projections for the UK and constituent countries*, at: http://www.statistics.gov.uk/downloads/theme_population/Population_Trends_131_web.pdf
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SECTION 4: MIGRATION RATES

Internal (i.e. within-UK) Migration

Age-sex-specific 'propensity to migrate' rates are calculated, separately for in and out migration, using mid-year population estimates and the estimated number of migrants to/from the rest of the UK during the following year.

Source of rates: Mid-year estimates of population and estimates of internal migration for local authority districts, ONS. Migration flow data is available from mid-2001 onwards, but the rates are calculated using data from the most recent three-year period (i.e. mid-2003 to mid-2006). This ensures that future assumptions are based on observations over a reasonable amount of time, without considering behaviour from four or five years ago, which may have changed for a number of reasons.

Basis of assumptions for future: It is not possible to predict future trends in migration from elsewhere in the UK, so the projections assume that each age-sex group will have the same propensity to migrate across the entire projection period.

Detailed discussion of assumptions:

Annual flows of migrants are only published for quinary (5-year) age-sex groups, so it is a necessary assumption that migrants are equally distributed within each age-sex group: e.g. that a 31 year-old male is as likely to migrate as a 34 year-old male. This is reasonable for most age-sex groups, with the exception of 15-19s. For the purposes of population estimation, students are defined as resident at their term-time address, so are counted as a migrant in the year that they leave the parental home to go to university. Hence it seems likely that a greater proportion of 15-19 year-old migrants would be aged 18-19 than aged 15-17.

The only source of sub-quinary migration data is the 2001 Census, which provides the number of migrants in the preceding year who were aged 15, 16-17 or 18-19. Therefore, sub-quinary age-sex-specific 'propensity to migrate' rates can be calculated for these three groups.

The proportions of 15-19 year-old in and out migrants from the census who were 15, 16-17 and 18-19 were applied to the number of 15-19 year-old migrants over the most recent three-year period (i.e. 2003/04 to 2005/06) to give an estimated number of 15, 16-17 and 18-19 year-old migrants over this period. These are then divided by the population aged 15, 16-17 and 18-19, respectively, to calculate separate propensity to migrate rates.

The propensity to migrate rates are then applied to the population (by single year of age and sex) at the start of each projection (or forecast) year. This means that predicted in and out migrants are dependent on the structure of the existing population, but the information available provides no alternative method – and this is an accepted practice in demographic modelling.

It is not appropriate to attempt to predict future trends in migration on the basis of observations over recent years, and national projections do not provide such information. Therefore, although there appears to have been a decreasing trend in net migration to Herefordshire from the rest of the UK since 1998, the 2006-based *projections* assume that 'propensity to migrate' will remain as it has been, on average, over the three years before 2006. The in- and out-migration rates used in the projections are given in Table 5, with the net rate shown to indicate the overall effect; note that net rates are positive for all ages except 18-29 year-olds.

See the forecasts methodology (p.20 onwards) for further discussion of internal migration assumptions.

Table 5: Propensity to migrate between Herefordshire & rest of UK rates by age/gender (per thousand population)

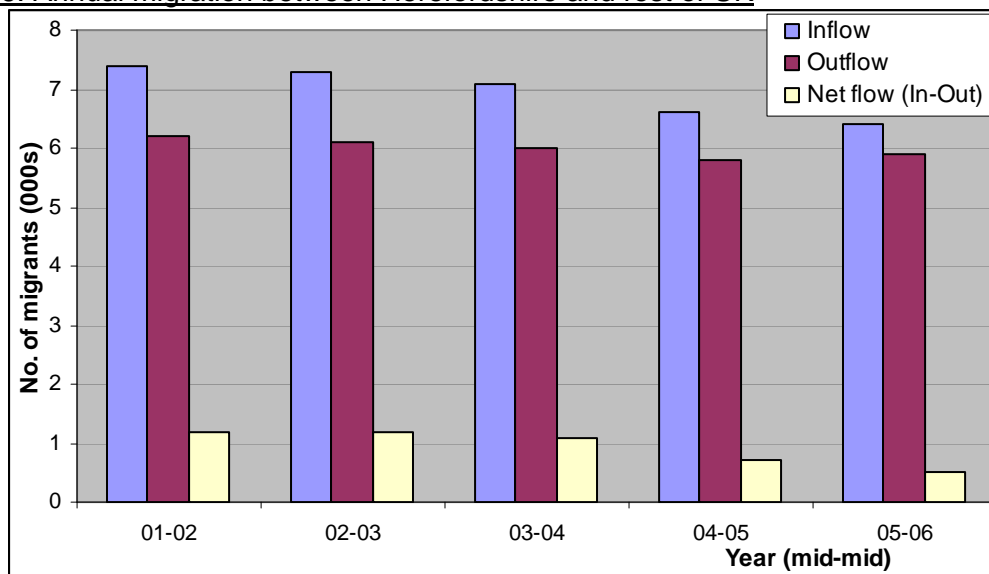
Age	In-migration from UK		Out-migration to UK		Net (in minus out)	
	Male	Female	Male	Female	Male	Female
0-4	54.9	51.3	40.9	38.5	14.0	12.8
5-9	34.0	33.1	26.8	27.8	7.2	5.3
10-14	27.6	29.3	27.0	26.0	0.6	3.3
15	21.4	21.4	12.6	12.2	8.8	9.3
16-17	27.8	27.9	23.7	22.9	4.1	5.0
18-19	40.4	52.7	120.4	185.6	-80.0	-132.9
20-24	87.6	128.1	93.8	137.4	-6.2	-9.3
25-29	76.2	93.4	82.4	91.4	-6.2	2.0
30-34	60.8	62.1	54.3	49.0	6.5	13.1
35-39	46.1	43.8	35.9	32.2	10.1	11.7
40-44	37.8	31.8	28.9	25.3	8.9	6.5
45-49	29.6	27.0	20.9	20.2	8.7	6.8
50-54	27.1	29.8	21.2	20.1	5.8	9.7
55-59	31.3	30.0	20.1	18.4	11.1	11.6
60-64	31.5	29.9	16.8	16.0	14.7	13.9
65-69	25.5	22.1	14.6	14.2	11.0	7.8
70-74	16.7	15.6	12.2	12.4	4.5	3.2
75+	15.5	20.4	14.9	15.4	0.7	5.0

Source: HC Research Team based on ONS internal migration estimates and mid-year population estimates, for the three year period 2003-04 to 2005-06. ONS data is Crown Copyright.

Variant internal migration assumptions:

As Figure 6 illustrates, there has been a decline in the annual total net inflow of migrants from the rest of the UK into Herefordshire over the last five years – mainly due to a drop in the number of in-migrants. The fall has been most notable in the last two years (i.e. mid-2004 to mid-2006).

Figure 6: Annual migration between Herefordshire and rest of UK



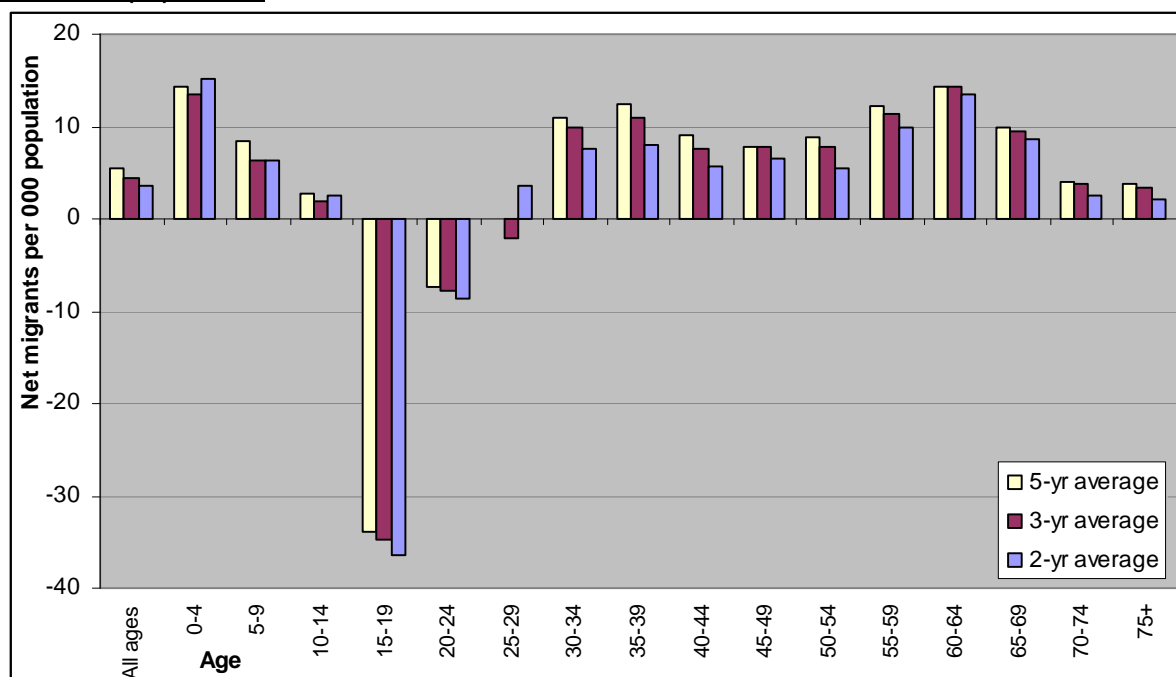
Source: Migration Statistics Unit, ONS. Crown Copyright

Whilst the average of the most recent three years' worth of within-UK migration flows were considered most appropriate to take forward as the 'most likely' scenario of propensity to migrate to and from Herefordshire (i.e. the principal projection), the reduction in annual flows over the five-year period appeared to provide realistic variant scenarios. If within-UK

migration continues at the average level observed over the most recent two years, flows would be lower than the principal projection would suggest; this provides a 'low' variant of overall internal migration. On the other hand, if flows were to revert to the average observed over the whole five-year period, flows would be higher than the principal projection suggests: a 'high' variant.

However, these overall trends have not been reflected in age-sex specific flows. Figure 7 shows the average net propensities to migrate into Herefordshire for five year age-groups, i.e. the net in-flow divided by the existing population (multiplied by a thousand for ease of reading). Whilst average net propensities were highest over the full five-year period and lowest over the most recent two years for most age-groups, there are notable exceptions. Average net in-flow of both under 5s and 25-29 year-olds has been *highest* in the last two years and lowest in the three years that form the basis of the principal projection. The latter is also true for 10-14 year-olds, although the five-year average is very slightly higher than the two-year average.

Figure 7: Average annual net migration to Herefordshire from rest of UK by age, per thousand population



Source: HC Research Team using ONS population and migration estimates. 5-yr average based on flows mid-2001 to mid-2006; 3-yr is mid-2003 to mid-2006; 2-yr is mid-2004 to mid-2006.

One of the effects of these differing trends is that, if the patterns of migration observed in the last two years were to continue, the *total* population of Herefordshire would be lower (all other factors being equal) than the principal projection would suggest, but this would not be the case for all age-groups. For instance, there would be a projected annual net inflow of 25-29 year-olds rather than an outflow, which would not only affect the number of this age, but the number in older cohorts in later years as they age.

Rather than artificially adjust the internal migration rates so that the high variant predicts the highest inflow at all ages, and vice versa, it was decided to take the two and five year averages discussed above as high and low 'overall internal migration variants', accepting that they won't be 'high' and 'low' for all groups.

The reasoning behind this was that these reflect what has actually happened in Herefordshire: a fall in overall net in-migration over the last two years has been accompanied by an increase in net migration of 25-29 year-olds, amongst others.

Table 8 shows the net propensity to migrate rates under the 'overall high' and 'overall low' internal migration variants, with the principal rates replicated for comparison.

Table 8: Variant net propensity to migrate between Herefordshire & rest of UK rates by age/gender (per thousand population)

Age	High		Principal		Low	
	Male	Female	Male	Female	Male	Female
All ages	5.2	5.6	4.5	4.4	3.6	3.5
0-4	14.6	14.1	14.0	12.8	16.2	14.1
5-9	9.1	8.0	7.2	5.3	7.1	5.5
10-14	0.7	5.1	0.6	3.3	1.3	3.9
15	8.6	11.3	8.8	9.3	7.9	7.7
16-17	4.4	7.7	4.1	5.0	3.1	3.4
18-19	-82.7	-131.8	-80.0	-132.9	-79.9	-136.2
20-24	-9.3	-5.5	-6.2	-9.3	-9.0	-8.6
25-29	-5.2	5.2	-6.2	2.0	-0.2	7.2
30-34	8.6	13.3	6.5	13.1	7.0	8.3
35-39	11.3	13.3	10.1	11.7	7.3	8.7
40-44	9.3	8.8	8.9	6.5	5.5	5.9
45-49	9.3	6.5	8.7	6.8	7.3	5.8
50-54	7.1	10.6	5.8	9.7	4.2	7.0
55-59	11.7	12.7	11.1	11.6	10.1	9.7
60-64	14.6	14.1	14.7	13.9	12.3	14.4
65-69	11.6	8.1	11.0	7.8	10.3	7.1
70-74	4.6	3.4	4.5	3.2	2.8	2.3
75+	2.6	4.6	0.7	5.0	-0.5	3.8

Source: HC Research Team based on ONS internal migration estimates and mid-year population estimates, for three year period 2003-04 to 2005-06. ONS data is Crown Copyright.

International Migration

For previous work predicting the future population of Herefordshire it was not considered necessary, and was not possible due to a lack of information, to attempt to model the international migration component of Herefordshire's population change.

However, it was important to attempt to model international migration for the 2006-based projections because of increased focus on the issue at a national level and particular interest in the potential impact of migrant workers on the population structure. This was made possible by the availability of more supporting information from ONS, in light of its new methodology for estimating international migration at local authority level.

It was not realistic to produce propensity to migrate rates in the same way as for internal (within-UK) migration (see above) for two reasons. Firstly, it would be unreasonable to expect the immigration profile to be dependent on the existing population structure. Secondly, ONS have only provided detailed data on *net* international migration (i.e. immigration minus emigration), both for the estimates for Herefordshire and projected trends for the UK as a whole. For some age-sex groups the net flow is negative, and the POPGROUP software does not allow negative rates.

It was therefore decided that counts would be input for each year of the projection period. Several possible ways of determining these flows were considered, including using those assumed in the revised ONS 2004-based sub-national population projections (SNPPs), which were current at the time the 2006-based Herefordshire forecasts were produced.

As mentioned in the introduction (p.3), the 2004-based SNPPs have been revised to take account of the new methodology for estimating international migration at LAD level and the

subsequent revisions to the mid-year population estimates. They do not take account of the increase in assumed future net flow at the UK level between the 2004-based and 2006-based national population projections. The long-term (i.e. 2014/15 onwards) assumption in the 2004-based national projections was of an annual net inflow of 145,000 people; this was increased to 190,000 for the 2006-based projections.¹⁰

As Table 9 shows, the revised 2004-based SNPPs for Herefordshire assumed an increasing net *outflow* of migrants from the county – which does not correspond with the small net inflow observed in 2005-06.

Further work would be required to ascertain the basis of these assumed flows and what effect the change in assumptions at the national level might have. It would not have been possible to carry out this work within the timescale necessary for the completion of the 2006-based population forecasts for Herefordshire.¹¹

Table 9: Estimated and projected total annual net immigration to Herefordshire; ONS' mid-year estimates and sub-national population projections

Year (mid-mid)	Mid-year estimates	2004-based SNPPs
2001-02	-443	n/a
2002-03	-166	n/a
2003-04	-231	n/a
2004-05	-10	n/a
2005-06	+53	-91
2006-07	n/a	-134
2007-08	n/a	-151
2008-09 onwards	n/a	-169

Sources: ONS Population Estimates & Sub-national Population Projections Units. Crown copyright.

Note: Data provided on request – figs. are NOT National Statistics & are supplied unrounded to facilitate understanding; due to rounding totals don't match published 'components of change'.

As there was no way of making a better prediction of what is most likely to happen to international migration to or from Herefordshire, it was decided to assume that the county will receive the same proportion of net immigrants to the UK as it has over recent years, and that these net migrants will have the same age-sex structure as observed over those years.

The assumption is then that overall net immigration to Herefordshire will follow the overall trend predicted for the UK in the most recent national projections (i.e. 2006-based). The 'high' and 'low' variant assumptions for the latter provide the basis for alternative assumptions for net international migration to the county.

It is usual to use at least three years' worth of data to determine a typical picture, but as the expansion of the European Union in May 2004 led to a marked change in immigration to Herefordshire (see Table 10) the two years 2004-06 were considered to be most relevant. According to the ONS estimates of Total International Migration shown in Table 10, in these two years Herefordshire received an annual average of 0.01% of the total net in-flow to the UK.¹²

¹⁰ http://www.gad.gov.uk/Demography_Data/Population/2006/methodology/migrass.asp

¹¹ The 2006-based SNPPs were published in June 2008; it is hoped that further understanding can be gained from these to inform the next set of local population forecasts.

¹² As part of its *Improving Migration and Population Statistics* Project, in August 2007 ONS published revised population estimates using a new methodology for estimating international migration at LA level. The revisions initially appeared at odds with anecdotal evidence, which seems to be supported by information from administrative sources, of large numbers of people coming to work in Herefordshire from overseas – particularly the 8 eastern European states that joined the EU in May 2004. However, analysis has shown that these migrants could be short-term (i.e. for less than a year), so there is currently no evidence on which to challenge the estimates of international migration. For further information contact the Research Team.

Table 10: Observed Total International Migration to Herefordshire and UK

Year (mid-mid)	Herefordshire			UK
	Immigration	Emigration	Net	Net
2001-02	+205	-648	-443	<i>n/avail</i>
2002-03	+173	-339	-166	<i>n/avail</i>
2003-04	+243	-474	-231	+173,000
2004-05	+409	-419	-10	+258,000
2005-06	+613	-560	+53	+176,000
Annual average (2004-06)	+511	-490	+22	+217,000

Source: ONS; Crown copyright. Note: Hfds data provided on request – figures are NOT National Statistics & are supplied unrounded to facilitate understanding of population estimates.

Applying this percentage to the likely, high and low variant assumptions of net immigration to the UK as a whole gives the annual flows to Herefordshire shown in Table 11.

Table 11: Annual total net immigration to Herefordshire assuming 0.01% of the projected future net flow to the UK

Year (mid-mid)	Low migration	'Likely' migration	High migration
2006-07	+16	+19	+22
2007-08	+18	+24	+30
2008-09	+17	+23	+29
2009-10	+16	+22	+28
2010-11	+15	+21	+27
2011-12	+14	+20	+26
2012-13	+13	+19	+25
2013-14 onwards	+13	+19	+25

Source: Herefordshire Council Research Team using ONS data.

Although the total net in-flow each year is very small, Table 12 shows that, on average over the two years 2004-06, there was a net *inflow* of younger adults and a net *outflow* of older adults and children. Due to the small numbers involved, there is little change in these annual age-sex specific numbers throughout the projection period. The age profile of the net migrants means that the international migration component will have more of an impact on the population structure than on the total population numbers; specifically, it will increase the number of women of child-bearing age by just over fifty each year – which will in turn slightly increase the annual number of births.

Table 12: Average annual net immigration to Herefordshire by age & sex (mid-04 to mid-06)

Age	Male	Female
0-4	-5	4
5-14	-1	-9
15-24	+32	+31
25-34	+20	+20
35-44	+2	+3
45-54	-9	-14
55-64	-13	-16
65-74	-7	-16
75+	-1	-1
Total	19	3

Source: ONS Population Estimates Unit, Crown Copyright.

Note: Data provided on request – figures are NOT National Statistics & are supplied unrounded to facilitate understanding of population estimates.

SECTION 5: VERIFICATION PROCESS

The POPGROUP software enables 'constraints' to be applied to its projections in the form of mid-year estimates of population, and also allows any combination of observed births, deaths and migrants to be input directly into the model.

This capability is utilised in verifying the rates and assumptions used in the Herefordshire projections. For the first stage, the base year is set to the 2001 mid-year estimates, and the estimates for 2002 to the most recent year (i.e. 2006 in this case) included as constraints. However, when analysing the outputs for these constraint years for the 2006-based projections, more consideration was given to 2003 to 2005, as these are the three years that rates and differentials are based on.

Fertility assumptions

The validity of the age-specific local differentials was tested by inputting, as well as the mid-year estimates for 2001 to 2006 as the base and constraints:

- numbers of deaths, migration flows and differentials to reflect past trends in births in England & Wales, over the period 2001-2006;
- assumed future rates for fertility, mortality and migration;
- the special population to represent the extra males in the Herefordshire population.

Two models were then run: one containing the above inputs only and the second including these plus the local age-specific fertility differentials (p.7).

The numbers of births predicted by each model were then compared to the observed births each year; births were predicted more accurately by including the local differentials – i.e. by applying national observed age-specific fertility rates adjusted to reflect the different patterns of fertility in Herefordshire over the three years 2004-2006.

In addition to these checks, Herefordshire Primary Care Trust was able to provide provisional data on the number of births observed in the 2007 calendar year. It was not possible to build these into the 2006-based model as at this stage no detail was known about the age of mothers, and comparable information for England and Wales was not available.

Nonetheless, the number of births during mid-2006 to mid-2007 predicted by applying the age-specific fertility rates to the mid-2006 population (1,710) is very similar to the provisional count of births over this period to mothers resident in Herefordshire (1,720).

However, the provisional figures suggest a much higher than average number of births in the latter half of 2007 (980 compared to between 830 and 880 since 2003). This may be an anomaly or the beginning of a trend; it was impossible to even begin to assess this for the production of the 2006-based forecasts as births in the first half of 2008 had not even occurred.

Mortality assumptions

The validity of the age-sex-specific local differentials for ages 55+ was tested by inputting, as well as the mid-year estimates for 2001 to 2006 as the base and constraints:

- numbers of births, migration flows and differentials to reflect past trends in mortality in England & Wales, over the period 2001-2006;
- assumed future rates for fertility, mortality and migration;
- the special population to represent the extra males in the Herefordshire population.

Two models were then run: one containing the above inputs only, and the second including these plus the local age-sex-specific mortality differentials (p.10).

The numbers of deaths for each age-sex group predicted by each model were then compared to the observed deaths each year; numbers of deaths were predicted more accurately by including the local differentials – i.e. by applying national observed age-sex-specific mortality rates adjusted to reflect the different patterns of mortality at ages 55+ in Herefordshire over the three years 2004-2006.

Migration assumptions

The migration assumptions are tested in the following way:

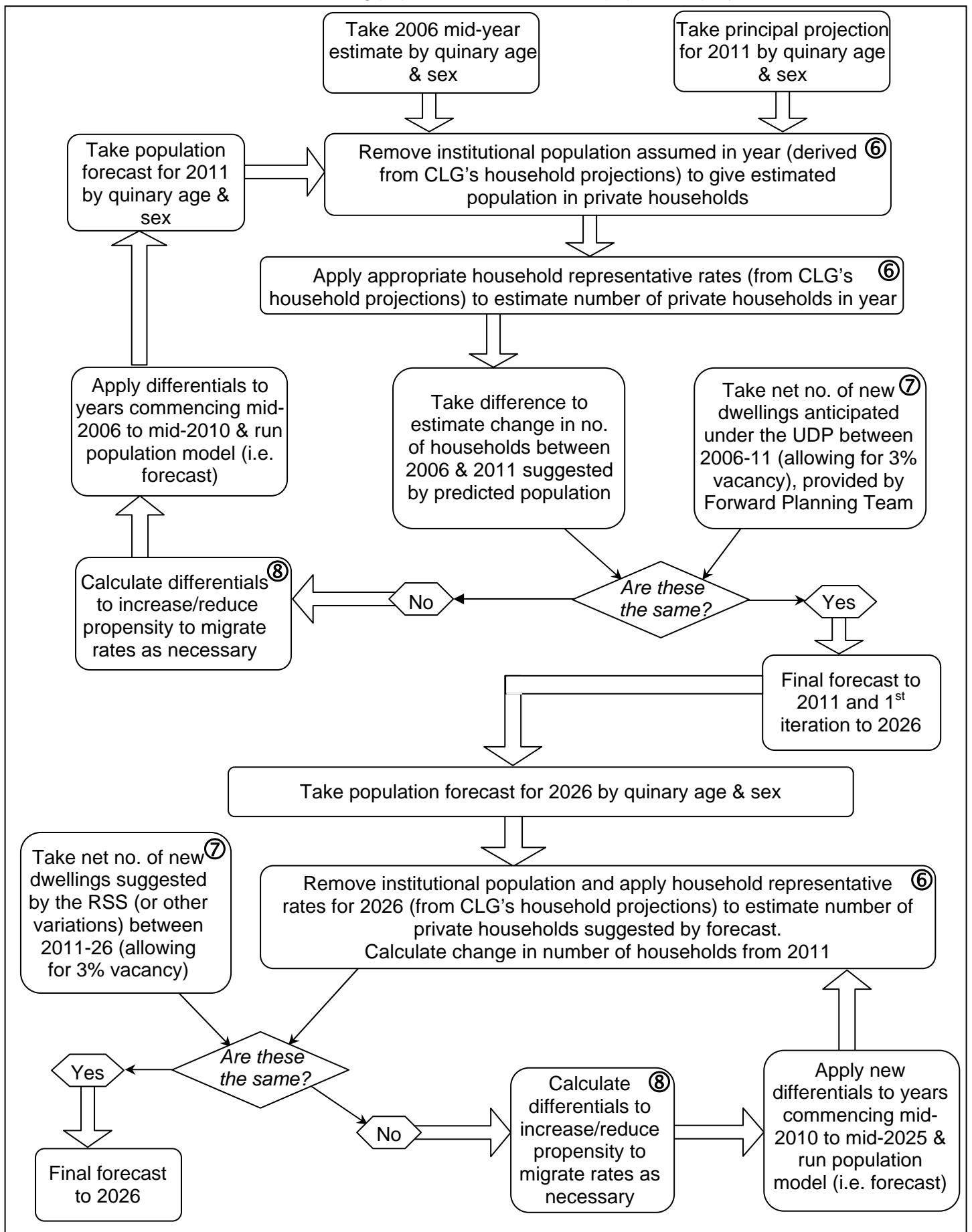
- Total births (by sex) and deaths are input for each year mid-2001 to mid-2005. These are derived from the Vital Statistics outputs by averaging consecutive calendar years – as mid-year data is only published for total births and deaths (in the ONS Components of Change);
- The software then outputs the ‘impact of constraints’ – i.e. how much the projected population, by single year of age & sex, has to be adjusted to meet the mid-year estimate;
- These ‘impacts of constraints’ are studied to identify any ages where there may be a problem with the rates, i.e. where the rates consistently over or under-estimate by more than 50 (anything less would not result in a difference if the figures were rounded to 100), and if there is a problem possible remedies are considered.

The above process identified, in an earlier forecast, the problem with the assumption that migration is consistent across the 15-19 year-old age-group.

The ‘impacts of constraints’ show the net effect of migration, but it is also possible to study the in and out flows as suggested by the rates, and compare these to the observed flows over the constraint years. If there are any consistent over or under estimates, the rates could be adjusted by applying differentials. It was not found to be necessary to adjust the internal migration rates for the 2006-based projections. Again, see the population forecasting methodology (p.20 onwards) for further discussion of internal migration.

POPULATION FORECASTS FOR HEREFORDSHIRE

Flowchart B: Process for creating population forecasts from population projection



SECTION 6: HOUSEHOLD ASSUMPTIONS

The Department for Communities and Local Government (CLG) produce household projections for local authorities based on ONS' sub-national population projections. These apply predicted future trends in household formation to the population projections to give the number of households that would be expected in particular years if the trend-based sub-national population projections were realised. The CLG 2004-based household projections (published in March 2007) were current for the 2006-based population forecasts.¹³

It is possible to use detailed supporting information for Herefordshire's household projections (supplied by CLG on request) to determine the proportion of people in each quinary age-sex group that are predicted to be a representative (i.e. "head") of each of five household types.¹⁴ These "household representative rates" for a given year can then be applied to any population estimate, projection or forecast to give the number of households that such a population structure would suggest.

Before applying household representative rates, the population living in communal establishments such as residential care homes, prisons, halls of residence, etc. must be removed. The CLG household projections assume that the *number* of people in communal establishments within each age-sex-marital status category will remain constant at 2001 census levels for the under 75s, and that the *proportion* in those aged 75 and over will remain the same as in 2001.

Projections of the population by marital status are only published at a national level; the Herefordshire Council population forecasts do not attempt to build in assumptions regarding the marital status of the predicted population. The 2006-based population forecasts assume that the numbers of Herefordshire communal establishment residents in each quinary age-sex group will remain constant at 2001 census levels for the under 75s. For ages 75 and over the proportion of each age-sex group assumed to be living in communal establishments is taken directly from the CLG household projections for Herefordshire for the appropriate year.

Table 13 gives an indication of the household representative rates that are applied to the resulting private household population to estimate the number of households in a particular year for the 2006-based population forecasts. These are the summary rates for all household types – in practice a different rate is applied to estimate the number of representatives of each type of household in each age-sex group.

¹³ Revised 2004-based household projections, consistent with ONS' revised 2004-based population projections, were published on 28th Feb 2008 – too late for consideration in the 2006-based population forecasts. There do not appear to be any changes to the underlying assumptions, but household representative rates may have changed slightly due to constraining techniques employed; methodology is available from: <http://www.communities.gov.uk/news/corporate/707319>.

¹⁴ Married couple household; cohabiting couple household; lone parent household; other multi person household; one person household.

Table 13: Proportion of private household residents who are representatives of any type of (unconcealed)¹⁵ household

Age-group	2006		2011		2026	
	Male	Female	Male	Female	Male	Female
15-19	3%	3%	3%	4%	3%	5%
20-24	28%	16%	28%	17%	30%	18%
25-29	64%	23%	64%	24%	65%	26%
30-34	80%	23%	80%	25%	80%	28%
35-39	91%	21%	92%	23%	93%	28%
40-44	91%	21%	92%	23%	92%	28%
45-49	93%	22%	93%	24%	93%	26%
50-54	95%	20%	95%	22%	94%	26%
55-59	96%	20%	96%	22%	96%	27%
60-64	97%	23%	97%	24%	97%	26%
65-69	98%	27%	98%	27%	98%	28%
70-74	98%	39%	98%	37%	98%	36%
75-79	98%	53%	99%	49%	99%	43%
80-84	97%	66%	98%	63%	98%	55%
85+	94%	76%	94%	75%	95%	70%
Total 15+	67%	22%	69%	24%	73%	27%

Source: derived from supporting data for (original) 2004-based household projections for Herefordshire, CLG; figures are rounded to 0 d.p. for ease of reading. NB. For classification purposes, the male of a couple household is always classified as the representative.

SECTION 7: ASSUMPTIONS REGARDING FUTURE HOUSING PROVISION

Planned housing provision in Herefordshire between 1996 and 2011 is set out in the Unitary Development Plan (UDP); an amendment in March 2007 increased the original target of 11,700 new dwellings (i.e. gross completions, before demolitions and conversions out of residential use are removed) over the 15 year period to 12,200.¹⁶

Allowing for development that has already occurred, 4,329 additional dwellings (i.e. net) are expected to be completed between mid-2006 and mid-2011.¹⁷

The UDP still gives the best indication of housing completions to 2011, but the Regional Spatial Strategy (RSS), which is currently in draft form, gives an indication of the net number of new dwellings that will be expected in Herefordshire between 2006 and 2026. The RSS phase 2 revision Preferred Option¹⁸ allocates 16,600 of the 365,600 dwellings planned for the West Midlands region to the county. This gives an expected 12,271 (16,600 minus 4,329) net new dwellings between mid-2011 and mid-2026.¹⁹ As this is the figure in the Preferred Option for the RSS, it is the best prediction that can be made at the present time as to the level of housing provision in Herefordshire between 2011 and 2026. It is therefore taken as the basis of the principal population forecast from 2006.

¹⁵ Rates are also provided for 'concealed' households, i.e. a household 'hidden' within another – e.g. a single mother living with her parents would be classified as a 'concealed lone parent representative'; the husband of a married couple living in a shared house as a 'concealed married couple household representative'.

¹⁶ Adopted Unitary Development Plan:

http://www.herefordshire.gov.uk/docs/Forwardplanning/5_HOUSING.pdf.

¹⁷ Source: Forward Planning Housing Land Availability 2006 database, Herefordshire Council.

¹⁸ Available at: <http://www.wmra.gov.uk/page.asp?id=386>.

¹⁹ Plans give figures for financial years, but it is assumed that these are close enough to the mid-mid year period to not be of significance.

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). The report suggests that by 2016 annual net housing provision in the West Midlands region should be at 20,400 as a minimum, with a “high point” target of 23,000. The RSS phase 2 revision Preferred Option suggests an annual average²⁰ supply of 18,280 across the region.

There is no indication as to how much of any increased supply at a regional level would be allocated to Herefordshire. The county’s allocation was not increased in the first revision of the RSS, which saw the region’s total increased by 3,000, so it may be feasible to expect a greater proportion of any further increase; on the other hand the emphasis in the RSS itself is that development should be focused on the major urban areas of the region.

In the absence of any other information, it is assumed at this stage that any future increase would be distributed across the region in the same proportions as the current Preferred Option. In this case the NHPAU figures could suggest a minimum net housing provision of 18,520 in Herefordshire between 2006 and 2026, with a “high point” target of 20,880. This highest figure provides an alternative scenario to which to constrain the population forecasts, to give an indication of what the county’s population could be if housing provision were increased further.

Table 14 summarises the potential housing supply under each of the scenarios discussed in this section. For the purposes of constraining the population forecast to meet these levels of availability, a 3% vacancy rate in new housing stock is assumed – i.e. that only 97% of these dwellings will be filled with households. This assumption is consistent with that made in the RSS phase 2 revision Preferred Option.²¹

Table 14: Potential net housing supply in Herefordshire

Scenario	2006-2011	2006-2026
UDP & current RSS	4,329	16,600
UDP & NHPAU minimum	4,329	18,520
UDP & NHPAU high point	4,329	20,880

²⁰ This is a crude average, not taking into account any proposed phasing of development.

²¹ Source: Technical paper on housing allocations for RSS Phase 2 Shaping the Preferred Option.

SECTION 8: CONSTRAINING MIGRATION TO MEET ANTICIPATED HOUSING PROVISION

Principal Forecast

Population projections for Herefordshire are converted into population forecasts by altering migration assumptions so that the change in the number of households predicted by the change in population over a particular period matches the change in the number of available dwellings anticipated under housing development plans.

Therefore, the first step in converting the 2006-based principal projection into a forecast was to apply the communal establishment and household representative rates (see Section 6) to the 2006 mid-year estimate of population to calculate the number of households in the base year.

The comparable rates for 2011 were then applied to the principal projection for 2011, and the projected change in households calculated by taking the difference of these two figures. This projected change was then compared to the anticipated supply of new dwellings (allowing for a 3% vacancy rate) under the UDP.

The principal 2006-based population projection suggested an increase of 3,400 households between 2006 and 2011; 799 fewer than the 4,199 additional dwellings anticipated to be occupied according to the UDP.

To meet this anticipated housing supply, the rates of internal (i.e. within-UK) in-migration (shown in Table 5, p.13) were increased and out-migration reduced, by broadly equal factors. It is assumed that net international migration to/from Herefordshire is not affected by the level of housing supply as these flows are very small (see Section 4, pp.15-17).

The adjustment of within-UK migration involved the calculation of two differentials: one to apply to propensity to in-migrate rates and one to apply to propensity to out-migrate rates. It was not possible to make any assumptions regarding the demographics of any additional (or retained) migrants, so it was necessary to assume that the age-sex structure of migrants will remain as it has been over the last three years, on average. Therefore, the relevant differential is applied to the propensity to migrate rates of all age-sex groups within each migration flow.

This assumption is not necessarily realistic: it is feasible that certain groups will be influenced more by the supply of new housing than others, and that this would to some extent be dependent on the types of housing provided. However, no information is available on either the type of housing that will be built, or the likely impact on propensity to migrate, to make any other assumption.

Once the differentials to apply to migration to and from Herefordshire for each year from 2006 to 2010 were determined, the communal establishment and household representative rates for 2026 were applied to the forecasted population for 2026. The population model predicted an increase of 9,604 households between 2011 and 2026, whilst the RSS currently suggests an increase of 11,903 available dwellings (i.e. allowing for a 3% vacancy). New differentials were calculated to adjust migration over this period so that the forecasted increase in the number of households corresponds with the current expectation under the RSS.

The differentials applied to the propensity to migrate rates for each year of the two periods for the 2006-based principal forecasts are shown in Table 15. In-migration rates were increased, and out-migration reduced, by around 3% each year from mid-2006 to mid-2010 to meet the housing supply targets of the UDP. From 2011 to 2026, the rates were adjusted by slightly smaller factors (around +/-2.5%) to meet the housing supply anticipated under the current draft of the RSS – which itself is likely to be a minimum.

Table 15: Differentials applied to propensity to migrate rates between Herefordshire and rest of UK to convert 2006-based principal projection into principal forecast

Period	In-migration	Out-migration
2006-2010	1.02916	0.96886
2011-2026	1.02359	0.97534

Source: Herefordshire Council Research Team; 2006-based population forecasts

Variant Forecasts

Five variant forecasts were produced to illustrate the sensitivity of the principal forecast to changes in the underlying assumptions. Four of these adjust variant projections to the principal housing assumption, to give an indication of how changes in demographic rates might affect the population given the currently expected level of housing.

The final variant forecast adjusts the principal projection to meet the higher level of housing provision discussed in Section 7 (pp.22-23) in order to provide an indication of how more housing may affect the population given the expected trends in demographic rates.

Differentials were calculated to apply to the rates of 'propensity to migrate' between Herefordshire and the rest of the UK in exactly the same way as described above for the principal population forecast.

Full details of the demographic assumptions used in each of the variant forecasts are given in the following section (p.26), but the differentials applied to the propensity to migrate rates are shown in Table 16 below. The numbers correspond to the labels given to each variant projection and forecast in Table 18 on p.28. Note that the last two forecasts used the variant internal migration assumptions described in Section 4 (pp.13-15).

Table 16: Differentials applied to propensity to migrate rates between Herefordshire and rest of UK to convert projections into variant forecasts

Variant Projection	Variant Forecast	Period	In-mig	Out-mig
High population-principal internal migration (no. 20)	High variant forecast (no. 26)	2006-2010	1.02532	0.97324
		2011-2026	1.01440	0.98527
Low population-principal internal migration (no. 21)	Low variant forecast (no. 27)	2006-2010	1.03299	0.96429
		2011-2026	1.03298	0.96449
Principal (no. 1)	High housing forecast (no. 23)	2006-2010*	1.02916	0.96886
		2011-2026	1.06522	0.93353
High population-high overall internal migration (no. 10)	High & 5-yr average UK migration variant forecast (no. 24)	2006-2010	1.01527	0.98430
		2011-2026	1.00578	0.99417
Low population-low overall internal migration (no. 17)	Low & 2-yr average UK migration variant forecast (no. 25)	2006-2010	1.04958	0.93991
		2011-2026	1.04423	0.94974

* Note that the differentials for the 'High housing' forecast to 2010 are the same as for the principal forecast (Table 15) because the anticipated housing supply during the UDP period is fixed.

Source: Herefordshire Council Research Team; 2006-based population forecasts

SENSITIVITY TESTING

As the Government Actuary's Department explains, "...due to the inherent uncertainty of demographic behaviour, any set of projections will inevitably be proved wrong, to a lesser or greater extent, as a forecast of future demographic events or population structure."²² They publish a range of variant national projections based on alternative assumptions around the components of population change.

The principal forecast is the Research Team's prediction of what is most likely to happen to the population of Herefordshire between 2006 and 2026. However, as already discussed, 'variant' projections and forecasts have also been produced to facilitate understanding of the sensitivity around this forecast for particular groups of the population.

The variant assumptions regarding fertility, mortality, migration and housing provision have been detailed in the relevant sections above; this section summarises which combinations of these assumptions have been used to produce the different variant projections and forecasts. Table 17 summarises the differing assumptions.

Table 17: Summary of variant assumptions for Herefordshire

Assumption	Details
Principal fertility	Follows principal projection of future trends for E&W, with constant differentials applied to reflect local pattern over recent years
High fertility	Follows high variant assumed future trends for E&W, with constant differentials applied to reflect local pattern over recent years
Low fertility	Follows low variant assumed future trends for E&W, with constant differentials applied to reflect local pattern over recent years
Principal mortality	Follows principal projection of future trends for E&W, with constant differentials applied to reflect local pattern over recent years
High mortality	Follows high variant assumed future trends for E&W, with constant differentials applied to reflect local pattern over recent years
Low mortality	Follows low variant assumed future trends for E&W, with constant differentials applied to reflect local pattern over recent years
Principal international migration	Total annual net flow assumed to be same proportion of total net flow to UK assumed for principal national projection as in two years to mid-2006; age-sex structure assumed to remain constant
High international migration	Total annual net flow assumed to be same proportion of total net flow to UK assumed for high variant national projection as in two years to mid-2006; age-sex structure assumed to remain constant
Low international migration	Total annual net flow assumed to be same proportion of total net flow to UK assumed for low variant national projection as in two years to mid-2006; age-sex structure assumed to remain constant
High overall* internal migration	5-yr average propensity to migrate between Hfds & rest of UK
Principal internal migration	3-yr average propensity to migrate between Hfds & rest of UK
Low overall* internal migration	2-yr average propensity to migrate between Hfds & rest of UK
Principal housing	16,600 net new dwellings 2006-26
High housing	20,880 net new dwellings 2006-26

** These rates give the highest/lowest total migration flows (i.e. all ages), but patterns for age-sex groups differ; see pp.13-15 for discussion.*

²² www.gad.gov.uk/Demography_Data/Population/2006/methodology/varpurpose.asp

Responsibility for producing national population projections has moved to ONS, but the projections are still published on the GAD website.

Table 18 overleaf shows the combinations of assumptions used in the variant projections and forecasts. The top section of the table shows the variant projections that were run to examine sensitivity around the principal projection, whilst the last four rows detail the variant forecasts that have been produced.

As explained in Section 8 (p.25), one forecast (the 'high housing' forecast) adjusts the principal projection to the high housing assumption and the other four adjust variant projections to the level of development suggested in the current Preferred Option of the Regional Spatial Strategy (see pp.22-23) – i.e. 16,600 net new dwellings.

Two approaches were explored for these four variant forecasts:

1. Taking the variant assumptions for fertility, mortality and immigration and then adjusting the *variant* internal migration assumptions to meet anticipated housing provision (used for variant forecasts 24 and 25 in Table 18 on p.28);
2. Taking the variant assumptions for fertility, mortality and immigration and then adjusting the *principal* internal migration assumptions to meet anticipated housing provision (used for variant forecasts 26 and 27 in Table 18).

Although both are valid methods of varying the assumptions, after they were produced it was not felt appropriate to consider the 2nd approach further. This was on the basis that variant forecasts are produced in order to illustrate sensitivity around the principal forecast and, as the internal migration rates are adjusted as part of this forecasting process, it is not appropriate to start with different rates.

Table 18: Variant projections and forecasts

No	Name	Fertility	Mortality	Migration		Housing
				International	Internal	
0	Natural change (NC)	Principal	Principal	None	None	n/a
1	Principal	Principal	Principal	Principal	Principal (3-yr average)	n/a
2	High fertility	High	Principal	Principal	Principal (3-yr average)	n/a
3	Low fertility	Low	Principal	Principal	Principal (3-yr average)	n/a
4	High mortality	Principal	High	Principal	Principal (3-yr average)	n/a
5	Low mortality	Principal	Low	Principal	Principal (3-yr average)	n/a
6	High international migration	Principal	Principal	High	Principal (3-yr average)	n/a
7	Low international migration	Principal	Principal	Low	Principal (3-yr average)	n/a
8	High overall internal migration	Principal	Principal	Principal	5-yr average	n/a
9	Low overall internal migration	Principal	Principal	Principal	2-yr average	n/a
10	High population-high overall internal migration	High	Low	High	5-yr average	n/a
11	High NC-principal migration	High	Low	Principal	Principal (3-yr average)	n/a
12	High NC-low overall migration	High	Low	Low	2-yr average	n/a
13	Principal NC-high overall migration	Principal	Principal	High	5-yr average	n/a
14	Principal NC-low overall migration	Principal	Principal	Low	2-yr average	n/a
15	Low NC-high overall migration	Low	High	High	5-yr average	n/a
16	Low NC-principal migration	Low	High	Principal	Principal (3-yr average)	n/a
17	Low population-low overall internal migration	Low	High	Low	2-yr average	n/a
18	'Old' NC-principal migration	Low	Low	Principal	Principal (3-yr average)	n/a
19	'Young' NC-principal migration	High	High	Principal	Principal (3-yr average)	n/a
20	High population-principal internal migration	High	Low	High	Principal (3-yr average)	n/a
21	Low population-principal internal migration	Low	High	Low	Principal (3-yr average)	n/a
22	Principal forecast (from 1)	Principal	Principal	Principal	Principal (3-yr average)	Principal (+16,600 2006-26)
23	High housing forecast (from 1)	Principal	Principal	Principal	Principal (3-yr average)	High (+20,880 2006-26)
24	High & 5-yr average UK migration variant forecast (fr. 10)	High	Low	High	5-yr average	Principal (+16,600 2006-26)
25	Low & 2-yr average UK migration variant forecast (from 17)	Low	High	Low	2-yr average	Principal (+16,600 2006-26)
26	High variant forecast (from 20)	High	Low	High	Principal (3-yr average)	Principal (+16,600 2006-26)
27	Low variant forecast (from 21)	Low	High	Low	Principal (3-yr average)	Principal (+16,600 2006-26)