

Projections Sub-Group (PSG)

Review of Sub-National Population Projections in Scotland

1. Background

The National Records of Scotland (NRS) are currently reviewing the methods used to produce the Sub-National Population Projections (SNPP) for council and NHS Board areas in Scotland. Our population projections are used for a wide range of resource allocation and service planning throughout Scotland.

1.1 Why are we doing this?

There are several reasons for reviewing the method of population projections at a local level. The main one is that the Office for National Statistics (ONS), who produce the population projections for the UK and its constituent countries, have reviewed the national method, and these changes mean that the method we are currently using for areas in Scotland will no longer work with these new national inputs. Reviewing the method will also allow Scotland to move from using an outdated net migration method to incorporate the latest academic thinking on the best way to project populations in line with international best practice.

1.2 How are we doing this?

We commissioned leading academics from Leeds University to: review the changes being made to ONS's national method; review our current sub-national method; provide an overview of projection methods used across the UK and across the world; and make recommendations for population projections for council and NHS Board areas in Scotland. We received their report at the end of May 2015, and we are now in the process of developing the new method and projection system.

We are taking this work forward as a statistical exercise through our Population and Migration Statistics Committee (PAMS), which includes council and Information Services Division, National Services Scotland representatives. We have asked for volunteers from this main committee to form a sub-group to provide feedback on the methods we are developing. This meeting of the sub-group is to talk about the recommendations from the academic report and our plans for taking them forward. The aim is for the group to meet again towards the end of the year to look at 2012-based results from the new method compared with the old method. We aim to publish 2014-based council and NHS Board area population projections in June 2016 using the new method.

1.3 Feedback from the Projections Working Group

Feedback on the content of this paper is very welcome. The remainder of this paper sets out the recommendations made by the academics and the methodological changes we are aiming to make.

During the meeting we will discuss in more depth the methods we are planning to introduce to the methodology and provide presentations on some of the theory. We look forward to hearing your thoughts on these.

2. Review of the Sub-National Population Projections

2.1 Changes to the National Population Projection method

The Office for National statistics (ONS) produce population projections for the United Kingdom, it's four constituent countries and Great Britain biennially. In 2012 they commissioned the Economic and Social Research Council Centre for Population Change to carry out a review of the methodology used in setting migration assumptions for the National Population Projections (NPP) and to make recommendations for future methods¹.

One of the recommendations was to model migration as flows instead of nets, and to express cross-border flows in terms of rates, rather than volumes. For the 2012-based projections, after additional research by ONS, the international migration assumptions were based on in and out flows rather than net migration. For the 2014-based NPP ONS will also use UK cross-border migration rates.

This new change in the NPP method will affect how the Sub-National Population Projections (SNPP) for Scotland are created.

2.2 Implications for Sub-National Population Projections in Scotland

The current SNPP methodology has been in place since 1995, with some minor amendments made over the years². The system, which is written in Visual Basic for Applications (VBA) for Excel, was also created in 1995, and has had minimal changes made to it since its inception.

The developments that ONS are implementing in the NPP mean that the current net migration method can no longer be used and would require extensive changes to be made to the Excel programs. Therefore we have taken the opportunity to fully review the method and develop a new system, using SAS, rather than try to adapt the old system to use a new method.

Footnotes

1) More information on this report can be found on the Office for National Statistics website - [National population projections \(NPPs\) migration assumptions methodology](#).

2) More information on changes to the method and system can be found in papers of the [Population Projections Working Group \(PPWG\)](#) and the [Population and Migration Statistics \(PAMS\) Committee](#).

This also provides us with the opportunity to develop a new methodology in line with changes in demographic theory since the original method was created. As part of this development, the decision was made to commission leading academics in the field of demographic research to review the current methodology used in the SNPP, and to make recommendations on how the methodology may be refined.

2.3 The report from the academics

At the beginning of 2015, we asked Professor Phil Rees of Leeds University and colleagues, Dr Pia Wohland, Dr Paul Norman and Dr Nik Lomax, to write a report with recommendations for Sub-National Population Projections in Scotland.

The report was completed at the beginning of May 2015 and consists of the following:

- A review of the new NPP methodology;
- A summary of the current SNPP method in Scotland;
- A review of other SNPP models used across the world and in academia;
- A method for producing projections at non-standard geographies; and
- Recommendations on the approach to employ when developing the new methodology.

Note

The full report can be found in Annex A of this paper, this includes an executive summary on pages IV to VI for ease of reading.

2.4 The key recommendations

The primary recommendation made in the paper is that the Scottish SNPP should move from a single-region model to a multi-region model by changing from assuming a single net migration for each council area, to a rates based approach for council area and rest of UK migration.

The report also advocates using an adjustment developed by Statistics Canada³ when applying migration rates, keeping the mortality and fertility methods the same as the current method, and applying a method similar to the method used by the ONS in the NPP when projecting and allocating international migration.

Finally the report discussed the merits of impact scenarios, which are variant projections based on different likely scenarios, to be included in addition to the standard variants.

Footnote

3) More information on the adjustment can be found on the Statistics Canada website - [Projection of interprovincial migration](#).

2.5 The new method and next steps

We are planning to implement several of the recommendations made in the review paper. At present much of the development is still in the planning phase. However, we plan to have completed an alpha version of the system by Christmas, with a full test on 2012 data planned for early 2016.

The projections will be trend based, and there are no plans to change the current approach of using the cohort-component method to project the population. There are also no plans to change the methods used to project births and deaths, which are based on scaling the mortality and fertility rates used in the NPP for local areas.

It is planned that Within Scotland, and Rest of UK migration to and from councils will be projected using a rates based model. Out-migration from a council to another area will be projected by assuming a rate based on past trends in migration, and the population of the council in recent years. We are also investigating the use of the adjustment developed by Statistics Canada that would be applied to the rates in order to better project migration between council area with large population differences (i.e. the size of the population of Glasgow City is largely different from the size of the population of Orkney Islands).

It is also planned that international migration to and from council areas will be projected by first assuming a long-term total using an ARIMA (Auto-Regressive Integrated Moving Average) time series model for each council area or building brick, which will then be constrained to the NPP assumptions. A run-in period would then be projected based on the long-term total and the run-in period used in the NPP. This is similar to how the ONS project the long-term international migration at Scotland level in the NPP. Data from the NRS migration estimates based on patient registers will then be used to derive age and sex distributions for international migrants.

We are planning to publish the same seven variants that have been produced as part of previous releases.

At present Strategic Development Plan areas and National Park populations are projected following publication of the projected population at council area level. It is planned that these geographies will be projected and published at the same time as council and NHS Board area projections.

Presentation

During the meeting we will provide more information on single-region models, multi-region models, the Statistics Canada adjustment, and the current method used to project births and deaths.

Note

We are still examining the approach to projecting international migration and will provide a paper for the group to consider once this work has been completed.

Discussion point

Sub-Group views are welcome on our plans for:

- Maintaining the method for projecting births and deaths,
- Changing from a single-region net migration model to a multi-region rates based model for within Scotland and Rest of UK migration.

2.6 Geographical areas to be projected

Currently we produce population projections for NHS Board areas, Strategic Development Plan (SDP) areas, and National Park areas in addition to council areas. With the changing of legislation in 2014 regarding the NHS Health Board areas, these areas can now simply be created by aggregating the council area projections to the desired NHS Health Board area.

For SDP areas, and National Park areas we are exploring several options including:

- (I) Project building brick areas which will sum to the geographies;
 - Advantages: This approach has been successfully used in the past when projecting previous versions of NHS Board areas.
 - Disadvantages: Some of the building bricks are small, and it may be impractical to project them.
- (II) Project council area populations and proportion into building brick areas which sum to the geographies;
 - Advantages: This approach is adapted from a recommendation in the report.
 - Disadvantages: This method relies on the proportions for building brick areas staying the same throughout the projection period. However, initial investigations of census and mid-year populations suggest that these small areas have not changed much since 2001.

Discussion point

Sub-Group views are welcome on these methods.

2.7 Consultation on assumptions

As with previous projection rounds we will hold a consultation on part of the migration component of the projections. However, due to the planned changes in the method used to project within Scotland migration and Rest of UK migration, it is likely that this consultation will only consist of the long-term international migration assumptions.

As the rates based model for a given year involves the population from the previous year, then the within Scotland and Rest of UK migration will change each year and will require the system to have been run before any migration projections for these flows can be examined.

This would require the consultation to be held after the system had been run, potentially putting pressure on the timetable for publication.

Discussion point

Sub-Group views are welcome on this approach to the consultation process.

2.8 Quality assurance & testing

The new system will be tested using 2012 input data as a base year and a complete projection will be produced. This will then be compared with the published 2012-based data.

It will be possible to compare the new projection with the previous projection (using the old method) as well as the population estimates from 2013, and 2014.

A paper detailing the differences between the two methods, and the differences between both sets of projections and the population estimates will be presented to the next meeting of this group.

2.9 Publication

We plan to publish the 2014-based Population Projections at council area, NHS Board area, SDP area, and National Park area in June 2016.

2.10 Next steps

We are currently researching the effects of our proposed methodology and specifying the new system. We are being guided in the development of the new system by our IT colleagues and we have also recruited a dedicated SAS programmer to help code the new system.

Comments on our approach are welcome.

NRS: Population and Migration Statistics
11 August 2015