Forecasts of population and household for Nottinghamshire and Derbyshire authorities

Chesterfield

February 2011

Guidance on the nature and use of the projections in this report

Projections as part of the planning process
Projections do not provide an answer to 'how many houses should be built', but part of the picture to inform plan-makers what the implications of different futures, or taking certain decisions, are likely to be. Rather than giving one answer, they give a selection of possibilities which can be compared to each other, and used to inform other aspects of a sustainable plan; the economy, social and environmental factors. Therefore, they should be used with care, and with an understanding of what they tell us, and what they are not telling us.

The nature of projections
These projections have been produced to inform the local authorities about the likely outcomes for households and population, by testing a limited selection of future assumptions. Projections are not predictions of the future, but forecasts of the likely outcome, given certain assumptions. These assumptions are critical to how well the projections inform users.

Scenarios
Projections can be altered to inform policy decisions such as local plan-making. In these instances, they can be used to illustrate the outcome were certain decisions to be taken or if certain assumptions are made about the future. The **scenarios** in the NNDD projections have been selected to illustrate possible futures, not necessarily ones that will or should come about. For example, the 'Natural Change' scenario is unrealistic, as it assumes no-one moves in or out of a local authority, but is informative to demonstrate the needs of the local population into the future, through different life stages.

The strength of the model is in being able to change assumptions and use the resulting scenarios to understand the dynamics of the population and housing need and demand.

Underlying assumptions
Many of the assumptions in these projections are based on the best information about the way in which the population and households change over time. In general many assumptions behind the projections are made for technical reasons, and based upon the best evidence available. These are standard in the POPGROUP model and have been used for this initial set of projections. Examples of these are fertility rates, mortality rates, and household formation. However, these assumptions can also be altered in order to test possible futures, and the sensitivity of the assumptions.

Further projections
Once informed by the initial set of scenarios, it is likely that local authorities will want to test out further scenarios. The Derbyshire Research Unit are able to do this on their behalf. The cheapest and most effective way of doing this will be to bring together a scenario for all local authorities at once. The four commissioning authorities will enable this to happen on a regular basis, following discussions with those who wish to develop different scenarios. Individual authorities will, however, also be able to commission their own projections, if required.

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Note:

The authors of this report do not accept liability for any costs or consequential loss involved following the use of the work referred to here, which are entirely the responsibility of the users of the work.

User Manuals:

A more complete review of the functionality and methodology which underpin POPGROUP and the Derived Forecast Model are to be found in the respective User Manuals available from the POPGROUP website http://www.ccsr.ac.uk/popgroup/

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1. Introduction

1.1. Background

Since 2007/8 and the onset of the economic recession, new dwelling completions have fallen considerably. Housing development plans are now outdated given the prevailing economic conditions and the judgement from the new Government that previous Regional Spatial Strategy (RSS) dwelling targets are largely redundant.

Derbyshire County Council and Derby City Council are seeking a revised demographic evidence base from which to develop new policies for housing development.

1.2. Requirements

Derbyshire County Council and Derby City Council's objective is to have a suite of population, household (and labour force) forecasting models that take full account of the very latest statistical releases from the Office of National Statistics and Communities and Local Government (CLG).

- Revised mid-year population estimates 2002-2009
- 2008-based sub-national population projections
- 2008-based sub-national household projections

These data have provided the basis for the derivation of a number of alternative scenario forecasts as follows:

- Migration-led forecasts (2001-2009 historical trend)
- ONS 2008-based projections
- Natural change
- Net-nil migration
- Dwelling-led forecasts
- Jobs-led forecasts

These scenario forecasts have produced population, household and labour force impacts for each of the local authority areas as follows:

- Amber Valley
- Bolsover
- Chesterfield
- Derby
- Derbyshire Dales
- Erewash
- High Peak
- North East Derbyshire
- South Derbyshire

These scenario forecasts have produced population, household and labour force impacts for Chesterfield.

1.3. POPGROUP

Scenario inputs and outputs have been delivered in POPGROUP-compatible files, enabling users to run further analyses, as required, from their own desktop PCs.

POPGROUP is a family of demographic models developed to forecast population, households and the labour force for areas and social groups. POPGROUP incorporates a **cohort component methodology** for its population projection model, a **headship rate model** for its household projection model and an **economic activity rate model** for its labour-force projection model. The household and labour force projections have been delivered using the **Derived Forecast** model, a new module in the POPGROUP suite.

POPGROUP is used by over 90 local and regional organisations in the UK and has been subject to extensive enhancement and development over the last ten years. It uses MS Excel workbooks to manage its data inputs and outputs and provides great flexibility to enable users to experiment and analyse alternative forecasts.

1.4. Document structure

This document constitutes a Final Report.

The main body of the Report provides a summary of the output produced from each of the scenarios.

The Appendix provides further guidance on the data, methodology and assumptions used in the development of the alternative forecasts.

2. Summary of scenarios results

2.1. *What scenarios have been defined?*

This project has delivered a population, household and labour force forecasting capability for the districts of Derbyshire: Amber Valley, Bolsover, Chesterfield, Derby, Derbyshire Dales, Erewash, High Peak, North East Derbyshire, South Derbyshire.

Six demographic scenarios have been defined and forecasts produced. All scenario forecasts have been produced with a 2031 time horizon. The scenarios have been defined as follows:

Small Area Scenarios		
1	scenario_Migration-led	'Migration-led' scenario which uses historical evidence from an eight-year period (2001/2-2008/9) to derive assumptions about future migration (no SNPP constraints are applied).
		Each component of migration (immigration, outmigration, immigration and emigration) is measured for the eight-year period. Projection assumptions for each are based on the 'average' for these eight years, applied as an age-specific migration schedule in each case.
2	scenario_SNPP	'SNPP' scenario which replicates 2008-based Sub-National Population Projections using all SNPP assumptions on births, deaths and migration.
		Migration assumptions will differ from those used in the migration-led scenario in that they are derived from a historical period 2003/4 – 2007/8.
3	scenario_ Natural Change	'Natural Change' scenario which is constrained by zero net international and internal migration; with only births and deaths driving population change.
4	scenario_Net Nil Migration	'Net Nil Migration' scenarios which balances in-migration and out-migration in total but retains the age-composition of each.
5	scenario_Dwelling-led	'Dwelling-led' scenario using a forecast of new dwelling development based upon average completions 2001-2010.
6	scenario_Employment-led	'Employment-led' scenario using a policy forecast change which retains the number of jobs at its 2010 level (no new jobs created).

2.2. Population scenario summaries

This section provides a chart illustration of the population forecasts produced from each of the defined scenarios for Chesterfield and a corresponding table of data.

Chesterfield (17UD)
Population forecasts
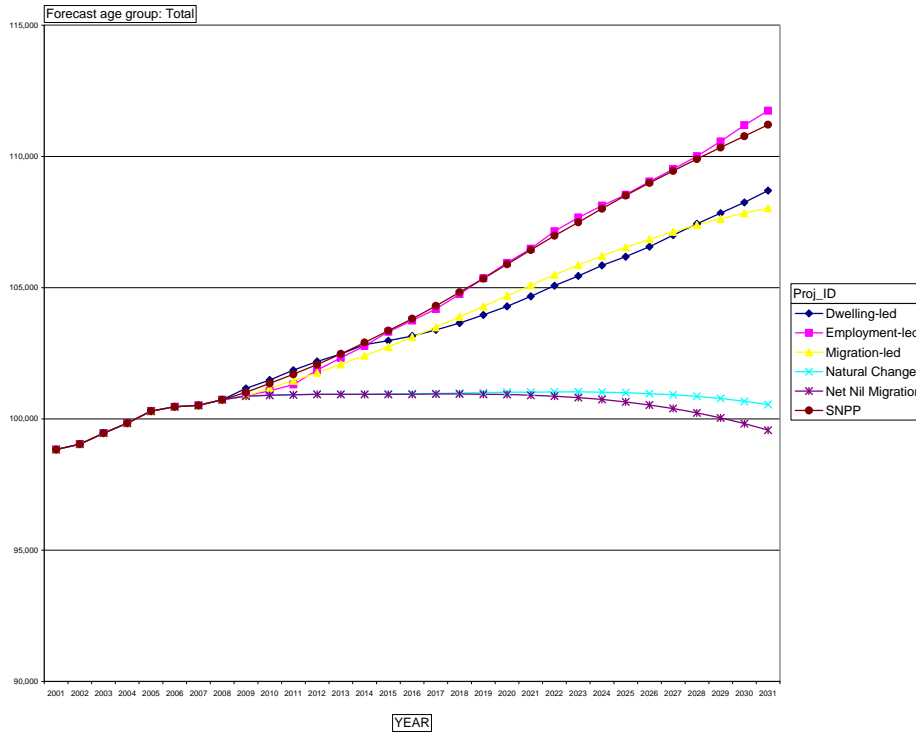
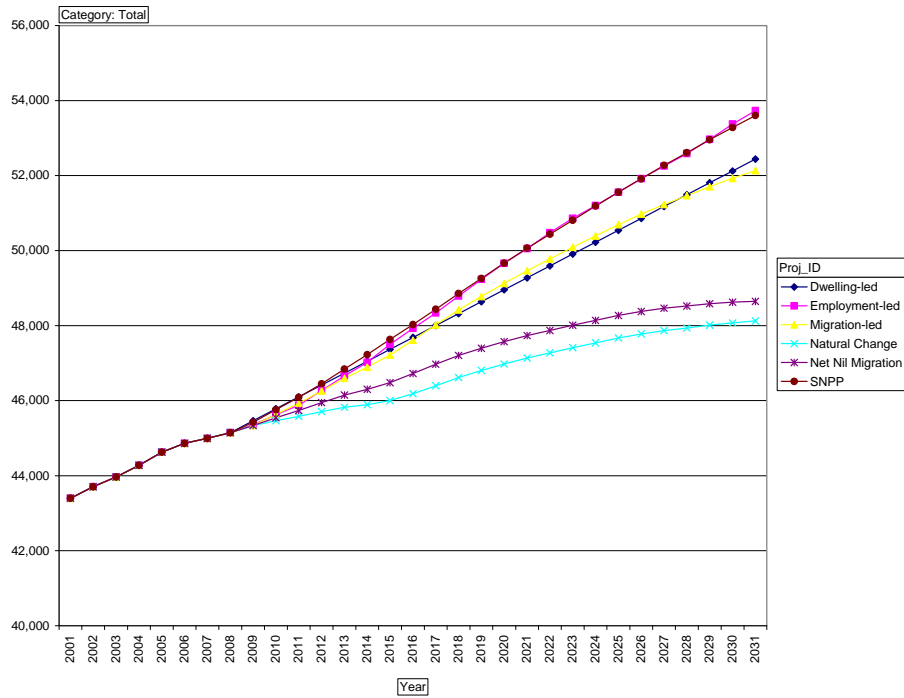| Forecast age group: Total	Proj_ID					
YEAR	Dwelling-led	Employment-led	Migration-led	Natural Change	Net Nil Migration	SNPP
2001	98,830	98,830	98,830	98,830	98,830	98,830
2002	99,040	99,040	99,040	99,040	99,040	99,040
2003	99,460	99,460	99,460	99,460	99,460	99,460
2004	99,840	99,840	99,840	99,840	99,840	99,840
2005	100,300	100,300	100,300	100,300	100,300	100,300
2006	100,460	100,460	100,460	100,460	100,460	100,460
2007	100,520	100,520	100,520	100,520	100,520	100,520
2008	100,730	100,730	100,730	100,730	100,730	100,730
2009	101,160	100,890	100,870	100,870	100,870	101,010
2010	101,480	101,070	101,170	100,900	100,900	101,350
2011	101,860	101,310	101,460	100,920	100,920	101,700
2012	102,190	101,860	101,760	100,940	100,940	102,070
2013	102,480	102,330	102,080	100,940	100,940	102,480
2014	102,830	102,780	102,410	100,940	100,940	102,910
2015	102,980	103,320	102,750	100,950	100,940	103,360
2016	103,160	103,750	103,120	100,960	100,940	103,820
2017	103,390	104,190	103,490	100,970	100,950	104,310
2018	103,650	104,760	103,890	100,990	100,950	104,830
2019	103,960	105,360	104,290	101,000	100,940	105,350
2020	104,290	105,940	104,690	101,020	100,900	105,890
2021	104,670	106,490	105,090	101,020	100,900	106,440
2022	105,080	107,150	105,490	101,030	100,870	106,980
2023	105,450	107,670	105,860	101,030	100,810	107,490
2024	105,850	108,120	106,210	101,020	100,740	108,010
2025	106,180	108,540	106,540	101,000	100,650	108,510
2026	106,560	109,040	106,850	100,960	100,530	108,990
2027	107,000	109,520	107,130	100,920	100,400	109,450
2028	107,430	110,010	107,390	100,860	100,230	109,900
2029	107,840	110,570	107,630	100,780	100,040	110,340
2030	108,250	111,190	107,840	100,670	99,820	110,770
2031	108,700	111,740	108,030	100,550	99,570	111,210

2.3. Household scenario summaries

This section provides an illustration of the implications of the population forecasts upon **household** numbers. Household numbers are derived (using the Derived Forecast model) through the application of (CLG's 2008-based) household headship rates to the age-sex profile of the population.

A chart illustration is accompanied by its corresponding table of data.

Chesterfield (17UD)

Household forecasts

PopGroup	17UD

Category: Total	Proj_ID					
Year	Dwelling-led	Employment-led	Migration-led	Natural Change	Net Nil Migration	SNPP
2009	45,464	45,357	45,335	45,335	45,335	45,423
2010	45,781	45,620	45,633	45,466	45,540	45,758
2011	46,098	45,878	45,931	45,581	45,735	46,086
2012	46,415	46,274	46,262	45,709	45,946	46,449
2013	46,733	46,661	46,595	45,824	46,147	46,841
2014	47,050	47,021	46,890	45,893	46,301	47,228
2015	47,368	47,498	47,212	46,000	46,479	47,629
2016	47,685	47,928	47,611	46,188	46,723	48,027
2017	48,003	48,338	48,019	46,398	46,971	48,436
2018	48,321	48,790	48,421	46,616	47,206	48,856
2019	48,638	49,231	48,780	46,804	47,397	49,259
2020	48,956	49,663	49,125	46,976	47,572	49,667
2021	49,273	50,054	49,462	47,136	47,733	50,065
2022	49,590	50,480	49,776	47,274	47,871	50,436
2023	49,907	50,864	50,090	47,414	48,011	50,809
2024	50,224	51,202	50,390	47,540	48,138	51,186
2025	50,541	51,555	50,693	47,672	48,269	51,557
2026	50,857	51,919	50,973	47,779	48,376	51,913
2027	51,174	52,252	51,231	47,868	48,463	52,272
2028	51,490	52,589	51,464	47,936	48,524	52,609
2029	51,806	52,967	51,703	48,012	48,585	52,956
2030	52,122	53,372	51,925	48,074	48,623	53,280
2031	52,438	53,729	52,134	48,124	48,646	53,603

2.4.Dwelling scenario summaries

This section provides an illustration of the implications of population and household totals upon dwelling (housing) numbers. The following table indicates the 'net' increase in dwellings necessary to meet the forecast increase in household numbers from each scenario.

Household-dwelling conversions are achieved using a 'vacancy rate' for the district, derived from 2001 Census data and detailed in the Appendix to this document.

Chesterfield (17UD)
Dwelling forecasts

Chesterfield						
Net New Dwellings						
YEAR	Dwelling-Led	Employment-Led	Migration-Led	Natural Change	Net Nil Migration	SNPP
2008/9	329	217	194	194	194	286
2009/10	330	273	311	136	214	349
2010/11	330	268	309	119	202	341
2011/12	330	413	345	134	220	377
2012/13	330	402	347	120	209	408
2013/14	330	374	307	71	160	403
2014/15	331	497	335	111	185	417
2015/16	331	448	415	196	254	414
2016/17	331	426	424	219	258	426
2017/18	331	470	418	227	245	437
2018/19	330	459	374	196	199	419
2019/20	330	449	360	178	182	425
2020/21	330	407	351	167	168	415
2021/22	330	443	326	143	143	386
2022/23	330	400	328	145	146	387
2023/24	330	352	312	132	133	393
2024/25	330	368	315	137	136	386
2025/26	330	378	291	111	111	371
2026/27	329	347	269	93	91	373
2027/28	329	350	242	71	63	350
2028/29	329	393	249	80	63	361
2029/30	329	422	231	64	40	338
2030/31	329	371	218	52	24	336
Average	330	388	316	135	158	383

2.5. Labour force scenario summaries

Using the Derived Forecast model, it is possible to examine the effect of alternative population forecasts upon the size of the labour force in the district. This is achieved through the application of economic activity rates (by age and sex) to the population of the area.

Economic activity rates (averaged 2004-2008) have been derived from NOMIS (see Appendix). Separate rates have been derived for Derby; the Derbyshire economic activity rates have been applied to other districts. In each case the rates are kept constant throughout the projection period.

The table below illustrates the size of the labour force that would result from the alternative population forecasts, keeping economic activity rates constant throughout the forecast period. The user may use the scenario capability of the Derived Forecast model to experiment with alternative economic activity rates to asses their impact upon the size of the local labour force.

Chesterfield (17UD)
Labour Force forecasts

PopGroup	17UD

Category: Economic Activity	Proj_ID					
Year	Dwelling-led	Employment-led	Migration-led	Natural Change	Net Nil Migration	SNPP
2009	52,296	52,116	52,127	52,127	52,127	52,177
2010	52,376	52,116	52,173	51,973	51,981	52,222
2011	52,461	52,116	52,200	51,810	51,816	52,250
2012	52,323	52,116	52,069	51,490	51,485	52,100
2013	52,205	52,116	51,974	51,207	51,184	52,035
2014	52,137	52,116	51,894	50,937	50,892	51,997
2015	51,893	52,116	51,776	50,629	50,558	51,928
2016	51,735	52,116	51,743	50,404	50,305	51,921
2017	51,612	52,116	51,702	50,171	50,042	51,931
2018	51,427	52,116	51,605	49,881	49,720	51,891
2019	51,264	52,116	51,495	49,577	49,382	51,855
2020	51,117	52,116	51,384	49,273	49,042	51,842
2021	51,032	52,116	51,292	48,988	48,720	51,862
2022	50,898	52,116	51,158	48,665	48,356	51,832
2023	50,825	52,116	51,099	48,424	48,068	51,858
2024	50,815	52,116	51,039	48,193	47,781	51,922
2025	50,781	52,116	50,986	47,980	47,505	51,972
2026	50,733	52,116	50,887	47,725	47,182	52,003
2027	50,725	52,116	50,784	47,466	46,855	52,033
2028	50,713	52,116	50,662	47,189	46,508	52,037
2029	50,639	52,116	50,475	46,847	46,093	52,010
2030	50,527	52,116	50,245	46,460	45,633	51,951
2031	50,484	52,116	50,054	46,111	45,207	51,924

3. Appendix: Data Inputs and assumptions

The POPGROUP model draws data from a number of sources, building an historical picture of population, households, fertility, mortality and migration on which to base its scenario forecasts. Using the historical data evidence for 2001-2009, in conjunction with information from ONS national projections, a series of assumptions have been derived which drive the scenario forecasts. These assumptions are used when historical data or constraints on fertility, mortality, migration and population are not available.
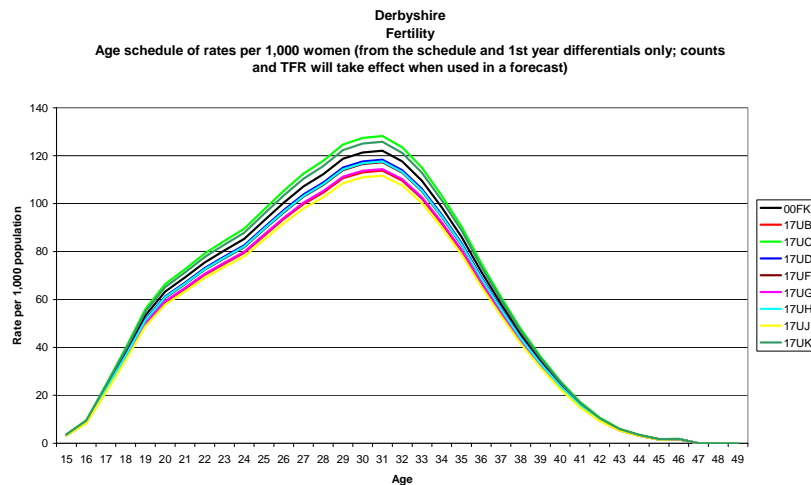
3.1. Population

The forecasting process uses the following population data as historical constraints:

- Mid 2001 to mid 2009 population by single year of age and sex. Data for the scenarios included the revised 2002-2008 mid-year estimates released by ONS in 2010, and the 2009- mid-year estimates released a little later.

3.2. Births and fertility

The forecasting process uses the following birth and fertility information:

- Mid-year counts of births by sex, 2001 – 2009.
- Standard age-specific fertility schedule from national projections, used to set the age-pattern of rates for each district (2008-based schedules). The published TFR for each district and nationally are combined with the standard national age-specific age profile to produce age-specific fertility rates for each district within Derbyshire (see below).

Derbyshire
Fertility
Age schedule of rates per 1,000 women (from the schedule and 1st year differentials only; counts and TFR will take effect when used in a forecast)
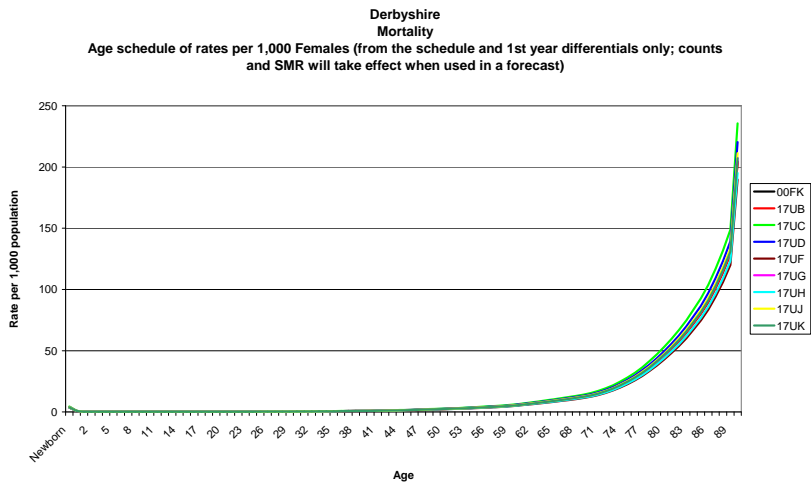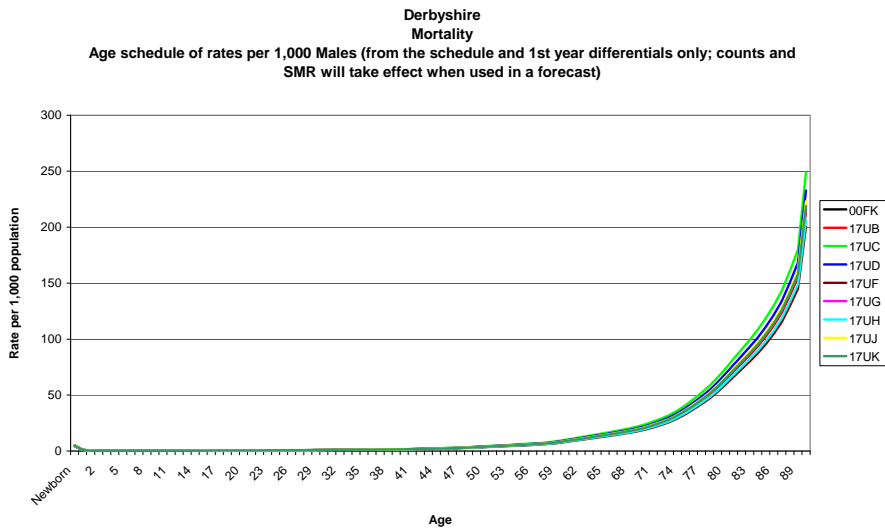
Future trends

The trend in fertility for each year of the forecast follows that set by ONS in its national 2008-based population projection assumptions. Following the rise in fertility since 2001, these national assumptions assume a decline from 2009.

2008-based
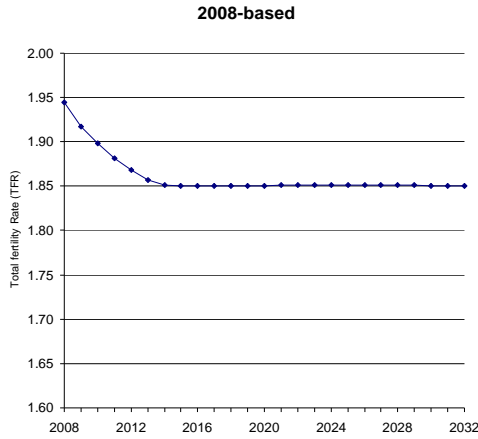
3.3. Deaths and mortality

The forecasting process uses the following death and mortality information:

- Mid-year counts of deaths 2001 – 2009.
- Deaths by age and sex from 2001 – 2009.
- The published SMRs for each district are combined with the standard national age-specific age profile to produce age-specific mortality rates for each district (see below).

Derbyshire
Mortality
Age schedule of rates per 1,000 Males (from the schedule and 1st year differentials only; counts and SMR will take effect when used in a forecast)

Derbyshire
Mortality
Age schedule of rates per 1,000 Females (from the schedule and 1st year differentials only; counts and SMR will take effect when used in a forecast)

Future trends

The <u>trend</u> in mortality for each year of the forecast (at district level) follows that set by ONS in its national 2008-based population projection assumptions. Mortality rates continue to decline throughout the projection period (see below).
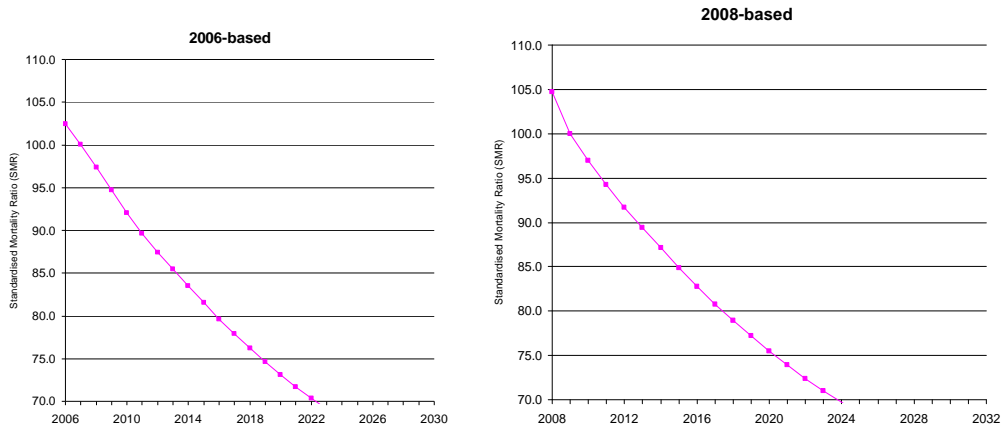
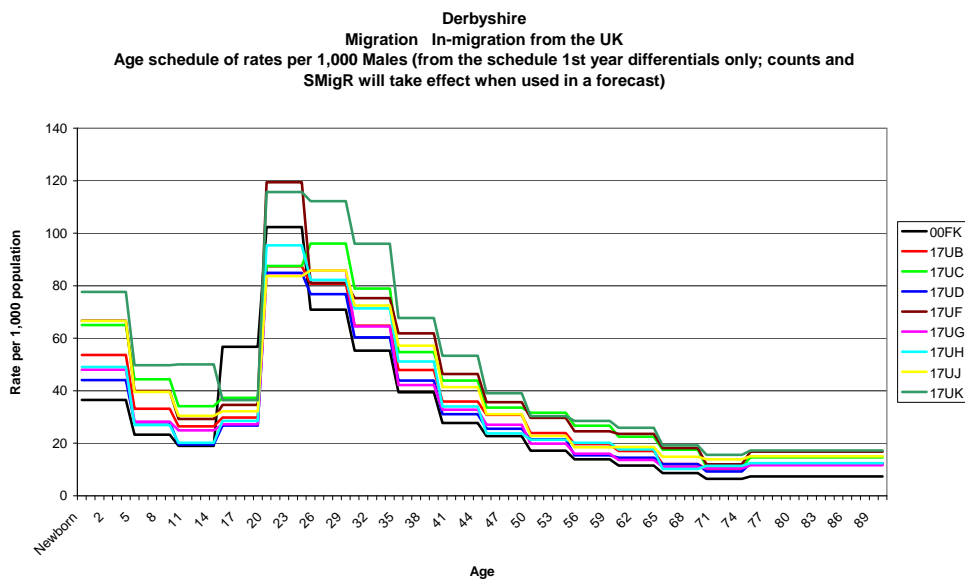Different assumptions are applied to the male and female schedules of mortality decline.
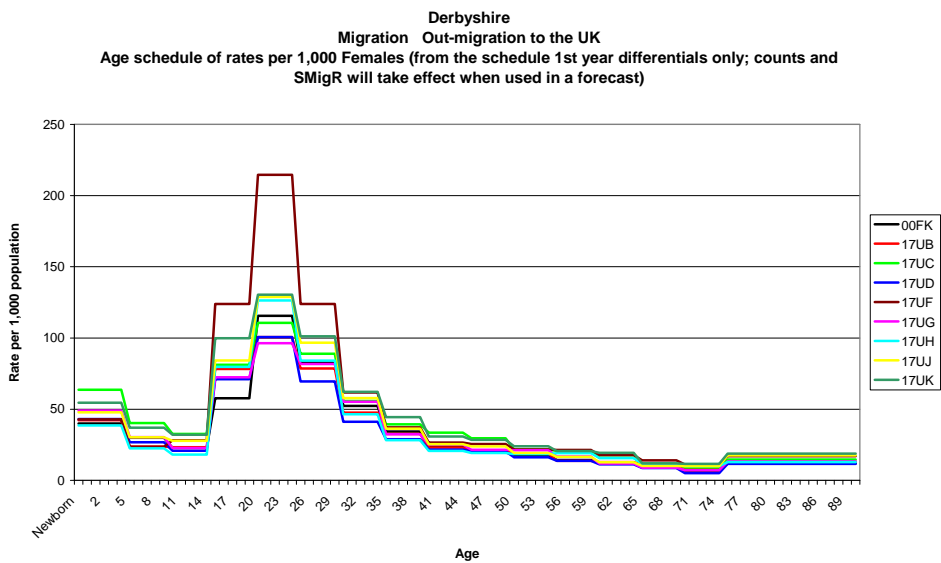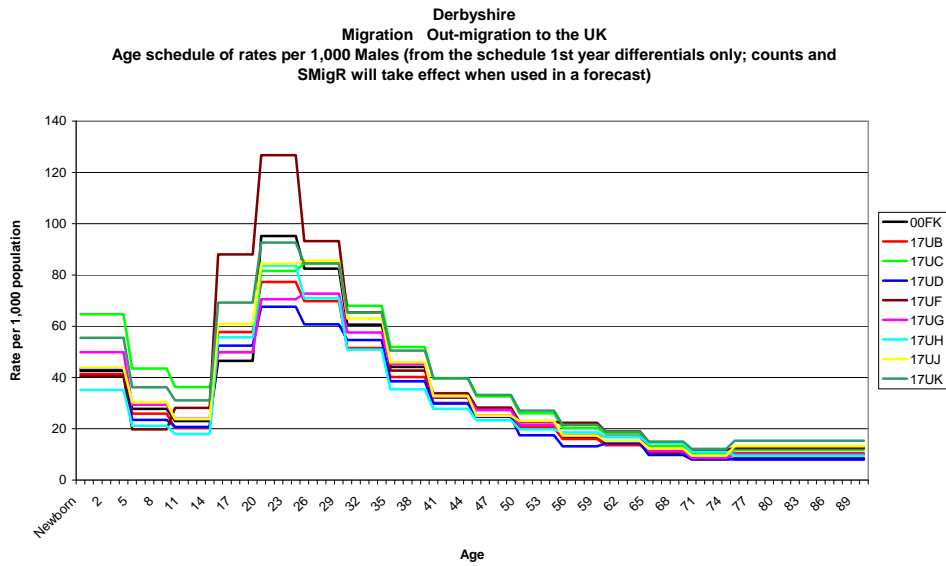
3.4. Migration

Migration is typically the most difficult component to measure. Estimation of migration schedules and associated long-term assumptions are made at district level
The forecasting process uses the following migration statistics:

- Internal migration data by age and sex is drawn from patient registration statistics. The 2008-based projections include the revisions resulting from ONS' new estimation methodology, with new registration statistics produced for 2002-2008.

- Mid-year population estimates provide assumptions for international migration on immigration and emigration flows by district.

Example in-migration schedules for males and females are illustrated below. The weighted average rate for each age-sex category is used for all the years of the forecast up to and including the last year.

Derbyshire
Migration   In-migration from the UK
Age schedule of rates per 1,000 Females (from the schedule 1st year differentials only; counts and SMigR will take effect when used in a forecast)

Derbyshire
Migration   Out-migration to the UK
Age schedule of rates per 1,000 Males (from the schedule 1st year differentials only; counts and SMigR will take effect when used in a forecast)

Derbyshire
Migration   Out-migration to the UK
Age schedule of rates per 1,000 Females (from the schedule 1st year differentials only; counts and SMigR will take effect when used in a forecast)

For *overseas* migration counts of immigration and emigration for 2001/2 to 2008/2009 are taken from ONS mid-year population estimates and applied to the standard age-specific migration schedule for immigration from the 2001 Census (see below)

Derbyshire
Migration   In-migration from Overseas
Age schedule of rates per 1,000 Males (from the schedule 1st year differentials only; counts and SMigR will take effect when used in a forecast)
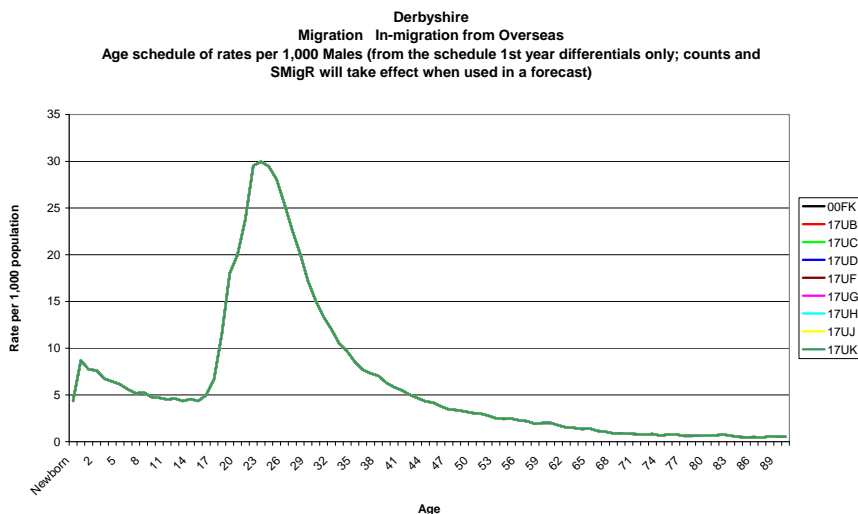
Overseas migrant counts in the forecasts are the average of previous years derived from the residual migration after deducting counts of births, deaths, and UK migrants from population change for years in which they are all recorded.

3.5. Households

The household projection methodology used by POPGROUP is that employed by CLG, applying headship rates by household type to population forecasts by age and sex. This produces a household forecast by household type, age and sex.

Household forecasts for Derbyshire have been made using the latest CLG 2008-based projections from November 2010 which provide information on:
- Households by household type
- Population not in households
- Headship rates by household type, age and sex

These are 2008-based and are used in all scenarios.

The household types as defined by the CLG 2008 household projections and used by the Derived Forecast Model are as follows:

1. One person households: Male
2. One person households: Female
3. One family and no others: Couple: No dependent children
4. One family and no others: Couple: 1 dependent child
5. One family and no others: Couple: 2 dependent children
6. One family and no others: Couple: 3+ dependent children
7. One family and no others: Lone parent: 1 dependent child
8. One family and no others: Lone parent: 2 dependent children
9. One family and no others: Lone parent: 3+ dependent children
10. A couple and one or more other adults: No dependent children
11. A couple and one or more other adults: 1 dependent child

12. A couple and one or more other adults: 2 dependent children
13. A couple and one or more other adults: 3+ dependent children
14. A lone parent and one or more other adults: 1 dependent child
15. A lone parent and one or more other adults: 2 dependent children
16. A lone parent and one or more other adults: 3+ dependent children
17. Other households

3.6. Dwellings

The Derived Forecast model uses a 'vacancy rate' to convert households into dwellings. These vacancy rates have been derived from 2001 Census data and are maintained at a constant level in the scenario forecasts. Users may vary them to evaluate alternative scenarios. The vacancy rate data by district are as follows:

Derbyshire Vacancy Rates	
Amber Valley	3.70%
Bolsover	4.57%
Chesterfield	3.90%
Derby*	4.48%
Derbyshire Dales	5.41%
Erewash	2.61%
High Peak	2.90%
North East Derbyshire	2.26%
South Derbyshire	2.21%

Source: Census 2001; * Derby based on 2001 council tax records

To run dwelling-led scenarios, Derbyshire County Council provided forecast dwelling numbers based upon the average completion figure from 2000 to 2010. This average completion figure was held constant throughout the projection period from 2008/9 to 2030/31.

Derbyshire	Supply units from 2010/11 to 2030/31
Derby	685
Amber Valley	357
Bolsover	254
Chesterfield	330
Derbyshire Dales	166
Erewash	303
High Peak	331
North East Derbyshire	250
South Derbyshire	567
Total	3,244

Source: Derbyshire County Council

3.7. Labour Force

Economic Activity

For the labour force scenario the economic activity rates that were used were the Derbyshire average from 2004-2009 for all districts apart from Derby due to the incomplete nature of the data. For Derby, the city economic activity rate average from 2004-2009 was used.

Derbyshire	Economic Activity Rate (%)						Average
	2004	2005	2006	2007	2008	2009	2004-2009
Males							
16-19	56.8	64.0	68.0	63.9	58.8	71.2	63.8
20-24	90.4	94.5	80.4	84.8	87.8	95.3	88.9
25-34	95.3	96.5	93.9	87.9	98.2	93.4	94.2
35-49	91.4	93.6	95.1	93.3	95.9	94.4	94.0
50-64	72.0	71.5	71.6	69.1	74.2	78.2	72.8
65+	8.3	7.6	10.9	10.6	8.1	13.5	9.8
Females							
16-19	61.7	68.8	59.9	74.3	59.8	61.0	64.3
20-24	76.4	72.9	72.9	80.1	86.0	81.4	78.3
25-34	78.2	79.3	82.3	76.1	85.0	80.5	80.2
35-49	80.9	83.5	84.2	81.4	84.2	84.8	83.2
50-64	56.8	58.5	62.0	58.2	56.6	63.2	59.2
65+	3.8	3.6	2.2	4.2	2.0	5.1	3.5

Source: NOMIS

To evaluate 'jobs-led' forecasts, two additional parameters are required by the Derived Forecast model, in addition to the economic activity rates: unemployment rate and commuting ratio.

Unemployment Rate
The average unemployment rate for 2004-2009 for the district has been applied and maintained at a constant level throughout the forecast period.

Derbyshire	Unemployment Rate (%)						Average
	2004	2005	2006	2007	2008	2009	2004-9
Amber Valley	3.3	2.7	2.8	!	5.7	7.9	4.5
Bolsover	5.4	7.8	8.2	10.1	3.8	5.8	6.9
Chesterfield	3.8	5.5	7.8	7.2	5.2	8.0	6.3
Derby	7.4	5.3	4.6	6.1	5.5	8.1	6.2
Derbyshire Dales	1.7	3.5	4.8	3.9	2.8	3.3	3.3
Erewash	3.4	3.9	5.1	4.9	7.7	10.6	5.9
High Peak	4.5	3.9	3.2	3.2	4.3	4.8	4.0
North East Derbyshire	3.4	4.2	4.0	6.2	4.1	5.0	4.5
South Derbyshire	1.4	4.4	4.8	6.1	3.7	7.2	4.6

Source: NOMIS

Commuting Ratio

A commuting ratio is applied to the district which is derived from the 2001 Census as the ratio between the total number of workers and total number of jobs in the area. Commuting Ratio derivation for the district is illustrated below (ratios are again maintained at a constant level throughout the forecast period).

Chesterfield

Where do people who live in Chesterfield work?

Live	Work	Flow	%	Cum%
Chesterfield	Chesterfield	28,895	66.5	67
Chesterfield	North East Derbyshire	4,250	9.8	76
Chesterfield	Sheffield	2,754	6.3	83
Chesterfield	Derbyshire Dales	1,352	3.1	86
Chesterfield	Bolsover	1,199	2.8	89
Chesterfield	Amber Valley	610	1.4	90
Chesterfield	Rotherham	468	1.1	91
Chesterfield	Mansfield	411	0.9	92
Chesterfield	Bassetlaw	351	0.8	93
Chesterfield	Derby	333	0.8	94
Chesterfield	Nottingham	324	0.7	94
Chesterfield	Ashfield	234	0.5	95
Chesterfield	High Peak	189	0.4	95
Chesterfield	Others	2,064	4.8	100
	Total	43,434		

Where do people who work in Chesterfield live?

| Origin	Destination	Flow	%	Cum%
Chesterfield	Chesterfield	28,895	59.2	59
North East Derbyshire	Chesterfield	8,814	18.1	77
Bolsover	Chesterfield	2,944	6.0	83
Sheffield	Chesterfield	2,736	5.6	89
Derbyshire Dales	Chesterfield	1,188	2.4	91
Rotherham	Chesterfield	564	1.2	92
Amber Valley	Chesterfield	486	1.0	93
Mansfield	Chesterfield	357	0.7	94
Bassetlaw	Chesterfield	318	0.7	95
Ashfield	Chesterfield	259	0.5	95
Others	Chesterfield	2,256	4.6	100
	Total	48,817		

Commuting ratio	0.89

4. Appendix: Methodology summary

Population projections use a standard **cohort component** methodology whilst the household projections use a standard **household headship rate** methodology, as employed by ONS and CLG respectively. Labour force projections are produced using an **economic activity rate** model.

A more detailed description of the population and household projection methodologies is available from the User Guide and Reference Manual on the POPGROUP website. The mathematical calculations for each method are documented at the end of each of the manuals. www.ccsr.ac.uk/popgroup/about/manuals.html.

The general population projection and household methodologies are illustrated below.
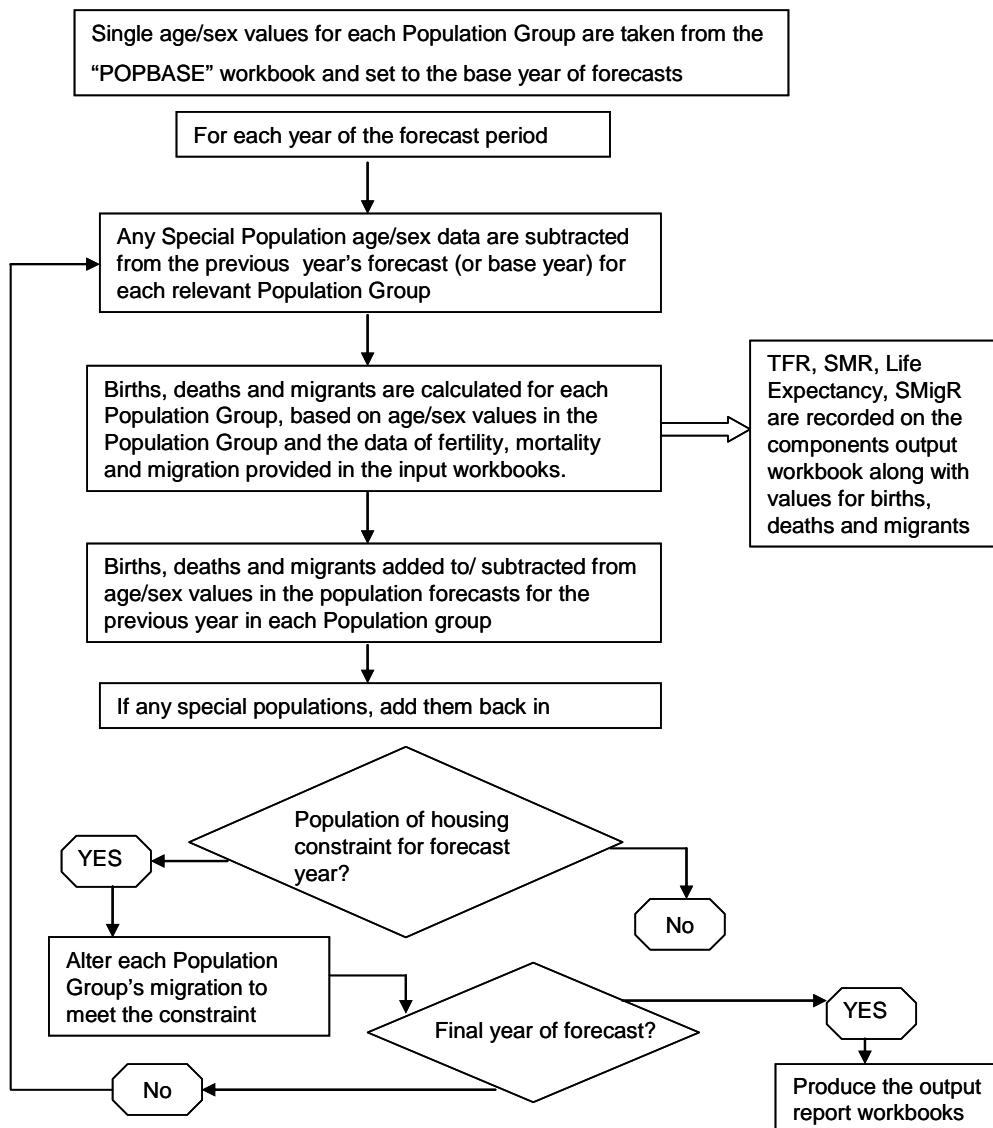
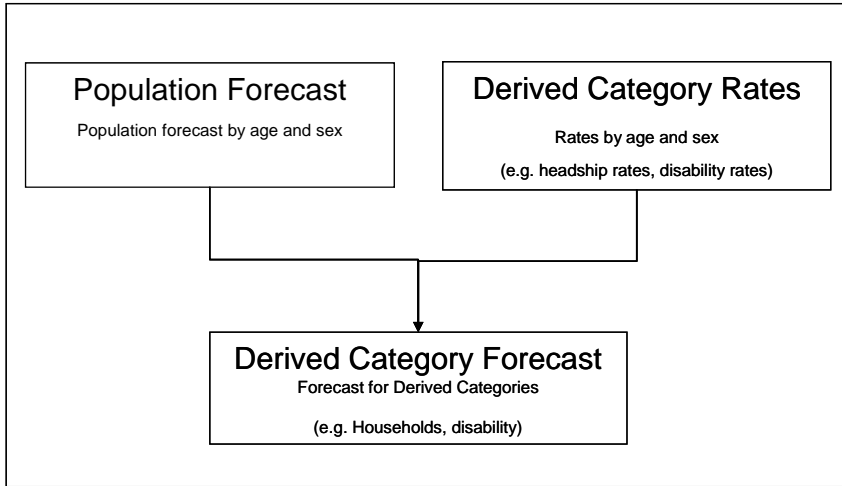
POPGROUP Population Projection Methodology

Figure 1: Derived Forecast Model - methodology

Algebraically the model is defined as follows:

$$D_{a,s,u,y,d,g} = P_{a,s,u,y,g} * R_{a,s,u,y,d,g} / 100$$

Where:

D =	Derived Category Forecast
P =	Population 'at risk' Forecast
R =	Derived Category Rates

and

a =	age-group
s =	sex
u =	Sub-population
y =	year
d =	derived category
g =	group (usually an area, but can be an ethnic group or social group)

Derived Forecast Projection Methodology