Cambridgeshire County Council

Research and Performance

Cambridgeshire County Council Research Group 2012-based population and dwelling stock forecasts

Forecasting Methodology
February 2014

This paper describes the methods, data and assumptions used to produce Cambridgeshire County Council Research Group's population forecasts. It accompanies the 2012-based suite of population and dwelling stock forecasts published in February 2014. The 2012-based forecasts run to 2031 and are available by local authority and ward and by age.
The 2012-based suite of forecasts comprises the following:

- **Population forecasts** by local authority district to 2031. A summary set of figures is published online, however the forecasts are available by single year of age and sex and for all years through to 2031 on request.

- **Dwelling stock assumptions** by local authority district and ward, through to 2031, for the years 2016, 2021, 2026 and 2031. These show the level of house-building that is assumed in the Research Group's published population forecasts.

- **Population forecasts** by ward to 2031, for broad age groups and for the years 2016, 2021 2026 and 2031.

The 2010-based forecasts have been affected by a set of circumstances related to both policy changes and local conditions. These are discussed below. Readers requiring a full technical discussion of the entire methodology should read the whole document. Readers who are primarily interested in the circumstances surrounding these forecasts will find the Introduction and Section 2 of most use.

Summary

- The Research Group's (RG) population forecasts are "housing led" in that they are consistent with planned levels of house-building between 2011 and 2031. The latest forecasts run to 2031 from a base year of 2012 and are consistent with dwelling "targets" set out in published local authority housing trajectories.

- The local authority forecasts are produced by taking the population by sex and single year of age and ageing it forward the population, from 2012, year by year. Population change is forecast by allowing for the main components of population change: births and deaths (which together give natural change), and migration. This is the standard population forecasting methodology, as used by the Office for National Statistics (ONS).

- The forecasts assume the completion of some 74,600 additional dwellings in Cambridgeshire between 2012 and 2031. The forecasts include the proposed Cambridge Fringe developments and the new towns of Alconbury Weald and Northstowe. However, all the district councils in Cambridgeshire have yet to have their latest local plans adopted, therefore the housing assumptions have not been fully through the formal planning process and do not yet reflect adopted district council policies. This uncertainty means that these forecasts should be used in the knowledge of possible revisions in future forecasts.

Introduction

Cambridgeshire County Council Research Group (RG) produces annual population and dwelling stock forecasts for the County, districts and wards. The RG's forecasts are 'policy led', which means that they are consistent with planned levels of house-building across the County. They are therefore different to projections produced by the Office for National Statistics (ONS), which are trend-based, meaning that they assume that recent trends will continue in the future (see Section 4 for further discussion).

While the forecasts are based on local policies as far as possible, the location and phasing of housing development, and the resulting forecasts, do not themselves represent County or district council policy. Rather, the forecasts indicate the possible population implications of planned housing development and other demographic change. All forecasts are based on a series of assumptions and would change in the light of new information.

In this round, RG forecasts were been consistent with housing targets laid out in the latest local authority housing trajectories; in most cases, those included in local plan submissions. They still do not constitute a formal policy position as none of the district councils' local plans have been adopted.

Given these considerations the RG advises that the 2012-based population forecasts be used in the knowledge of possible or revisions in future forecasts.

When published elsewhere, the forecasts must be properly referenced[1] and rounded to the nearest 100 people.

Definitions:

The total population figures are forecasts of the usually resident population. This definition is the same as that used in the 2011 Census in which all students are counted at their term-time address. The forecasts include all persons living in communal establishments as well as those living in private households.

Forecasts of dwelling stock relate to the number of self-contained residential units whereby, if there is more than one separate area of living accommodation within a property, each is counted separately. Vacant properties, second homes and holiday homes are included, as are non-permanent dwellings, such as caravans and houseboats (where these are used for dwellings).

[1] The forecasts should be referenced as:
Cambridgeshire County Council Research Group 2012-based population forecasts

Section 1: District-level forecasts

RG uses POPGROUP, a forecasting model developed by Bradford Council, the University of Manchester and Andelin Associates and run at a local authority level. Figures for Cambridgeshire are aggregated from the district-level figures. The main population forecasts are produced by taking the population by sex and single year of age and ageing it forward from a base date, year by year. Population change is forecast by allowing for the main components of population change: births and deaths (which together give natural change), and migration. This is the standard population forecasting methodology, as used, for instance, by the ONS. This section outlines the methodology in more detail.

1.1 Base Population

The base year for the population used in the latest forecasts is 2012. The base populations are derived from the RG's population model, run forward from an original base year of 2011 to give annual mid-year population estimates for each year since 2011. The original 2011 base is derived from the 2011 Census.

The population model is run to produce population estimates in the same way as it is run to produce population forecasts, as detailed below, except that actual births and deaths by age are input instead of forecast ones. Net migration rates are then adjusted until the model generates the estimated mid-year total population of the area concerned. This total estimated population is produced by rolling forward the 2011, census-based, total population on the basis of changes in electoral rolls, numbers of children aged 0-3 (from NHS GP Registrations), changes in school rolls and data on house-building.

The estimated population by age and sex calculated by the model is then calibrated with other known data, particularly for specific age-groups. The main groups used recently for calibration are 0-4s from the NHS GP Registrations, 4-15s from school rolls, 17+ population based on electoral rolls, older age groups from NHS GP registration data. The estimates produced by the model are further checked by comparing the numbers of households calculated by the model with information on numbers of dwellings completed since 2011.

1.2 Fertility Assumptions

Births are forecast by applying age-specific fertility rates to the numbers of women of childbearing age in the local population. These age-specific fertility rates provide a basic fertility curve that can be adjusted upward or downward according to forecast changes in age-specific fertility. The numbers of births forecast in any year are therefore dependent on the forecast age-specific fertility rate and on the numbers of women in childbearing age groups. The forecast age-specific fertility rates used in the model are derived from the components of change used in the ONS 2010-2012 population estimates. The national age-specific fertility rates are adjusted at district level to take account of differences between local and national fertility patterns. The adjustment is done on the basis of a detailed comparison of recent national and local age-specific rates. The next national series of fertility rates projections is likely to be published with the ONS 2012-based population projections in 2014.

1.3 Mortality Assumptions

The process by which deaths are calculated in the model is very similar to that used to calculate births. Deaths are forecast by applying age-specific mortality rates to the number of men and women in the local population. These rates provide a basic pattern of mortality that can be varied according to forecast changes in age- and sex-specific mortality rates. The number of deaths forecast in any one year is therefore a product of the sex and age structure of the population and the death rates being applied to the population in that year. The

forecast sex- and age-specific mortality rates used in the model are derived from the national series used in the 2010-based ONS population projections. The national mortality rates are adjusted at district level to take account of differences between local and national mortality patterns. The adjustment is done on the basis of a detailed comparison of recent national and local age specific rates.

1.4 Migration Assumptions

Migration is modelled in two stages: firstly, an age and sex structure of in- and out-migrants is determined; secondly, annual totals for the level of net migration are forecast. Net migration is the balance between migration into an area and migration from it. The age and sex structure of migrants gives the probability of migrants being of a particular age and sex. This structure is determined for the base year of the model and then fitted to forecast totals of net migration to produce numbers of migrants into or out of an area by sex and age. The age and sex structure of migrants used in the model is based on that found at the 2010 ONS Projections. Adjustments are sometimes made to the age-structures of migrants during the course of running the model to produce annual mid-year estimates.
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Migration is the only variable in the model that significantly affects the size of many age-groups as they move through the population – the child and adult age-groups before the ages at which mortality begins to have a major impact. When calibration with other sources of age-group data, such as school rolls, suggested that too many or too few migrants were being added to or taken out of those age-groups, the age-structure of migration in the model was adjusted to bring changes in the total numbers in those year-groups back in line with the trends suggested by the other sources of data.

The model operates by holding international migration constant (at 2010 levels) and adjusting internal migration (from within the UK) to give an assumed rate of net migration. In this model run, in-migration is adjusted such that the number of households generated by the model is consistent with the number of dwellings that are expected to be built between 2012 and 2031. (see Section 2).

The forecasts have been produced before all 2011 Census data has been released, particularly data on migration flows. Future forecasts are likely to incorporate more up-to date information on migration.

1.5 Reliability

Forecasts are only as accurate as the assumptions on which they are based. Assumptions used here about fertility, mortality and migration are based on the best available information, but they are complex factors with countless influences. It is impossible to predict the future; we can only make reasoned guesses based on what we know about the past and the present. The forecasts are continually revised as new assumptions become available. This means that current figures will differ to those published (for the same time frame) in previous years. In some cases differences may be quite considerable due to revised assumptions about the phasing of planned development.

The district level forecasts rely on dwelling targets being achieved and are therefore subject to the same reliability issues that affect the dwelling stock forecasts (see section 2.1 below). In general, the forecasts become less reliable the further they project into the future. The total population forecasts will be more reliable than for individual ages and sexes. Users are advised that figures have been rounded to the nearest 100 to avoid a spurious perception of accuracy.

Section 2: Dwelling stock assumptions

Dwelling stock assumptions form the basis of the population forecasts. These are based on trajectories published by the district councils. Table 2 sets out the future levels of house-building assumed in the forecasting model. Overall, some 74,600 additional dwellings are assumed will be completed between 2012 and 2031. These include the proposed Cambridge Fringe developments and the new towns of Alconbury Weald and f Northstowe although caveats attached to those developments are outlined below (see Section 2.1).

Table 1: Summary of house building 2011-2031

District	1: Actual completions 2011-2012	2: Projected 2012-2031	4: Total 2011-2031
Cambridge City	350	13750	14100
East Cambs	350	11150	11500
Fenland	200	10850	11050
Huntingdonshire	850	17350	18,200
South Cambs	650	21550	22,200
Cambridgeshire	2,400	74650	77,050

The phasing and location of new housing by ward is determined through the Local Plan process. District councils produce annual housing trajectories, detailing the number and phasing of dwellings expected to come forward on individual sites. These trajectories are used to guide the distribution of house-building between wards and five-year time-bands, although some 'smoothing' may take place and the trajectories may not be followed exactly. For example, all the local plans make provision for future windfall developments, but the location of these is unknown. In the model, these are apportioned to wards that have been identified as areas of future growth. Hence, the distribution of dwellings does not reflect district council policy.

All five district local plans have yet to be adopted, hence there may be some future change to housing targets.

The districts' trajectories follow financial years, while the RG forecasts reflect the mid-year point. For simplicity, the financial years are assumed to correspond to the nearest mid-year point. In other words, where a trajectory details development expected between April 2011 and March 2012, these are assumed to occur between mid-2011 and mid-2012 in our forecasts.

2.1 Reliability & Local Factors

The district- and ward-level dwelling stock forecasts present an optimistic view of dwelling stock growth as they assume that all planned dwellings are built according to policy. In terms of planning for the future it is necessary to consider the full implications of policy, even if there are questions as to whether policy can be achieved. The extent to which policy targets are achieved depends on many factors, including market forces and the economy. All development is subject to the development control system; development on designated sites depends on suitable planning applications being received from developers. In addition, "windfall" sites, which have not been allocated for housing growth, are likely to become available.

All five district local plans have yet to be adopted, hence there may be some future change to housing targets as the final local plans emerge.

In addition to changes in overall housing policy, local factors may also affect the accuracy of

these forecasts.

Cambridge East Development

In previous forecasts, there was a large allocation of housing at Cambridge East. Marshalls had been actively looking into relocation options for the airport activities since 2006. In 2010, they announced that they did not have a deliverable relocation option and that they intended to remain at Cambridge Airport for the foreseeable future. In reviewing the future options for this large site, Cambridge City Council and South Cambridgeshire District Council have concluded that it is appropriate that this site remain out of the Green Belt and be safeguarded as a strategic reserve of land to be developed at a later date. Both local plan submissions include smaller allocations on part of this site.

Section 3: Ward level population forecasts

The mid-2012 population estimates by ward and age group form the base for the ward level forecasts. The total population change by age for each district for 2012-2016, 2016-2021, 2021-2026 and 2026-2031 is taken from the district level forecasting model, as described above. Age changes are distributed between constituent wards on the basis of the distribution and phasing of housing growth as contained within the ward level dwelling stock forecasts. Changes are applied sequentially, such that the 2012 ward age estimates are used as the base for the 2016 forecasts, which then become the base for the 2021 forecasts, which then become the base for the 2026 forecasts, and so on. The method used is as follows.

The ward level forecasting methodology considers two distinct population groups. The first is the “new” population: people moving into new dwellings. People moving into new houses usually have different characteristics to the existing population and often tend to be younger. This is particularly the case for new settlements like Cambourne and Northstowe. The second is the “local” population: people currently living in existing housing in the area. This population is, in general, ageing, so the number of people in younger age groups is dropping while the number in older age groups is rising.

In terms of the “new” population, additional population is allocated to wards based on the number of additional dwellings forecast. An average of 2.5 people is allocated per new dwelling, with a relatively young age structure as indicated by Census data. This is slightly higher than the average household size in the population overall, reflecting the tendency for families and younger people to move into new housing. Total population change by age related to new dwellings across the district is then subtracted from overall population change by age. This leaves the population change that can be attributed to change in the “existing” population. This change is then distributed between wards on the basis of the ward’s current population size and structure. In other words, change to the existing population is assumed to be equally spread (in proportional terms) across all the wards in a district.
to new dwellings across the district is then subtracted from overall population change by age.

This leaves the population change that can be attributed to change in the “existing” population. This change is then distributed between wards on the basis of the ward’s current population size and structure. In other words, change to the existing population is assumed to be equally spread (in proportional terms) across all the wards in a district.

3.1 Reliability

The ward age forecasts are subject to the same reliability issues as identified in Sections 1 and 2 above. In addition it should be noted that the methodology assumes the same average household size for all new dwellings, though it will vary depending on the size and types of dwellings actually built. Some wards may in reality show slightly higher or lower average household size amongst their new population. There is increasing pressure for new

developments to include a range of housing types, however, and across a ward the average is unlikely to vary greatly from the district average. Further, the methodology assumes that change to the “existing” population is evenly spread across the district. In reality, some areas may age or change faster than others, depending on factors such as population turnover. The total population forecast for each ward is more reliable than the age group breakdown. The forecasts will become less reliable the further they project into the future. When the age group forecasts are used, the age bands should be grouped as broadly as possible. All forecasts should be published rounded to the nearest 100. The age group forecasts are for planning purposes only and demonstrate the potential effects of possible demographic change and house building on local populations. The population forecasts themselves do not represent any form of population policy.

Section 4: Comparison with other population projections

These forecasts differ from those produced by the Office for National Statistics (ONS) in two main respects. Firstly, and most importantly, they are policy based rather than trend based. ONS projections use recent trends to project future changes. This means that projections for areas where the population has grown considerably in recent years (such as East Cambridgeshire, for example, due to the rapid growth that occurred in Ely) are likely to be an overestimate. For areas where significant growth is about to start, they are likely to underestimate growth. The RG policy based forecasts are based on the best available assessment of what is planned to occur within the forecast period.

Secondly RG projections are available at ward level. ONS produces projections at a local authority district level only. No information is available for wards or for market towns. The RG ward level forecasts are the only source of small area population forecasts available. The RG forecasts also differ from those produced elsewhere as they benefit from local knowledge. This enables local factors, such as the student population, to be taken into consideration.

About the Cambridgeshire County Council Research Group

The Research Group is the central research and information section of Cambridgeshire County Council. We use a variety of information about the people and economy of Cambridgeshire to help plan services for the county. The Research Group also supports a range of other partner agencies and partnerships.

Subjects covered by the Research Group Team include:

- Consultations and Surveys
- Crime and Community Safety
- Current Staff Consultations
- Data Visualisation
- Economy and The Labour Market
- Health
- Housing
- Mapping and Geographic Information Systems (GIS)
- Population
- Pupil Forecasting

For more details please see our website:

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