POPGROUP v.4

User Guide 2

How to Get Started with Household Projections

Prepared by Ludi Simpson

edge analytics

0113 384 6087
popgroup@edgeanalytics.co.uk

edgeanalytics

POPGROUP

Contents

edge<u>analytics</u>

POPGROUP

1 | Introduction

Household projections are a key component when assessing the need for new housing. In each country of the UK, official projections provide a wealth of information about demographic trends and household formation. Local information and local priorities are then used to adjust the official projections, to support the development of local plans.

This Guide describes how to get started with local household projections in England, Wales and Scotland, using the Derived Forecasts model of the POPGROUP suite of software. The Guide assumes that the reader has access to the Data Modules of official household projections that are regularly produced for POPGROUP users (available from Edge Analytics). It describes how to view and analyse the official projection for a set of local authority areas chosen by the user, how to make alternative scenarios, and how to compare their results.

Derived Forecasts software is installed and operates independently from the POPGROUP software for population projections. However, if you have already used POPGROUP (User Guide 1 provides an introduction), then you will find Derived Forecasts straightforward as the two software packages have similar design principles. Derived Forecasts and POPGROUP can be used together, as discussed in *Next Steps* on page 39.

This Guide uses the CLG Stage 2 household projections for Districts in England released in December 2015. Differences with Wales and Scotland are noted at appropriate places.

1.1. How much time do I need?

An existing user of POPGROUP will be able to install a new official projection, view and analyse it all within ten minutes. A complete novice will want to put aside half a day. Each of the alternative scenarios in Section 5 takes only a few minutes to complete and run, as does the comparison of different scenarios in Section 6. Again, the novice will want to put aside more time to consider the new skills that are being learned.

edge^{analytics}   POPGROUP

1.2. What else will I need to know?

This Guide is intended for those getting started with the software, by providing step-by-step support for specific common tasks. It assumes no prior knowledge. The Derived Forecasts reference manual remains the comprehensive Guide that should also be consulted to learn how the software operates and its full range of functionality.

Projections led by plans for housing or jobs are discussed in User Guides 4 and 5 (see page 39).

The POPGROUP suite of software (POPGROUP, Derived Forecasts, and their Data Modules) does not intend to be a 'black box'. When making projections, the user is responsible for the assumptions made about future population and household change. The user must understand something about how population and household formation combine to create a future number of households, and will earn that understanding from other texts and from courses.

POPGROUP is a very flexible engine for producing demographic forecasts and scenarios. To use it to its full, the user will consult its other Guides (listed on page 39). All documentation for POPGROUP is available by emailing **popgroup@edgeanalytics.co.uk**.

1.3. About this Guide

In this document, the names of Excel workbooks are written in bold grey font (e.g. **POPGROUP_Scenario**). Sheets within workbooks are written in bold grey italics surrounded by single quotation marks (e.g. **'Sched'**).

Folder names are written in uppercase, surrounded by single quotations (e.g. '…POPULATION\OUTPUT'). Users may name folders and workbooks using both lower and upper case, depending on preference.

References to cells within worksheets, or to buttons/options within the workbooks are in blue italics surrounded by single quotations, for example, *'Validate'*.

Two types of text box are used in this document:

(i) **Information**	! **Warning**

ⓘ | **Local authority areas**

This Guide refers to local authority areas in England, Wales and Scotland that are variously named Unitary Authorities, Districts, Boroughs or Council Areas. For shorthand, the Guide often refers to 'areas'.

ⓘ | **Record results for your area**

- The Guide asks you to choose one or more areas, and follow instructions to replicate the official projection and make alternative scenarios.

- You will manually record results for your area on page 37 to keep track of your progress.

ⓘ | **Instructions and advice**

- Much of this Guide is structured as boxed instructions for an 'Action' accompanied by images of the 'POPGROUP view' that you will see.

- Text outside the boxed instructions provides further advice and explanation.

ⓘ | **Derived Forecasts (DF) is a model-maker**

- DF makes a model for the local authority area(s) you specify, starting in the 'base year' of the projection. Sections 2-3 of this Guide help you to use DF to replicate the official government projection. It is just one projection that can be made with this model.

- Sections 4-5 of this Guide show you how to investigate the official projection and how to develop other household projections for your local authority area(s). Each projection uses the same model for your area(s), with different assumptions.

- After using this Guide, you may make household projections that start from a different year or have different areas, or make projections for other characteristics such as economic activity. These will be different models made with DF, held in separate folders.

---

edge<u>analytics</u>   POPGROUP

2 Install Derived Forecasts Software

This Guide does not repeat the installation instructions in the manual. However, here are some tips:

ⓘ **Location of Derived Forecasts (DF) on your computer**
When installing the software, usually from a disc or a Dropbox address, the default location for the software is on your hard drive at 'C:\FORECAST\'. DF documentation and software will assume that this is its location. However, many organisations will prefer a different location and DF will work with any path that does not begin with a back slash '\'. You can specify your path during the installation. If for any reason you need help, contact **popgroup@edgeanalytics.co.uk**.

❗ **Macros must be enabled when using DF**
DF works in Excel by using programs known as 'macros'. After installation, you must follow the instructions in the manual to enable macros and trust access to Visual Basic. Otherwise, DF cannot work and you will receive error messages.

ⓘ **Multiple copies of DF**
You may install the software on more than one computer within the organisation as specified on your licence. You may **not** pass the software to third parties. If the software is installed on a networked server, a single installation will serve all users connected to that server.

3 Install the Latest Official Household Projection

Each official household projection for England, Wales and Scotland has been replicated in DF, and is supplied to users as either:

(a) completed data files for selected local authority areas. In this case, install them as instructed, and continue with Section 4 to explore the results; or

(b) a Data Module which is installed and used to select local authority areas. Most local authorities receive the Data Module. In this case, follow the notes in the rest of this Section.

3.1. Install the Data Module

Follow the instructions in the Data Module's manual. Installation is simply a matter of clicking on the Data Module provided, specifying the folder to contain the Data Module if it is not the default provided, and allowing files to be copied.

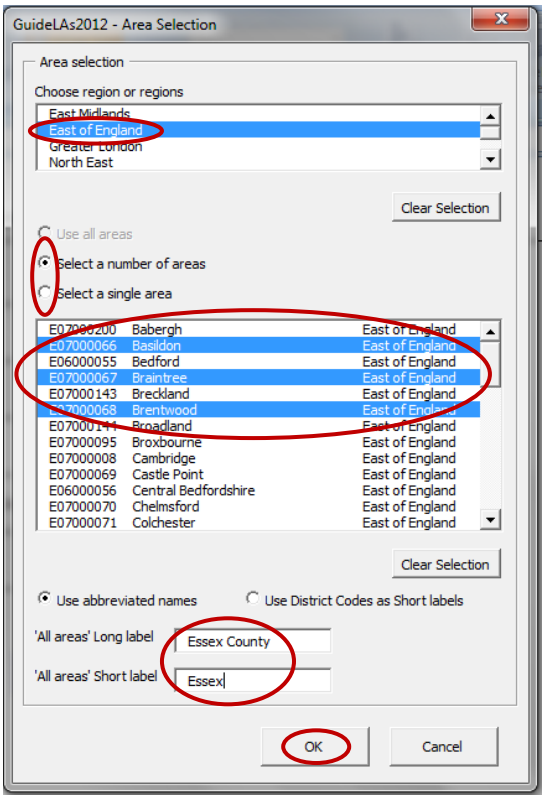| ❗	**Wales and Scotland projections; England projections other than 2012-based**
This Guide has been developed using CLG Stage 2 2012-based household projections for five areas in England. If you are working with areas of Wales or Scotland, or with a projection from a different base year, the same instructions will apply but names may differ. Occasionally a note appears in this Guide to indicate differences that might be expected in Wales or Scotland.	

3.2.   Produce the official projection

Further information is available in the Data Module's manual, which comes with the Data Module and is also available from **popgroup@edgeanalytics.co.uk**.

ⓘ   **Which areas will you make a model for?**
Before starting, decide which areas you wish to model. Up to 40 can be chosen, but usually you will choose either a single area or a group of neighbouring areas, for example all the districts within one county.

Action	POPGROUP view
When opening the Data Module, e.g. `DM_CLG2012HHStage2_Setup.xls`, two entries are required on this screen: 1. The '*File header'* will be repeated on all input and output files and is for information only. You may make it a blank space, or put a meaningful name like 'Districts'. 2. The '*Model ID'* will be used to name folders containing the model's files. Use it to remind you of the areas and the start year of the model, e.g. 'Manchester2012' or 'EssexDistricts2012' After completing this screen, click *'Run'*.	**POPGROUP Derived Forecasts** *CLG 2012 Household (Stage 2) Data Module* File header User - provide <File header> Model ID, to name folders User - provide <Model Id> Location of model folders C:\Forecast\2. DF Data Module data folder C:\Forecast\3. Data Modules\CLG2012HHStage2\Data DFSetup location C:\Forecast\2. DF Run

Action	POPGROUP view
A further screen appears where you choose the Region(s) containing your area(s), and then choose your area(s). If you chose more than one area, type a long and short label for the collection of *'All areas'*, e.g. 'Essex'. 	**!** **Wales and Scotland**

A further screen appears where you choose the Region(s) containing your area(s), and then choose your area(s).

If you chose more than one area, type a long and short label for the collection of *'All areas'*, e.g. 'Essex'.

!	**Wales and Scotland**
Regions are not a choice on your screen.	

!	**Selecting a single area**
If you choose to select a single area, you will not be asked to complete labels for *'All areas'*.	

When this screen is complete, click *'OK'*.

The model is then created. Input files are filled with the official projection assumptions. The projection outputs are created and saved. The model setup is saved in the Derived Forecasts (DF) folder, so that you can refer to it later.

The next Section explores the results of the official projection in some detail. You will learn how to use Derived Forecasts, and how its files are structured.

!	**The production of a model and running its official projection may take some time**
On a fast machine, a model for one area will take less than 1 minute. However, the time taken can be significantly longer for several areas, for a slower machine, or when using a slow connection to a server. With a combination of these things, it has been known to take more than 15 minutes. Be patient. Progress is indicated on the screen.	

4 Summarise the Results of the Latest Official Household Projection

4.1. Find the output files

Whether you have been supplied with the official projection in POPGROUP files, or have produced it using a Data Module, the results will be saved in an output folder. Your folder will have the Model ID specific to your areas. For example:
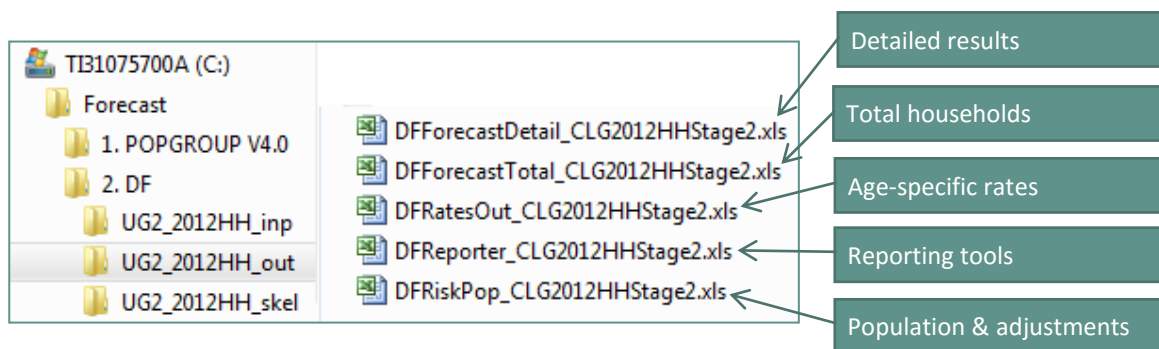
Check that these five files are there. Open each of them to see that they contain the results described.

We will mostly use the `DFReporter` file in this Guide, but all contain useful information, and are described in more detail in the Derived Forecasts reference manual.

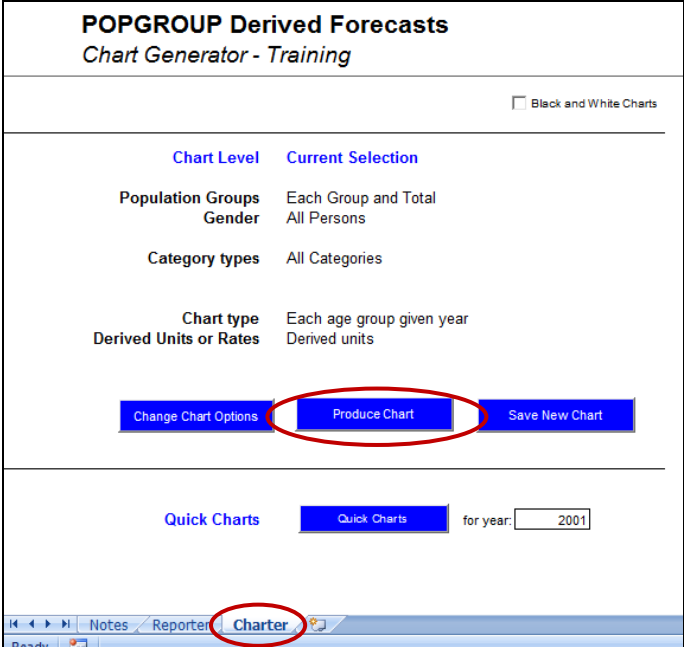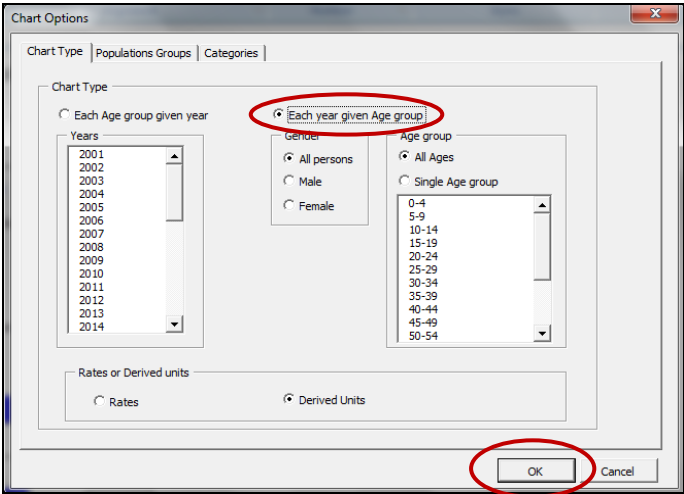If it is not already open, open the `DFReporter` file now.

| ℹ	**Starting year in England, Wales and Scotland**
The 2012-based projections by CLG for England districts were accompanied by estimates of past years starting in 2001, which are included in the Data Module. In Wales and Scotland, the starting year is 2011 and 2012 respectively, for the official projections available at the time of writing in 2016.	

4.2. View the number of households 2001–2037

Action: View number of Households	POPGROUP view
In the **DFReporter** file, make sure you are in the `'Charter'` sheet. Note the defaults under *'Current Selection'*. They will produce the number of derived units (households) headed by each age group in a default year. Click: Produce Chart Which age groups are the most common household representatives? Change the *'Current Selection'* by clicking on: Change Chart Options Click the option *'Each year given age group'*. Notice that the total households will be given for all persons and all ages. Click *'OK'* and then: Produce Chart Hover over the lines to see the number of households forecast in 2012 and in 2037. Record the results in 'Your Answers', page 37.	 **POPGROUP Derived Forecasts** *Chart Generator - Training* ☐ Black and White Charts **Chart Level** — **Current Selection** **Population Groups** — Each Group and Total **Gender** — All Persons **Category types** — All Categories **Chart type** — Each age group given year **Derived Units or Rates** — Derived units Change Chart Options — Produce Chart — Save New Chart **Quick Charts** — Quick Charts — for year: 2001 Notes / Reporter / Charter

Return to the `'Charter'` sheet and click:

Save New Chart

Enter any appropriate name for the saved chart, e.g. 'Total'.
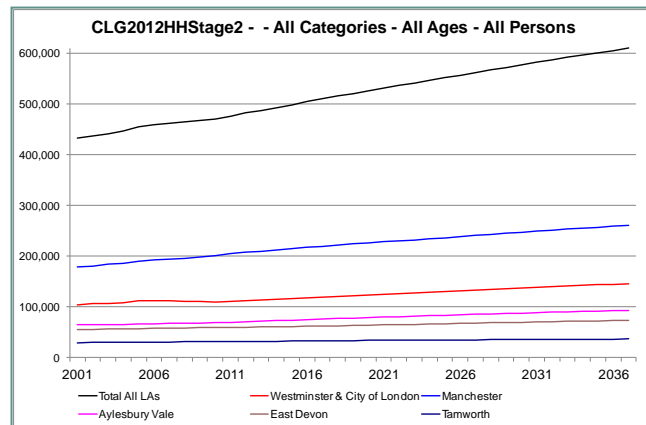
Now that it has been saved, the chart is not protected and can be edited like any Excel chart. For example, you can change the font sizes, format the axes, and reorder the areas to be suitable for a report.

4.3. View household size

Action	POPGROUP view
In the `DFReporter` file, change to the `'Reporter'` sheet. Change the *'Current Selection'* by clicking on: **Change Report Options** Click the option *'Report population per derived unit'*. In the case of household projections this is population per household, or average household size. Click '*OK*' and then: **Produce Report** Give the report sheet a name, eg. 'AvHHsize', and click *'OK'*. Record the Average household size (*'Population/Households'*) for 2012 and 2037 in 'Your Answers', page 37.	

4.4. View the household representative rates

> ⓘ **Household rates defined differently in England, Wales and Scotland**
>
> - In England's official projections from the 2008-based to the 2012-based, there are two stages. In Stage 1, the representative rates are calculated for men and women separately using a definition of 'household representative' that has been used on each Census since 1971. The total projected households from this long-time series are carried over to Stage 2. In Stage 2, new household representative rates are calculated, using the Census household reference person as representative. In Stage 2, the rates are for persons, not males and females separately, but each household type is projected separately before the total in each District is controlled to the Stage 1 projection.
>
> - In Scotland, the Census household reference person is used throughout. The representative rates are called 'headship rates', and are calculated for persons, not males and females separately, as for England's Stage 2.
>
> - In Wales, household *membership* rates are used, rather than representative rates. The rates therefore define the proportion of people of an age-group who are in each household type. After projecting the number of people in each household type, the number of households is estimated by dividing by the household size of that type.
>
> - These differences are summarised in **'Household projections across the United Kingdom'** published in 2011[1]. This report was written before the 2011 Census but describes the methods continued in the 2011 and 2012-based projections. For England, CLG have announced that methods will be reviewed for the 2014-round. POPGROUP's Data Modules replicate each country's official projections separately, adapting as the official methods develop.
>
> This Guide uses England as its example. Users of Wales and Scotland projections should follow the same instructions and be aware of slightly different labeling.

---

[1] Household Projections Across the United Kingdom Technical Report. Published by Statistical Directorate, Welsh Assembly Government, January 2011

Action: View rates	POPGROUP view
Go back to the **`'Charter'`** sheet. Try other options.	

Go back to the **`'Charter'`** sheet. Try other options.

To see the household representative rates (rather than the number of households) for each age in 2012.

Click: **Change Chart Options**

and choose *'Each Age group given year'*, choose the year 2012, choose *'Rates'*, and click *'OK'*.

Click: **Produce Chart**

Note that representative rates are zero for ages under 15: no child represents their household.

How do the areas differ at age 15-24? By how much? The representative rate is the proportion of the age group that represents or 'heads' their household. City areas tend to have more young people heading households.
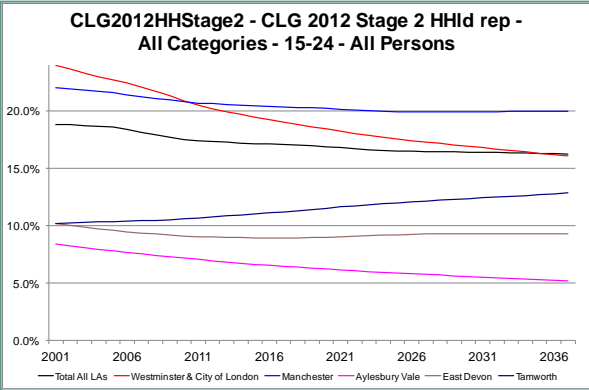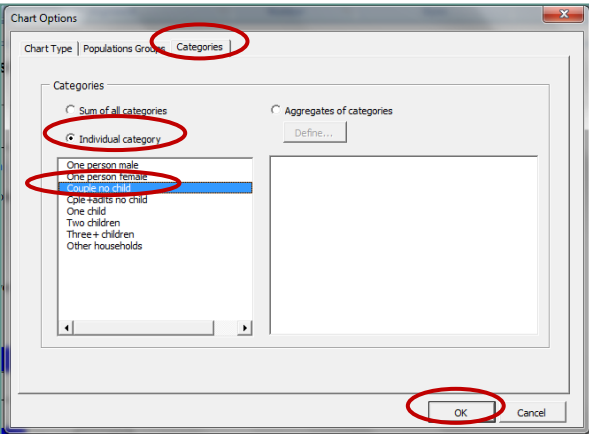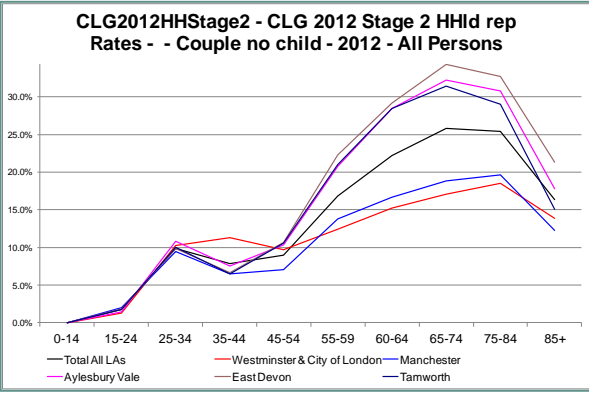
How do the areas differ at ages 40-44? By this age, around 90% of men live alone or in couple households and are counted as the representative of their household.

What happens for age over 65? Those in care homes are not included. It is the proportion of the age group *in households* who represent their household. More elderly people live alone. Can you explain the differences?

See below for different definitions currently used in England, Wales and Scotland.

Save this chart from the **`'Charter'`** sheet.

Action: View Rates	POPGROUP view
How do the representative rates change over time? Change the report options, this time choosing *'Each year given age group'*, *'Rates'*, and the age group 15-24. Repeat for age 85+. Repeat for other ages. The trends shown are those assumed by the official forecast.	
What are the representative rates for each type of household? Change the chart options. Choose *'Each age group, given year'* and then move to the *'Categories'* tab. Choose *'Individual category'* and highlight one of the categories. Click *'OK'* and produce the chart. To see charts of all the household categories, use the *'Quick charts'* section at the bottom of the Charter sheet. Choose a year, e.g. 2012, and then click: Quick Charts	 Note that you can also aggregate categories on this screen, eg to chart rates for all one-person households, or all households with children.

The **Reporter** file can be saved with its charts and tables for later use.

4.5. Understand how Derived Forecasts replicated the official household projection

ⓘ **Find the Input files**
The input files contain the assumptions made by official projections. The folder containing them will look something like this, with your Model ID used to name them. In Wales and Scotland, different numbers of files represent variations on the assumptions included. The files are named according to their contents:

Action: View Input files	**POPGROUP view**
Open the **DFRates** file.

Note there is a sheet for documentation and validation, and a sheet for each area. The default sheet contains information that would be applied to any area that lacked data. This is very similar to POPGROUP files.

Click on one of the area sheets. It will look similar to the image on the right. | |

Open the `PopAdjust` file which shows those not in households. In some official projections, this is a percentage for the elderly. Is it on your file? The setting for % or N can be changed by the user (see the example in section 5.2 below).	
Open the `Pop` file. This contains the official population projection.	

Derived Forecasts combines the official projection's assumptions about future population, the adjustment for those not in households, and the household representative rates as follows.

For each age and sex and household type category:

Households in year Y = (Population in year Y – Adjustment in year Y) * Rates in Year Y

$$(\texttt{DFPop} - \texttt{DFPopAdjust}) \text{ x } \texttt{DFRates}$$

The total number of household in a year is then calculated by summing the households for each of the age and sex and household type categories.

In the Welsh Government household forecasts, the calculation gives the number of people in each type of household, which is then divided by the average household size for that type of household, held in an additional file, `DFFactor`.

5 Create Alternative Scenarios with the Official Projections

For many purposes, you will want to create your own projections. For example:

- to understand how each of the official assumptions affects the projection results

- to see how sensitive are the official projections to alternative assumptions

- to update the household projections with more recent projections of population change

- to estimate how plans for housing or jobs might affect the population.
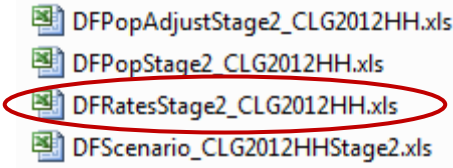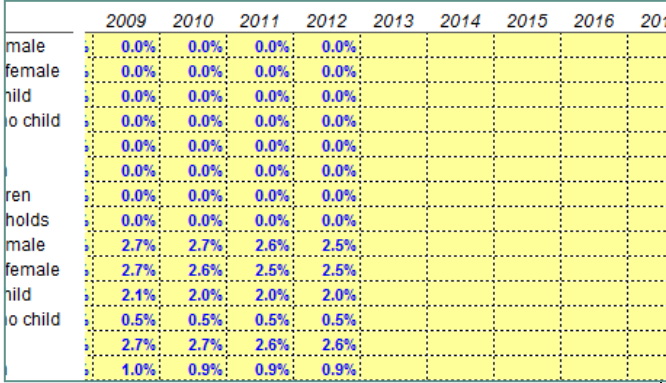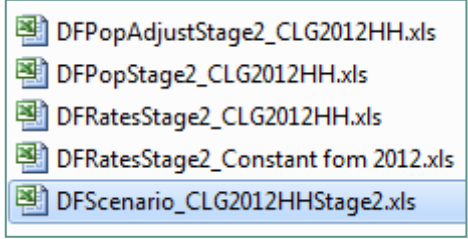
This Section guides you through making common alternative projections, so that you understand how Derived Forecast input files can be changed and how these changes affect the projection. Projections led by plans for housing or jobs are discussed in User Guides 4 and 5 (see page 39).
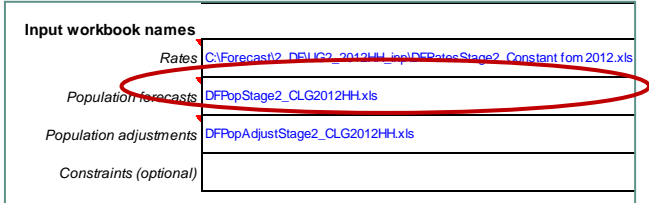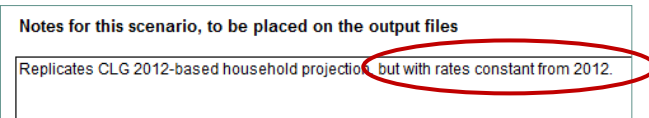
5.1. Scenario: No change in household size
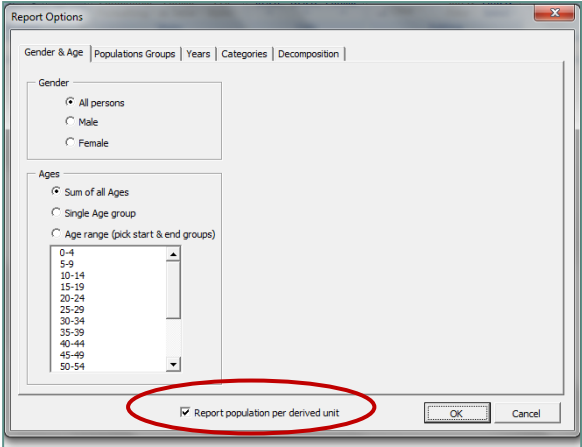
In this section, you will change the input files to specify no change in any household representative rate after the base year. This means that the likelihood of forming a household will not change over time. We achieve this by deleting rates after the base year, so that Derived Forecasts assumes the same rates after that.

This is not exactly the same as no change in household size. The changing number of children will affect household size, as will an ageing population. This scenario will help you to answer the following questions:

- How much of the projected household change is due only to the changing population?

- How much is household size changing due to the changing size of the population?

Action: Delete rates after 2012	POPGROUP view
From your input folder, open the **DFRates** file.	
Save As… with a different file name, for example replacing 'CLG2012HH' with 'ConstantFrom2012'.	**!** **Warning** If you do not alter the file name, your input file for the official projection will be over-written.
Select all the area sheets by clicking on the first and last area tab while holding the shift key. Select the block starting with the first item of data for 2013 and all rows, and delete these values. *[NB This deletes the values for projection years. In Wales where the projection is from 2011, delete values from 2012.]*	

- Add a comment to the **'Notes'** page to document this new DFRates file.
- Validate
- Save

Action: Run the constant rates projection	POPGROUP view
View your input folder. Notice that there are now two sets of Rates assumption for Rates; the official set and the one that you have just made. Open the **DFScenario** file.	

Amend the *'Scenario identifier'*. The identifier will name all the output files from this projection. A scenario workbook will be saved with this name.	**Scenario identifier** RatesConstantFrom2012 If you do not alter the scenario identifier, your official projection will be over-written.
Amend the entry for the *'Rates'* file to be the one that you have just produced. If you double-click to find it, the full path will be written in.	**Input workbook names** *Rates* C:\Forecast\2_DFUG2_2012HH_inp\DFRatesStage2_Constant fom 2012.xls *Population forecasts* DFPopStage2_CLG2012HH.xls *Population adjustments* DFPopAdjustStage2_CLG2012HH.xls *Constraints (optional)*
Amend the *'Notes'* for this scenario.	**Notes for this scenario, to be placed on the output files** Replicates CLG 2012-based household projection, but with rates constant from 2012.
When *all* the changes have been made as above, click at the top of the sheet: **Run Model**	You may be warned that: • You will be overwriting output files. This shouldn't be so on this occasion. Click *'Cancel'* and check that you have given your scenario a new identifier as above, before clicking *'OK'*. • All other Excel files that are open will be closed without saving (If this is a problem, click *'Cancel'* and save those files). The forecast will be run, the results saved, and the Reporter file left open. ***If this is your first forecast in Derived Forecasts, congratulations!***
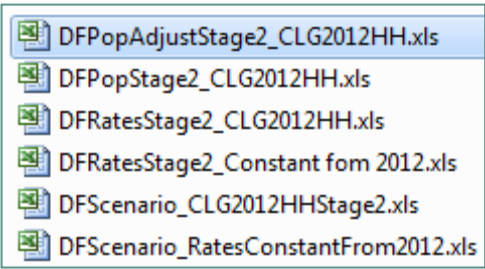
Action: Explore the results	POPGROUP view
The **DFReporter** file is left open after running a forecast. Click: **Change Report Options** and tick *'Report population per derived unit'*. Then click *'OK'*. Click: **Produce Report** providing a name for the new sheet which the report will be saved onto, e.g. 'default'.	
Use 'Your Answers' on page 37 to record the number of households in 2037, and the average household size in 2037. Write the change in number of households 2012–2037 under this scenario.	Because you specified that rates should be held constant, the projection has calculated the number of households in each future year that is the result of changing population and its age composition. The average household size will not be constant after 2012, because age and sex composition affects the number of people in each household. For example, older people tend to live in smaller households than the average, so an ageing population will have a falling household size.
Now use Derived Forecasts facility to automatically calculate the change in households due to population change, and the remainder due to representative rates changing. On *'Change Report Options'*, use the *'Decomposition'* tab to *'Pick start & end years'*. Use the Ctrl key to highlight just 2012 and 2037. Run the report.	**Decomposition of Change** **2012 - 2037** <table><tr><th></th><th>Population Effect</th><th>Rate Effect</th><th>Change</th></tr><tr><td>Total All LAs</td><td>124,263</td><td>3,102</td><td>127,365</td></tr><tr><td>Westminster & City of London</td><td>34,416</td><td>-624</td><td>33,792</td></tr><tr><td>Manchester</td><td>47,228</td><td>5,836</td><td>53,064</td></tr><tr><td>Aylesbury Vale</td><td>24,019</td><td>-1,643</td><td>22,376</td></tr><tr><td>East Devon</td><td>12,879</td><td>535</td><td>13,414</td></tr><tr><td>Tamworth</td><td>5,721</td><td>-1,002</td><td>4,719</td></tr></table> The results should be the same as you got in this section, without having to run an extra projection. Is the projected increase in households mainly due to increase in population, as in most parts of Britain at present?

5.2. Scenario: No increase in the elderly population in communal establishments

The official projection assumes that a constant share of the population aged 75 and older will be resident in communal establishments. It sets a % of the future elderly population will be in establishments, not a set figure N. This approach is favoured because the elderly population is growing and it is assumed that facilities for care in homes will grow at the same pace. For younger ages, the assumption is that the number in communal establishments will not change over time even if the population changes.

It is reasonable to ask how many extra households would be needed in your districts if this assumption about elderly not in households were not made. If the provision for elderly did not expand, the growing older population would remain in domestic housing. Of course the nature of those going to communal care would change, and some older people would perhaps be cared for in their children's homes. This exercise assumes that the high projected representative rates for the elderly continue to be applied to the whole of a growing elderly population. It therefore shows the maximum impact of constraining the communal establishments to a constant number of residents.

In this scenario, you will find the number of elderly in communal care in 2011 from the output of the official projection, and enter it in a new input file as a constant number over time. This involves some laborious data entry, which the instructions below make easier by using formulae.

Action: Open the population adjustment file and reformat its elderly entries from % to numbers	POPGROUP view
From your input folder, open the official assumptions about people not in households.	DFPopAdjustStage2_CLG2012HH.xls DFPopStage2_CLG2012HH.xls DFRatesStage2_CLG2012HH.xls DFRatesStage2_Constant fom 2012.xls DFScenario_CLG2012HHStage2.xls DFScenario_RatesConstantFrom2012.xls
Save as, giving the file a different file name: for example replace 'CLG2012hh' with 'ElderlyConstant from 2011'	Saving the new file now, avoids accidentally overwriting the original file.

On the first area sheet, type *'N'* over the three % for elderly males.

Repeat, typing *'N'* over the three % for elderly females.

Click on:

Reformat

at the top of the sheet.

Repeat these steps for each of the other area sheets.

Subtract	N	Male	70-74	36	36	35	35	35
Subtract	%	Male	75-79	2.9%	2.8%	2.6%	2.5%	2.4%
Subtract	%	Male	80-84	5.6%	5.6%	5.5%	5.5%	5.4%
Subtract	%	Male	85+	14.0%	13.6%	13.2%	12.8%	12.4%

Once done, check that the numbers in those rows will all appear as 0.

Action: Open the output file with the official assumptions on population not in households	**POPGROUP view**
Look in your output folder. There are now two of each output file, one from the official forecast and one from your own forecast from the previous scenario. Open the official forecast's **DFRiskPop** file. This holds the population adjustments in their output form, as numbers.	DFForecastDetail_CLG2012HHStage2.xls DFForecastDetail_RatesConstantFrom201… DFForecastTotal_CLG2012HHStage2.xls DFForecastTotal_RatesConstantFrom201… DFRatesOut_CLG2012HHStage2.xls DFRatesOut_RatesConstantFrom2012.xls DFReporter_CLG2012HHStage2.xls DFReporter_RatesConstantFrom2012.xls DFRiskPop_CLG2012HHStage2.xls DFRiskPop_RatesConstantFrom2012.xls
Note the rows in blue for the adjustment. They are all negative: people to deduct from the population, not in households. Does the official adjustment for people aged 75+ increase after 2011, or decrease? Record in 'Your Answers' the number aged 75+ not in households at the end of the forecast – the sum of six numbers (males 75-79, 80-84, 85+, and the same for females).	<table><tr><td>10</td><td></td><td></td><td>2010</td><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2</td></tr><tr><td>62</td><td>Male</td><td>75-79</td><td>-40</td><td>-39</td><td>-40</td><td>-41</td><td>-43</td><td></td></tr><tr><td>63</td><td>Male</td><td>80-84</td><td>-74</td><td>-77</td><td>-78</td><td>-81</td><td>-83</td><td></td></tr><tr><td>64</td><td>Male</td><td>85+</td><td>-105</td><td>-99</td><td>-106</td><td>-111</td><td>-117</td><td></td></tr><tr><td>65</td><td>Female</td><td>0-4</td><td>-5</td><td>-5</td><td>-5</td><td>-5</td><td>-5</td><td></td></tr></table> The blue adjustment rows are in the middle of each sheet. The rows for females are below those for males.

edge^analytics

POPGROUP

Action: Copy the official adjustments to the new input file, up to 2011	POPGROUP view
There are a number of ways of doing this copying. All are laborious. The following instructions to use formulae should take only a few minutes. First make a formula to put the first elderly adjustment from the output file into the input file, but as a positive value not a negative one: • On the *input* file for population adjustments select the sheet for the first area, and the first elderly cell: cell E22, for Males aged 75-79 for 2001. • Type an '=' and a minus '-', then click on the *output* file, in the cell for the adjustment for Males aged 75-79, D62. • The formula will appear in the formula bar. Delete the two '$' signs, so that the formula is a relative one. Press return to accept the formula. *Do the same for the first elderly cell in each of the other area sheets.*	Start the formula on the input file for adjustments: Finish it on the output file for adjustments: Delete the two '$'
Copy the first cell to the other elderly age-sex groups and to the other years up to 2011: • Group the sheets: click on the tab for the first area. With the shift key held down, click on the last area. • On the first sheet, copy the cell that you have entered a formula for. • Select all the three male elderly rows, from 2001 to 2011. • Paste formulas. • Select all the three female elderly rows, from 2001 to 2011. • Paste formulas. The formula was relative (without '$'s), so the pasting matches the input and output cells correctly.	It may be tempting just to drag the formula across and down. Avoid dragging to copy in POPGROUP, as the formatting will also be copied, sometimes with unintended bad consequences.
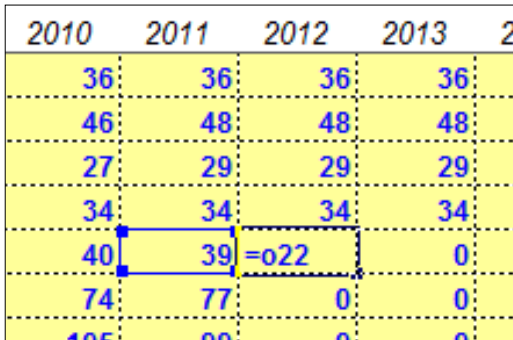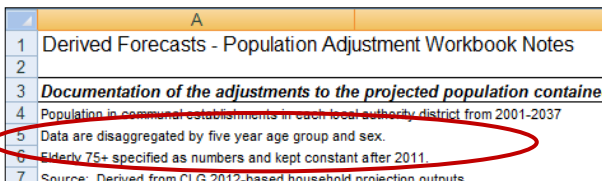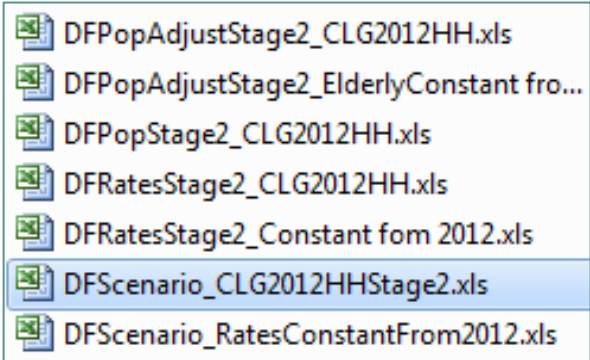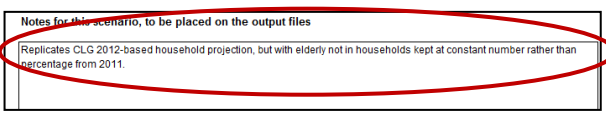
Action: Make the values for 2012 to 2037 the same as 2011	POPGROUP view
With the sheets still grouped, copy the values for 2011 to all subsequent years: • In the first area, select the first elderly cell for 2012, males aged 75-79 (P22), and type the formula *"=o22"*, and press Enter. • Copy that first elderly cell. • Select all the cells in the three male elderly rows from 2012 to 2037. • Paste Formulas. • Select all the cells in the three female elderly rows from 2012 to 2037. • Paste Formulas.	 This formula copied to later years will make the number not in households the same as in 2011. You could have copied the elderly cells in 2011 and copied as values to future years, to achieve the same result.
Check that the figures are as expected in each sheet. • Document the changes on the Notes sheet. • Validate. • Save the file.	

Action: Run the scenario and record the results	POPGROUP view
Open the **DFScenario** file for the official projection.	DFPopAdjustStage2_CLG2012HH.xls DFPopAdjustStage2_ElderlyConstant fro... DFPopStage2_CLG2012HH.xls DFRatesStage2_CLG2012HH.xls DFRatesStage2_Constant fom 2012.xls DFScenario_CLG2012HHStage2.xls DFScenario_RatesConstantFrom2012.xls
Amend the *'Scenario identifier'*. The identifier will name all the output files from this projection. A scenario workbook will be saved with this name. You can put whatever text you wish here.	**Scenario identifier** ElderlyNotInHH_ConstantFrom2011 If you do not alter the scenario identifier, your official projection will be over-written.
Amend the entry for the *'Population adjustments'* file to be the one that you have just produced. If you double-click to find it, the full path will be written in.	**Input workbook names** *Rates* DFRatesStage1_CLG2012HH.xls *Population forecasts* DFPopStage1_CLG2012HH.xls *Population adjustments* C:\Forecast\2. DF\Training2012_inp\DFPopAdjustStage1_ElderlyConstantFrom2011.xls *Constraints (optional)*
Amend the *'Notes'* for this scenario, lower in the sheet.	**Notes for this scenario, to be placed on the output files** Replicates CLG 2012-based household projection, but with elderly not in households kept at constant number rather than percentage from 2011.
When *all* the changes have been made as above, click at the top of the sheet: **Run Model**	You may be warned that: • You will be overwriting output files. In this case, cancel and check that you have given your scenario a new identifier as above, before clicking *'OK'*. • All other Excel files that are open will be closed without saving (Click *'Cancel'* and save those files if this is a problem). The forecast will be run, the results saved, and the **Reporter** file left open.

edge^analytics   POPGROUP

Action: Run the scenario and record the results	POPGROUP view
Use the `Reporter` file to find the total number of households in each District in 2037. Record it in 'Your Answers'.	
Calculate the difference from the official forecast, in the total number of households.	In households with a growing elderly population, this scenario will have more of them in households, and therefore project more households than the official projection. This is the case in most districts in Britain but not every district.
Change the options on the `Reporter` to find the number of households headed by someone aged 75 or older. Record it in 'Your Answers'.	Specifying the number of elderly in communal establishments is the only change made in this scenario. This is what produced the different number of forecast households when compared to the official projection.
Open the `DFRiskPop` output file from this forecast, and record the number of people aged 75+ not in households in 2037 (the addition of six numbers).	

5.3.   Scenario: More smaller households: no fall in household representative rates

The steady trend to smaller households during the second half of the 20th century in the UK was the result of many factors, including young adults leaving home at an earlier age, and greater frequency of divorce and separation in middle adult ages. The household representative rates for most ages were rising, as more people headed a household. This general trend has changed since 2001. The reasons for the change are debated – social policy, cultural change, economic crisis, and unaffordable house prices have all been blamed for the halt to decreasing household size.

Official projections of future household representative rates, based as they are on a projection from the past, are therefore viewed as less reliable than in the past. It is useful to provide scenarios that test the sensitivity of household projection results to alternative assumptions, as in this and the next Section.

edge analytics   POPGROUP
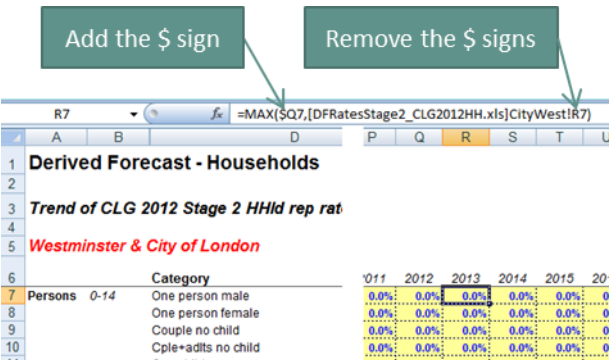
The current official projection shows some decreases in household representative rates, and some increases (you can view the trends in household representative rates from the Reporter file as described earlier).
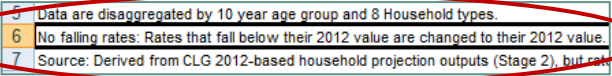
In this scenario, you implement an alternative assumption that the 2012 household representative rates are a 'floor'. Those that rise in the official projection will be left as they are, to rise. Those that fall will be replaced with the 2012 value. The result will be a greater number of smaller households than in the official projection. Different assumptions could be attempted, for example focused on particular age groups.
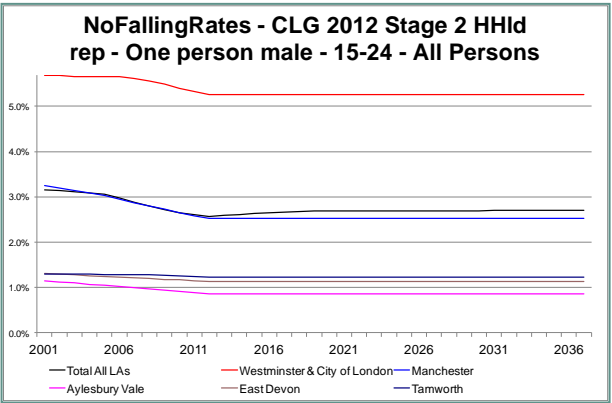
The following steps show what is needed to implement this alternative assumption on the Derived Forecast files.

!	**Wales – a different approach**
	In Wales, membership rates are forced to sum to 100%. To make more smaller households, make a formula which lifts the existing membership rates only for small households, those with one or two people. For example add to the principal projection and extra 0.1% each year. The scaling to 100% will dampen the impact, but the overall result will be to create more smaller households and fewer large households.

Action: implement the assumption that household representative rates for 2012 are a floor	POPGROUP view
Open the **DFRates** file for the official projection. Save the file with a new name, e.g. Replacing 'CLG2012hh' with 'NoFallingRates'. Open the **DFRates** file for the official projection again. Now you have two rates files open. It will be easier if you close all the other Excel files, except these two.	
On your new file (**NoFallingRates**), on the first area sheet, in the first cell for 2013, write a formula that will copy the official projection for 2013 if it is higher than the 2012 value. The formula will probably be in cell R7 of the **NoFallingRates** file, and it will probably refer to cell Q7 of the same file, and R7 of the official assumptions (the 2012 and 2013 values). For example: =MAX($Q7,[DFRatesStage2_CLG2012HH.xls]CityWest!R7] In order to be able to copy the formula to other cells, make sure there is one $ before the 2012 value and remove the two $ signs from the 2013 value.	 The dollar signs indicate absolute references. In the first term of this formula the 2012 column will not change when it is copied to other cells because it has a $. The row and column of the other parts of the formula will change to pick up the appropriate age, sex, status and year.

Copy the cell and *Paste Formulas* to all the cells of rates: all the rows of values, and all the columns from 2013 to 2037.

Check that each row of rates does have a floor of its 2012 value.

Repeat for each area sheet.

- Document on the *Notes* sheet

- Validate

- Save the file.

5	Data are disaggregated by 10 year age group and 8 Household types.
6	No falling rates: Rates that fall below their 2012 value are changed to their 2012 value.
7	Source: Derived from CLG 2012-based household projection outputs (Stage 2), but rate

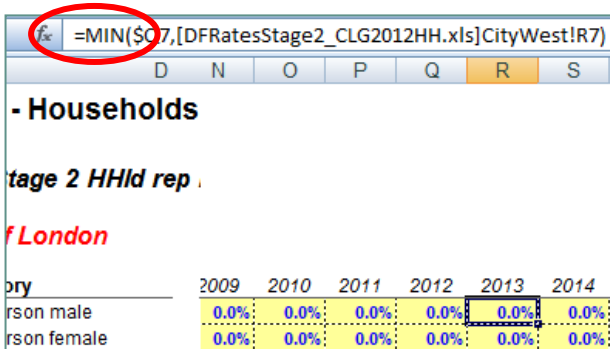| Action: Run the scenario and record the results	POPGROUP view
Run the new projection as in previous sections: • Open the **DFScenario** file for the official projection • Change the *'Scenario Identifier'* • Change the **Rates** file to identify your new assumptions • Amend the notes • Run the projection.	
On 'Your Answers', record the total number of households in 2037, and the average household size in 2037. It will be higher than the official projection. Use the **'Charter'** to select a time series for one age group and one household type, to check that the rate does not fall.	**NoFallingRates - CLG 2012 Stage 2 HHld rep - One person male - 15-24 - All Persons** *[chart showing percentage lines from 2001 to 2036, with legend: Total All LAs, Westminster & City of London, Manchester, Aylesbury Vale, East Devon, Tamworth]*

Is this alternative projection a possible future? Is it possible that no representative rate at any age will fall in the future? If you doubt that, for which ages is it very unlikely, and how would you amend the assumptions to make them most plausible?

edge analytics   POPGROUP

5.4. Scenario: More larger households: no increase in household representative rates

This scenario described here is the mirror of the previous section. The discussion justifying the need for sensitivity testing for the official projection of rates will not be repeated here, nor the warning for Wales. The instructions will assume that the previous section has been completed.

In this scenario, you implement an alternative assumption that the 2012 household representative rates are a 'ceiling'. Those that became lower in the official projection will be left as they are. Those that rose will be replaced with the 2012 value. The result will be larger households than in the official projection, and overall a lower projected number of households. Different assumptions, for example focused on particular age groups, could also be attempted.

The following steps show what is needed to implement this alternative assumption on the POPGROUP files.

Action: implement the assumption that household representative rates for 2012 are the ceiling	POPGROUP view

Open the **DFRates** file for the **NoFallingRates** assumption that you created in the previous section.
 	
Save the file with a new name, e.g. replacing 'NoFallingRates' with 'NoRisingRates'.
 	
Select the first cell for 2013 in the first area. It refers to the comparison with 2012 and the official projection for 2013. We need only to change the function 'MAX' to 'MIN'.
 	
Make this change.
  • Copy the cell.
  • Select the block of all rows and all cells from 2013 to 2037.
  • Paste Formulas.
Repeat on each area sheet.
	
	Warning: It may be tempting to use the Excel facility to 'Find and Replace' MAX with MIN. But this facility cannot be used on protected sheets. Unprotecting POPGROUP sheets is definitely not advisable as you may accidentally change the nature of sheets in a way that is impossible to tell but affects the operation of your forecasts.

Check that the values are as expected: in each row all values after 2012 are either the same or lower than 2012.

- Document on the Notes sheet
- Validate
- Save the file.

Action: Run the scenario and record the results	POPGROUP view
Run the new projection as in previous sections: - Open the **DFScenario** file for the official projection. - Change the *'Scenario Identifier'* - Change the **Rates** file to identify your new assumptions - Amend the notes - Run the projection.	
On 'Your Answers', record the total number of households in 2037, and the average household size in 2037. It will be lower than the official projection. Use the **'Charter'** to check that the rate for any age-sex-status group does not rise.	**NoRisingRates - CLG 2012 Stage 2 HHld rep - Couple no child - 35-44 - All Persons** Chart showing percentage trends from 2001 to 2036 with lines for: Total All LAs, Westminster & City of London, Manchester, Aylesbury Vale, East Devon, Tamworth. Y-axis ranges from 0.0% to 10.0%.
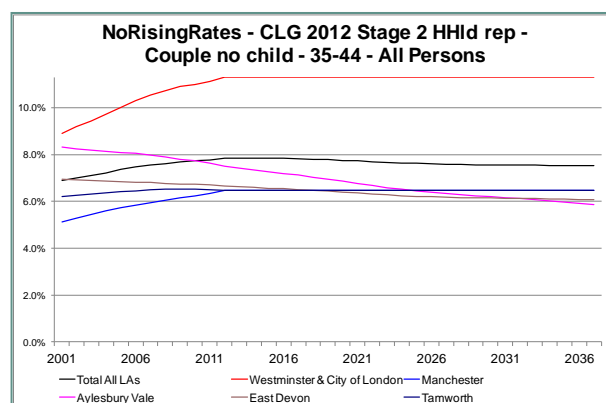
5.5. Scenario: An alternative scenario of population change

All the household projections scenarios in previous Sections have used the official population projections. There will often be different scenarios of future population to reflect more up to date information, or scenarios with different assumptions for migration, fertility or mortality. There are four ways to easily produce household projections based on a different population projection. Use whichever seems simplest for you. If the only output you need is the total households, then the fourth option is probably suitable.

1. Amend the Derived Forecasts input file `DFPop` directly. If the population projection has been produced outside POPGROUP, copy its results into this input file, document and save.

2. Load a POPGROUP population forecast into a `DFPop` file using the option on that file's `'Notes'` sheet. The population forecast must start in a year the same as or before the Derived Forecast's first year. Document and save this input file.

3. Name a POPGROUP population forecast in the `DFScenario` file when running the household projection. The population forecast must start in a year the same as or before the Derived Forecast's first year. This is simpler than option 2.

4. Unlike the first three options which run Derived Forecasts with a new population input file, you can also run POPGROUP and ask that DF be run in the background. Name the DF `Population Adjustment` and `Rates` files in a POPGROUP scenario on its `'Constraints_and_impacts'` sheet. POPGROUP will then run DF in the background, and provide on its `comp` output file the total number of households. No information about household representatives or their ages or household types will be available. The population forecast must start in a year the same as or a*fter* the Derived Forecast's first year. This is often the method used when the interest is only the projected total number of households.

If the household projections (e.g. 2001) start at a date earlier than the population projections (e.g. 2012), only method 4 is available. If the user is prepared to enter population estimates for earlier years (in the example, 2001-2011), Method 1 can also be used. Alternatively, a population model starting in 2001 can be created from one starting in 2012, for example using the Data Module `MYEandChange` to enter past mid-year estimates, and the utility `JoinPOPGROUPmodels` to add the projection from 2012.

ⓘ	**Skeleton Files**

- As in POPGROUP, Derived Forecast models include a folder of empty skeleton files, one of each type, for the user to fill up and save in the input folder.

- It is often easier to amend the data in a file that has already been filled and saved in the input folder. This is what we have done for every scenario in this guide.

- It is a function of the Data Modules to fill empty skeleton files with data from an official projection, which the user can amend for their own scenarios.

To complete the following activity for this Section, choose one population projection that you have created with the same areas as used for household projections, and the same or earlier start year. In **DFScenario**, name the output file that begins **fore_**.

Action: See the household implications of a different population projection, within Derived Forecasts	POPGROUP view
Open the **DFScenario** file for the official projection. Move the cursor over the red triangle next to *'Population forecasts'*, to see the options available. The comments behind red triangles are a source of help on all POPGROUP files. Double click on the cell next to *'Population forecasts'*, and navigate to your folder of POPGROUP output files.	

Action: See the household implications of a different population projection, within Derived Forecasts	POPGROUP view
Choose the **fore_** output file from one of the projections other than the official projection. • Change the Scenario Identifier • Amend the notes • Run the projection. Record the number of households in 2037 and the average household size in 2037.	**Input workbook names** Rates	DFRatesStage2_CLG2012HH.xls Population forecasts	C:\Forecast\1. POPGROUP V4.0\TrainingLAs2012_out\fore_migAlternative2.xls Population adjustments	DFPopAdjustStage2_CLG2012HH.xls Constraints (optional) | **Scenario identifier**	MigAlternative2

6 Compare Scenarios

This Section uses Derived Forecasts' `DFCompare` file to compare the results from different projections.

When you have completed any Section of part 5, you will have created a new projection. Each projection has a scenario file with its identifier. The identifier is used to name the output files from that projection. The output files from all the projections are collected in the Derived Forecasts output folder. There will be a new folder to collect output files only when you create a new model: for other areas, or using a different base year, or referring to an output other than households.

The `DFCompare` file is intuitive to use. The steps below get you started.

Action: Load selected projections into DFCompare and analyse the results	POPGROUP view
Go to the folder '2. DF. It will probably contain sub-folders and files like those pictured (but your folders will carry the name you gave as your model ID). Open `DFCompare`	

There will be no summary files listed.

- Double click the cell next to *'Output folder to search'*, go to the output folder of your model, click *'OK'*.

- Click:

Refresh list

Delete any projections you do not want to compare on this occasion.

double click to browse for another folder

Output folder to search: C:\Forecast\2. DF\UG2_2012HH_out\

List of derived forecast files in the nominated output folder

Total any   Refresh list

DFForecastTotal_CLG2012HHStage2.xls
DFForecastTotal_ElderlyNotinHH_ConstantFrom2011.xls
DFForecastTotal_NoFallingRates.xls
DFForecastTotal_NoRisingRates.xls
DFForecastTotal_RatesConstantFrom2012.xls

Notice that Derived Forecasts finds all the `DFForecastTotal` output files.

It has them in alphabetical order, not the order you produced them in.

`DFCompare` extracts the summary output from those files.

Click:

Get data from workbooks

Derived forecasts will give you the opportunity to create aggregates of the categories of household, by stating the number of aggregates, allocating each category to an aggregate, and naming the aggregates.

An example is illustrated.

Aggregates of categories   *Number of aggregates of categories*

2

Category	Category Aggregate Id		Category Aggregate Id	Category Aggregate Name
One person male	1		1	One-person households
One person female	1		2	Households with children
Couple no child				
Cple+adlts no child				
One child	2			
Two children	2			
Three+ children	2			
Other households				

☐ Total of aggregates

If one or more aggregates are defined, the projections for them will be shown *in addition to* the individual categories.


Click:

Produce Summaries

Derived Forecasts will collect all the results, and sheets will appear on `DFCompare` for:

- documentation (`'Notes'`)
- results (`'Pivot Tables'` – do not change these)
- a chart for each household category and their total, and aggregates if defined.
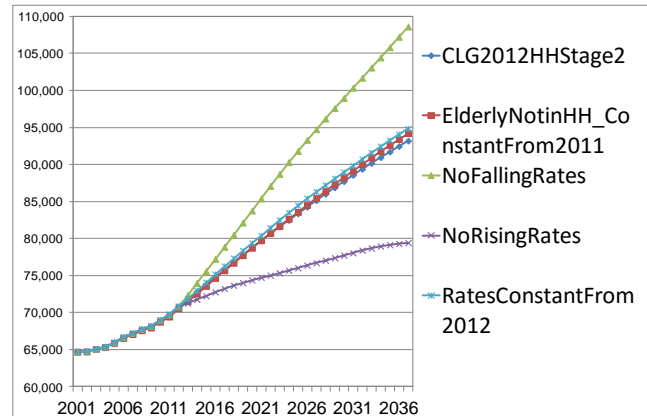
Still on the `'Menu'` sheet, click on the cell for the *'Default population group'*. If you have more than one area, choose the area to show by default on all the charts.	Default population group (click on dropdown to select a different group) **AylesbyV**
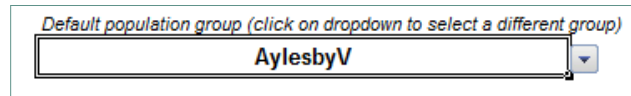
Move to the `'Total'` sheet and check that the different projections make sense to you. In the example opposite for Aylesbury Vale, three of the projections are close to each other. Because some household representative rates are forecast to rise and others to fall, the scenario of 'constant rates' has impacts on different age groups that have balanced each other out. The scenarios with no rates rising or no rates falling show much greater impacts in this case.	Chart of projected total households: Aylesbury Vale The chart has been edited to increase the size of the labels before copying to this Guide. All POPGROUP output files are unprotected so that they can be edited.
Now look at the charts for each category of household. Think through why the lines are as they are. This will help you to: • understand more about the household change in your area(s). • explain the official projection and its assumptions to other people.	Chart of projected one-person households: Aylesbury Vale The scenario in which the number of elderly not in households is steady, rather than increasing, would mean slightly more one-person households than the official projection. Keeping rates constant would make a bigger difference, as the official projection was to reduce the representative rates of one-person households. Note the different scales of this and the previous chart.
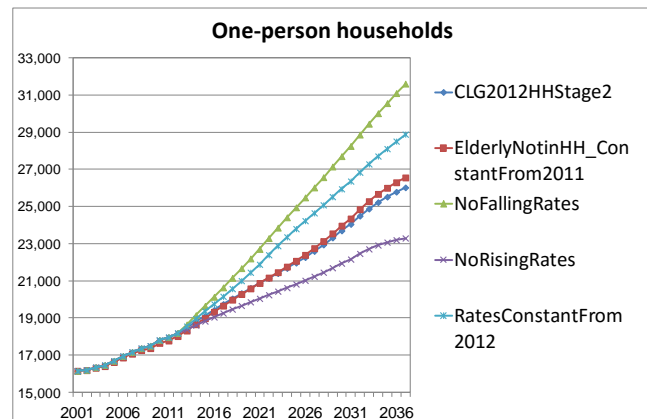
7 Your Answers

Use this section to record answers for each of your area(s). Write the area names in the column headings.

Section	Area 1	Area 2	Area 3	Area 4
4.2 and 4.3 Official projection				
Total households 2012				
Total households 2037				
Average household size 2012				
Average household size 2037				
5.1 Rates constant from 2012 (impact on household demand of population change only)				
Total households 2037				
Difference from official projection (calculate)				
Average household size 2037				
Change in number of households 2012-2037				
5.2 Elderly not in households constant from 2011				
Population aged 75+ 2037 not in households: official projection				
New scenario: Total households 2037				
Difference from official projection				
Households headed by someone aged 75+				
Population aged 75+ 2037 not in households				
5.3 Smaller households: no falling representative rates				
Total households 2037				
Difference from official projection				
Average household size 2037				
5.4 Larger households: no increasing representative rates				
Total households 2037				
Difference from official projection				
Average household size 2037				
5.5 An alternative scenario of population change				
Total households 2037				
Difference from official projection				
Average household size 2037				

edge^analytics   POPGROUP

8 Common Problems

> **!** **Message 'Cannot run the Macro' or similar**
>
> POPGROUP works in Excel by using programs known as 'macros'. After installation you must follow the instructions in the manual to enable macros and trust access to Visual Basic. Otherwise, POPGROUP cannot work and you will receive error messages.
>
> If you do not have the manual, contact **popgroup@edgeanalytics.co.uk**.

> **!** **I get a Windows error**
>
> Occasionally there will be a Windows error. Usually it is unclear why it has happened. Coming out of Excel and starting the task again will usually solve the problem. Occasionally after an error, you will be left with a window with program code. Again, close that window and Excel, and try again. These occasional errors are inevitable with a complex program working on many different operating environments, and are not unique to POPGROUP.
>
> If an error occurs more than once, note what happened (take a screen shot if you can), and email details to **popgroup@edgeanalytics.co.uk**.

9   Next Steps

POPGROUP is a versatile tool for analysis of population dynamics. The 'How to…' Guides currently expected in this series are:

1. How to get started with population projections

2. How to get started with household projections

3. How to get started with labour force projections

4. How to create population projections led by a plan for house-building

5. How to create population projections led by an economic plan for jobs

6. How to integrate population, housing and labour force projections.

Section 5.5 mentioned how Derived Forecasts can be run in the background when making a population projection with POPGROUP, to give the total number of households implied by the future population. Guides 4 and 6 will describe in detail how to use the two software Modules together.

Derived Forecasts is very flexible software that can make models for projecting any characteristics strongly related to age and sex. This flexibility is bypassed in this User Guide because we are using Data Modules that configure Derived Forecasts to replicate the official household projections. The flexibility when setting up a Derived Forecast is described in its manual that comes with the software and is available from **popgroup@edgeanalytics.co.uk**. It is used in the Labour Force Data Modules that is described in other User Guides.

Some users make forecasts for areas other than local authorities, for example for electoral wards or for service areas. Methods developed for small areas are documented and available from **popgroup@edgeanalytics.co.uk**. The NRS has its own **advice and guide** for small areas in Scotland.

edge**analytics**   POP GROUP