METHODOLOGY PAPER MID-YEAR POPULATION ESTIMATES FOR NORTHERN IRELAND

June 2017

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1   Introduction

In Northern Ireland, NISRA - the Northern Ireland Statistics and Research Agency - produce annual estimates of the resident population. The population estimates refer to the number of people in the population at 30 June each year, the statistics are therefore often referred to as the mid-year estimates.

The population statistics refer to the *usually resident* population. The definition of usual residence is based on United Nations guidelines[1]; in the United Kingdom the population statistics are benchmarked to the results of the 2011 Census of Population.

Final results for the current population estimates can be found by clicking here.

2   Population Estimates for Northern Ireland

At the Northern Ireland level, population estimates are updated each year using the cohort component method.

2.1   Components of Change Method

In simple terms the previous year's population estimate is "aged on" by one year, with births added and deaths removed. Net migration is also accounted for. The following formula is thus applied to update the population:

Previous year's population estimate aged on

- + Births to mothers resident in Northern Ireland;
- - Deaths;
- + Net migration (including movement of armed forces personnel)

The following sections describe how the different data sources are used in this calculation.

2.1.1 Census of population

The 2011 Census of population was the basis for the 2011 mid-year estimates, and historic births replaced estimates of the number of 0-3 year olds at mid-year. Following analysis of administrative data and consideration of Census 2011 imputation rates, a small adjustment (-2%) was made to estimates of those aged 16 and 17 in 2011, whilst maintaining the size of the total population.

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[1] See "Recommendations on Statistics of International Migration. UN 1998"

2.1.2 Ageing of the population

Each year the population by single year of age is aged on by one year (for example, all two-year-olds become three-year-olds one year later).

2.1.3 Births

Birth figures by sex are obtained from registrations with the General Register Office. They include all births that occurred between 1 July and 30 June the following year, registered up to 31 December the following year. Births to non-resident mothers are not included, as evidence from Great Britain and the Republic of Ireland suggests that there is an imbalance between the number of non-Northern Irish mothers giving birth in Northern Ireland on one side, and Northern Ireland mothers giving birth outside Northern Ireland on the other.

2.1.4 Deaths

The General Register Office provides details of registered deaths by sex and single year of age at mid-2016. It includes deaths that occurred between the 1 July and 30 June the following year, registered up to 31 December the following year. Also included are a small number of deaths that occurred prior to 1 July but were registered in the following year. Deaths of non-residents are included, under the assumption that equal number of Northern Ireland residents die abroad as non-residents die in Northern Ireland.

2.1.5 Migration into Northern Ireland

Migration into Northern Ireland or *inflows* is defined as persons who come to live in Northern Ireland from the rest of the United Kingdom or any other country for a period of at least one year. Inflows are estimated from the Medical Card Register, which is a list of patients registered with a family doctor. From this, the number, sex and age at mid-year of people who joined or rejoined the register within a one-year period is determined (this will include people who previously resided here, but left and then returned). It is recognised that the Medical Card Register is deficient in recording young adult males; therefore the age distribution of young adult males is adjusted to be similar to the young adult female age distribution.

2.1.6 Migration out of Northern Ireland

Migration out of Northern Ireland or *outflows* is defined as persons who leave Northern Ireland to live in the rest of the UK or any other country for a period of at least one year. Outflows are estimated from transferred and deregistered medical cards for flows to Great Britain and countries outside the UK respectively. These estimates are available by sex and age at mid-year. Previous research has shown that not all outflows are

measured fully by the medical card register[2] and therefore de-registrations are scaled up by an additional 67 per cent (i.e. the assumption is that only 3 out of 5 persons who leave Northern Ireland to go abroad deregister from their family GP). This scaling factor was determined through analysis of historic population change using results from Censuses of population. As with inflows it is recognised that the administrative data is deficient in recording young adult males, therefore the age distribution of young adult males is adjusted to be similar to the young adult female age distribution. Migration flows to Great Britain are constrained to figures agreed by NISRA, the Office for National Statistics and National Records Scotland.

2.1.7 <u>Armed Forces</u>

Armed Forces are treated as a special population since i) they are not commonly on the Medical Card Register and ii) their age structure remains fairly stable each year. Due to periods of service, individual members of the forces move relatively frequently into and out of the coverage of population estimates. The adjustment procedure is to subtract Armed Forces based in Northern Ireland in the previous year's estimates before ageing on the (civilian) population and then adding the Armed Forces back in after the ageing on is complete. The Defence Analytical Services Agency of the [Ministry of Defence](#) provides details on the number of forces stationed in Northern Ireland by age and sex on a quarterly basis.

3 Population Estimates for Areas within Northern Ireland

Since the publication of the 2013 population estimates in June 2014, population estimates for areas within Northern Ireland have been created using the Small Area Population Estimates (SAPE)[3] methodology. Prior to that, the Northern Ireland methodology was used to create estimates for Local Government Districts (up to 2012) and Parliamentary Constituencies (up to 2008). Recently it proved more difficult to create estimates for these distinct geographies due to the existence of small overlaps between the areas. This issue became more apparent with the reform of Parliamentary Constituencies in 2010 and the Local Government Reform in 2014, with a reduction in the number of Local Government Districts from 26 to 11.

The SAPE methodology is a combination of the Components of Change and Ratio Change methods. Estimates resulting from the combination of these methods gives rise to a resultant population change which cannot be perfectly explained by the components described in Section 2. As such, the remaining or unexplained difference is included in a category called "*Other Changes*".

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[2] NISRA has previously issued research papers on population migration, for example, see [Northern Ireland Migration Methodology Paper](#), [UK Migration Methodology Paper](#) and [Migration Report (2009)](#)
[3] See Annex A of [SAPE Bulletin (2012)](#)

3.1 Components of Change method

For smaller areas, the components of change method is similar to that for Northern Ireland as a whole. As before, the population is aged on by one year, births are added, deaths are removed, and an adjustment is made for migration. The data sources allow for this at the smaller area level due to them providing geographical indicators to georeference the place of usual residence.

At the Northern Ireland level, changes due to migration only involved movements to and from Northern Ireland. When estimating migration for areas within Northern Ireland, consideration must be taken of an additional component of migration, namely migration between areas within Northern Ireland (i.e. internal migration).

3.1.1 Migration within Northern Ireland

Internal (or within Northern Ireland) migration is defined as people moving their place of usual residence within Northern Ireland. Internal migration does not have an impact on the Northern Ireland level annual population estimates, only the distribution of the population across areas within Northern Ireland. To estimate internal migration between one year and the next, changes in the Medical Card Register are used. In addition, data from the Higher Education Statistics Agency (HESA) is used to account for under recording of migration in the Medical Card Register of students who move from the parental home to their place of study. Both datasets are available by age, sex and local area of origin and destination.

3.2 Ratio Change method

In the Ratio Change method, selected indicators of population change are used to update the population from some earlier or base period. The method assumes an unchanged relationship over time between the chosen indicator and the true population[4]. For example, if the chosen indicator increases by five per cent over the period for which estimates are required, the base population is also increased by five per cent. Further detail of this method is available in the original report on Small Area Population Estimates.

A number of administrative data sources are selected as indicators of population changes within the ratio change method. They are selected on the basis of a high level of coverage of the population and acceptable quality. The weight given to each data source depends on its quality in terms of its historic coverage of the population and the accuracy of information on age, sex and geographical area. These sources are discussed briefly below.

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[4] That is, the ratio of the true population to the indicator remains constant between the base period and the later period for which estimates are required, hence the name Ratio Change method.

3.2.1 Medical Card Register

Basic demographic information of people registered with a GP in Northern Ireland is recorded on the Medical Card Register. It should provide near-universal coverage of all persons ordinarily resident in Northern Ireland. However in practice, due to factors such as lags between population changes (e.g. moves from one area to another and notification of such changes to the Health and Social Care Business Services Organisation (BSO)), the Medical Card Register suffers from the problem of list inflation, which varies from one area to another and across age groups. This is particularly the case for those in the younger working age group, where the total number of persons on the Register tends to be in excess of the population estimates. List inflation can also be localised, for example, along the border with the Republic of Ireland.

3.2.2 Historic Births

The number of registered births that occurred in the two years prior to the current mid-year of interest is used as an indicator for the population aged 0 or 1 years. This information is similar to that used in the components of change method.

3.2.3 School Census

In the UK, compulsory school ages are 4 to 15 years. Some parents may however opt for home education, or send their children to boarding schools outside Northern Ireland. The vast majority of children resident in Northern Ireland attend local schools. Therefore, the School Census, which is held each year in October for those attending primary, post primary and special education, is considered an appropriate source to be included in the ratio change method for children of school age.

3.2.4 Child Benefit

Her Majesty's Revenue and Customs (HMRC) collects statistics on the number of children for which Child Benefit is claimed. This benefit became means-tested in January 2013, since claimants earning over £50,000 were liable to pay tax over it, and those earning over £60,000 would have to repay the entire entitlement. Rather than paying tax, claimants can now opt-out of receiving child benefit. In Northern Ireland, opting-out currently accounts for just under 3 per cent of children. This data source is still considered to have sufficient coverage to be included in the ratio change method.

3.2.5 Pensions and related Benefits

State Pension is a non-means tested benefit; currently all people are entitled to this when they turn 65 years. The state pension ages (SPA) for people aged under 65 currently changing. As a result, currently some females aged between 61 and 65 are also entitled.

Changes to SPA, as per the Pensions Act 2014, are as follows:

- Between 2012 and 2018, SPA will change from 65 years for men and 61 years for women, to 65 years for both sexes.

- Between December 2018 and October 2020, SPA will change from 65 years to 66 years for both men and women.

- Between 2026 and 2046, SPA will increase in two stages from 66 years to 68 years for both sexes.

Information is collected from the Department of Social Development on the number of claimants of State Pension and other related benefits[5].

4   Geography

Population estimates for areas within Northern Ireland are created firstly by Super Output Areas (SOAs), which are whole or subdivisions of the former 582 Electoral Wards. These SOAs become the building blocks to create population estimates for most other geographies (See Figure 1), with the following exceptions:

- 6 SOAs are split to create 12 Wards in the former Moyle Local Government District;
- 10 SOAs are split over two adjacent Local Government Districts[6]; and
- 101 SOAs of which parts lie within Neighbourhood Renewal Areas.

These subdivisions of SOAs are created in the final steps of the methodology.

All data sources required for the Components of Change and Ratio Change methods are supplied with geographical indicators. The most precise are POINTER references (i.e. exact XY coordinates of the place of residence). These were used in the 2011 Census, but are also available for births, deaths and the Medical Card Register – the main contributors to the Components of Change method.

Less accurate are the postcode-based data sources (School Census, Child Benefit and Pension Benefits), as they are allocated to the geographical area of the most central of properties with the same postcode. This can cause some inaccuracy issues at the smaller geography level. In addition, it is sometimes necessary to apportion a small
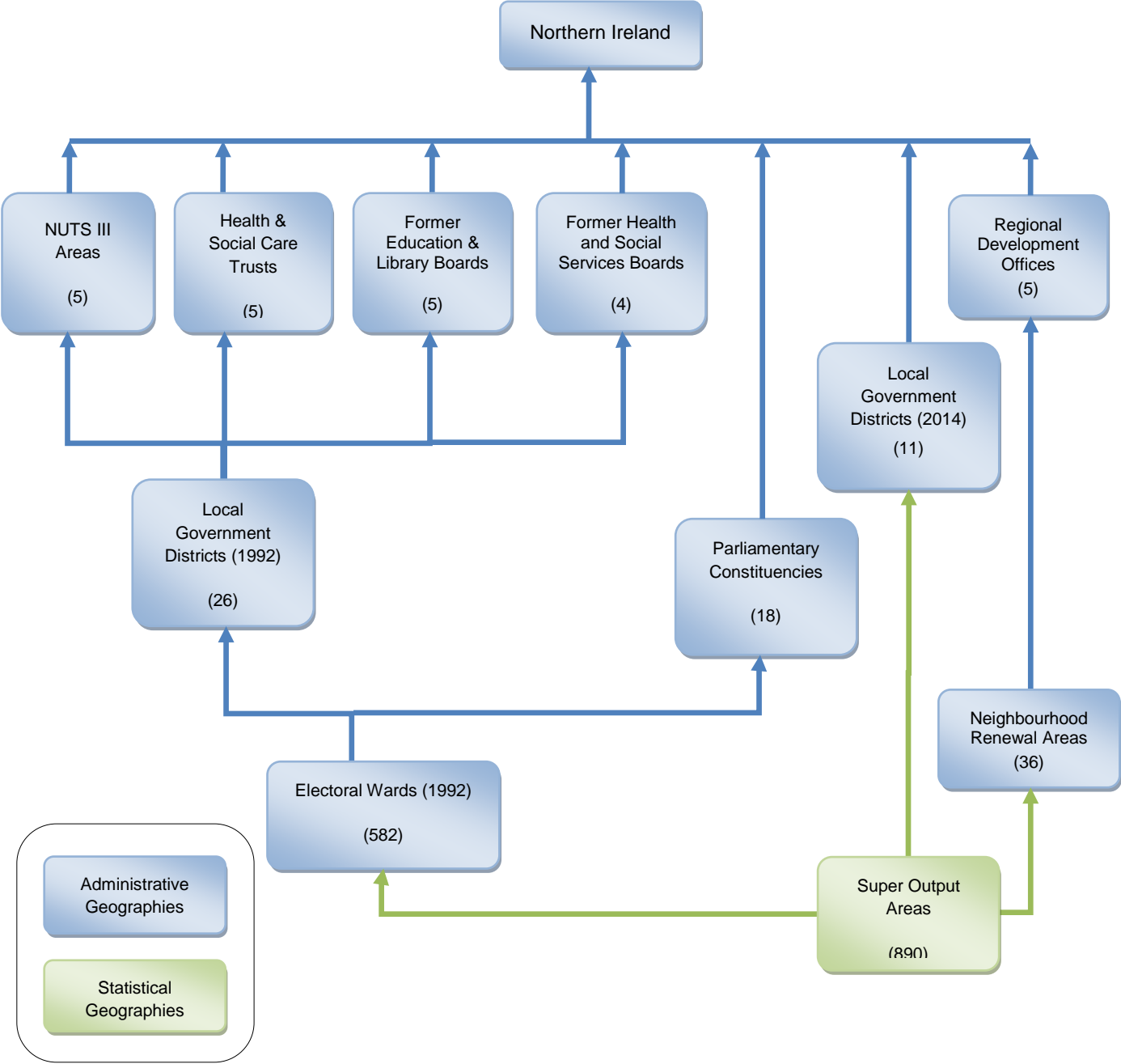
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[5] Related benefits include Attendance Allowance, Disability Living Allowance, Widows Benefit, Bereavement Benefits, State Pension Credit, Incapacity Benefit and Winter Fuel Payment.

[6] Armagh City, Banbridge & Craigavon; Belfast; Lisburn & Castlereagh; Newry, Mourne & Down; and Ards & North Down.

proportion of records with unknown geography based on the spatial characteristics of known records (e.g. for pupils based on the area around the school they attend).

Figure 1: Bottom-Up Approach used in the Population Estimates Methodology

5   Average of methods

The population estimates by SOA, sex and 5-year age band are derived from the average of figures created using the Components of Change and Ratio Change methods. These estimates are then subject to a process of quality assurance. In rare occasions, it is found that estimates from one or the other method appear to be outliers.

The general solution to these cases is to rely solely on one method rather than the average.

Once the quality assurance at the SOA level is complete, further work is undertaken to disaggregate these estimates by:

- single year of age to allow aggregation to larger geographies such as Local Government District and Parliamentary Constituencies; and
- sub-divisions of SOAs to create estimates for particular areas which are made up of split SOAs.

Both sets of disaggregations are achieved by apportioning the age-banded SOA level estimates using a combination of (a) the components of change estimates (which are available at the lowest geographic level and by single year of age), and (b) administrative data sources used in the ratio change method[7].

6   Quality Assurance

Changes over time and annual population estimates are compared to several administrative data sources. These include those used in the estimation process, but can also include the active medical cards, the electoral roll, benefit claimants, and the number of domestic properties. Any significant differences found are examined further.

The improvements made are carried forward in population outputs going forward, with continued monitoring of the quality and availability of data sources and methodology. A close collaboration with colleagues in the Office for National Statistics and the National Records Scotland ensures continued improvement and comparability.

A more comprehensive outline of the administrative data sources utilised, including details of the quality management actions undertaken to ensure that the data is suitable for population estimates, are detailed within the Administrative Data Quality Document.

NISRA, June 2017

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[7] Child Benefit data is not used in the disaggregation, as it is not currently available to the required level of detail.