Population Projections for Areas within Northern Ireland

2018-based Assumptions Consultation Paper

April 2020

NISRA
Northern Ireland
Statistics and Research Agency
Gníomhaireacht Thuaisceart Éireann
um Staitisticí agus Taighde

Covering note

The following paper was circulated to Demographic Statistics Advisory Group (DSAG) members in February 2020 for review and comment. It includes proposals and recommendations relating to the projection assumptions for mortality, fertility, and migration which will be used in the development of 2018-based population projections for areas within Northern Ireland (also referred to as sub-national population projections).

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Contents

Note: Throughout the report figures have been presented in a rounded form to ease readability. For example population figures have been presented to the nearest 100 and percentage changes have been presented to 1 decimal place. However, all calculations have been undertaken on the basis of unrounded numbers which will, in some instances, give rise to apparent discrepancies.

1   Introduction

Following the publication of national (i.e. Northern Ireland level) population projections, NISRA produces official sub-national population projections for Local Government Districts (LGDs) in Northern Ireland. These projections are based on the extrapolation of demographic trends in fertility, mortality and migration at a more disaggregated level. As such they intentionally do **not** include any anticipated demographic effects of future social or economic policies. The projections are used for planning purposes, for example, future numbers of children to plan for school places and future numbers of the elderly to plan for residential and nursing home care.

The next planned set of sub-national population projections will start from the mid-2018 population estimates and will project forward the population 25 years (to mid-2043). As such, they will be referred to as the Population Projections for Areas within Northern Ireland (2018-based). They will replace the current Population Projections for Areas within Northern Ireland (2016-based)[1]. For ease of reading, within this paper these statistics will be referred to as SNPP18 and SNPP16 respectively.

These new projections will be released in April 2020 and, in keeping with past practice, will be constrained to the most recent Northern Ireland level population projections as published in October 2019[2]. This recent publication projects the Northern Ireland population to rise by 43,800 persons in the five years between mid-2018 and mid-2023, an increase of 2.3%. Fifteen years into the projections (i.e. by mid-2033), the population is projected to increase to 1.97 million, a rise of 4.6% from mid-2018.

Sub-national projections will be produced for both the current 11 LGDs as well as the former 26 LGDs. This is necessary to address specific needs of users and to create projections for larger geographies, which are aggregates of the former 26 LGDs (i.e. Health & Social Care Trusts, former Education & Library Boards, NUTS-III).

This document focuses on the assumptions for the current 11 LGDs. Upon agreement, the same methodologies will be applied to the former 26 LGDs.

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[1] NISRA 2016-based sub-national projections: https://www.nisra.gov.uk/publications/2016-based-population-projections-areas-within-northern-ireland

[2] Detailed results and assumptions for 2018-based Northern Ireland Population Projections available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2018based

2 Purpose of this document

For each year of the projection period, it is necessary to make assumptions about:

- future mortality rates (to derive the number of deaths),

- future fertility rates (to derive the number of births), and

- future migration.

The purpose of this document is to outline the proposed methodology for SNPP18 and make recommendations for the assumptions to apply to the components of change elements listed above.

The paper has been written for members of the Demographic Statistics Advisory Group (DSAG), seeking their consideration and ratification (or otherwise) of the assumptions and recommendations made within.

Information on how to respond to this paper is provided on page 15.

3 Methodology

The sub-national population projections will be produced using a cohort-component based model. The projections start with the mid-2018 population estimates as the base year, disaggregated by single year of age, sex and LGD. This base population is then projected one year ahead to reflect estimates of deaths, births and migration. The population is also aged on to be one year older. This process is repeated for each year included in the projection period.

The latest version of the POPGROUP software will be used to produce the SNPP18, as was the case for the 2008, 2012, 2014 and 2016-based projections. Further details on POPGROUP can be found at: http://www.ccsr.ac.uk/popgroup/

4   Mortality Assumptions

At the national (i.e. Northern Ireland) level, the number of deaths in each projection year is calculated by applying projected Northern Ireland mortality rates by single year of age and sex to the Northern Ireland level population by single year of age and sex for each year of the projection period.   The national rates (as agreed with the DSAG) assume that people will continue to live longer, with age-specific death rates continuing to fall. In the long-term, rates of improvement in mortality rates are projected to be 1.2% per annum for most ages.

The projected deaths by single year of age and sex for each LGD (i.e. the sub-national level) are calculated using a similar approach, with the resulting figures being made consistent with the single year of age and sex distributions previously published in the Northern Ireland projections in October last year.

At the sub-national level, age-sex specific mortality rates need to be applied to the estimated population in order to calculate the number of deaths in each LGD.   However, there are two options to achieve this:

1. Assume that all LGDs behave like Northern Ireland and apply the national level mortality rates by single year of age and sex without adjustment; or

2. Apply the national level mortality rates but adjust them by scaling factors to account for observed variations within each LGD.
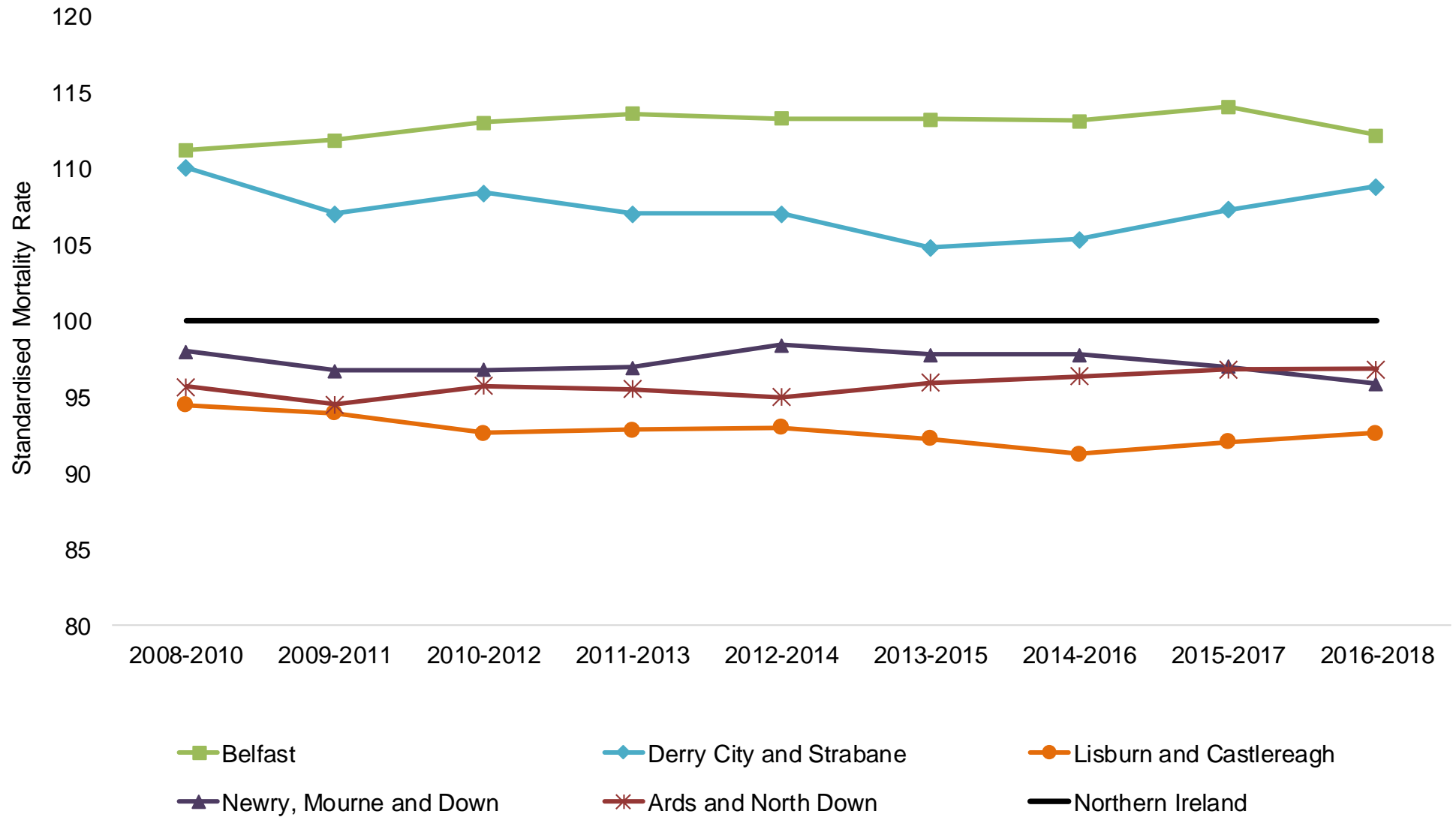
Figure 1 shows the Standardised Mortality Rates (SMRs) of selected LGDs in Northern Ireland[3] for historical data going back to 2008.   It can be seen from this chart that the historical figures show significant differences between the SMRs of the selected LGDs, and the trends do not suggest a convergence of mortality rates to the Northern Ireland figure.   As such, **the recommendation is to adopt approach 2 and apply the area-adjusted mortality rates to each LGD when calculating the projected number of deaths**.   This is in keeping with the approach taken for the last three sets of projections.

Also in line with the approach taken for SNPP16, **it is recommended that the scaling factors for each LGD are determined by analysing local variations observed in mortality rates for the period mid-2013/14 to mid-2017/18 (i.e. a five year average)**.   This is in line with the proposed approach to be taken in the Office for National Statistics (ONS) – subject to the outcomes of their consultation.

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[3] The chart figures have been calculated using broad age groupings of the population (i.e. 0-15, 16-29, 30-44, 45-64, 65-74 and 75+) and are produced for three year moving averages in order to smooth the trends.

Figure 1: Standardised Mortality Rates of selected Local Government Districts, 2008/10 to 2016/18 (non-zero y-axis)

Legend:
- Belfast
- Derry City and Strabane
- Lisburn and Castlereagh
- Newry, Mourne and Down
- Ards and North Down
- Northern Ireland

For the previous sets of sub-national projections, age-sex specific scaling factors were used to account for the variation in mortality for the selected age-sex groups within each LGD, noting that due to the relatively small size of the LGDs within Northern Ireland in terms of population, the LGD data is not considered to be sufficiently robust to create scaling factors for each single year of age and sex within each area. As such, scaling factors have been created for six broad age-sex groups within each LGD.

Furthermore, after defining the six broad age-sex groups, the potential robustness of the scaling factors were still affected by small numbers at the LGD level. To overcome this it was accepted that within each LGD, and in order to account for as much variation in the population as possible, the age-sex groups would continue to be considered separately but the scaling factors for each of them would be selected in the following priority order.

If deemed appropriate, the age-sex specific scaling factor was selected, otherwise the sex specific scaling factor was chosen. If neither the age-sex or sex specific scaling factors were appropriate the area specific scaling factor was selected. If none of the scaling factors were appropriate, the age-sex group was given a scaling factor of 1.00 (i.e. the NI level mortality rates would be applied to that age sex group).

Given that the most recent data (i) shows broadly the same levels of variation and, (ii) have the same limitations in terms of small numbers, **it is recommended that age-sex specific scaling factors are again applied to the broad age-sex groups used in SNPP16 and that they are produced on the same basis**.

Accordingly, Table 1 provides the proposed scaling factors that were derived for each broad age-sex group within each LGD (alongside the scaling factors used for SNPP16 for comparison – see figures in red). It can be seen that they closely align with those used for SNPP16, as might be expected.

DSAG members are asked to consider these mortality scaling factors for each LGD and respond to the questions in the feedback section.

Table 1: Proposed age-sex specific mortality scaling factors for the 11 Local Government Districts (based on a five year average)

Local Government Districts	Area Code	Projection	Male 0-64	Male 65-79	Male 80+	Female 0-74	Female 75-84	Female 85+
Ards and North Down	N09000011	2018-based	0.88	0.88	1.04	0.90	0.99	1.03
		2016-based	0.86	0.91	1.02	0.89	0.97	1.03
Antrim and Newtownabbey	N09000001	2018-based	0.99	0.97	1.04	1.06	1.05	0.99
		2016-based	0.99	0.98	1.03	1.05	1.08	0.98
Armagh City, Banbridge and Craigavon	N09000002	2018-based	0.95	0.92	0.98	0.95	1.00	1.00
		2016-based	0.95	0.91	0.95	0.94	1.00	1.01
Belfast	N09000003	2018-based	1.35	1.25	1.04	1.24	1.09	0.99
		2016-based	1.37	1.27	1.03	1.27	1.10	0.99
Causeway Coast and Glens	N09000004	2018-based	0.87	0.95	0.93	0.92	0.90	0.93
		2016-based	0.83	0.94	0.97	0.92	0.89	0.96
Derry City and Strabane	N09000005	2018-based	1.07	1.08	1.03	1.09	1.09	1.04
		2016-based	1.07	1.07	1.00	1.11	1.06	1.03
Fermanagh and Omagh	N09000006	2018-based	0.96	0.93	0.97	0.94	0.99	1.02
		2016-based	0.96	0.95	0.95	0.94	0.95	1.01
Lisburn and Castlereagh	N09000007	2018-based	0.80	0.88	0.98	0.84	0.90	1.03
		2016-based	0.77	0.87	0.98	0.83	0.93	1.03
Mid and East Antrim	N09000008	2018-based	1.00	0.98	1.04	0.95	0.96	1.00
		2016-based	0.94	0.95	1.04	0.95	0.97	0.96
Mid Ulster	N09000009	2018-based	0.85	0.98	0.97	0.91	1.01	0.97
		2016-based	0.82	0.94	1.02	0.85	0.98	0.98
Newry, Mourne and Down	N09000010	2018-based	0.95	1.03	0.94	0.97	0.91	0.99
		2016-based	0.96	0.99	0.97	0.98	0.93	1.01
Northern Ireland	**N92000002**	**2018-based**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

Note that the scaling factor is calculated as:

$$\text{Scaling Factor} = \frac{\text{SMR of Area}}{\text{SMR of NI}}$$

Since the NI SMR is always 1.00, the area SMR is essentially the scaling factor (albeit expressed as a proportion).

The size of the scaling factor indicates how mortality in each of the age-sex groups in each area is expected to behave in comparison to the Northern Ireland equivalent age-sex group. For example, for Belfast, the scaling factor of 1.35 for males aged 0-64 means that each NI level single year of age mortality rate for males aged 0 to 64 will be increased by 35% to reflect the higher expected levels of mortality in that age-sex group in that area.

5   Fertility Assumptions

At the national level, the number of births in each projection year is calculated by applying projected Northern Ireland fertility rates by single year of age to the Northern Ireland level population of females at childbearing age (i.e. 15 to 44) by single year of age for each year of the projection period. In the long-term, the national projections assume that the hypothetical "average woman" in Northern Ireland will have 1.92 children in her lifetime, otherwise referred to as Total Period Fertility Rate (TPFR).

The projected births by single year of age and sex for each LGD (i.e. sub-national level) are calculated using a similar approach, with resulting figures being (i) split by sex using the male-female ratio 105:100 as per the Northern Ireland projections[4] and (ii) made consistent with the single year of age and sex distributions published in the Northern Ireland projections.

At the sub-national level, age specific fertility rates are applied to the estimated population in order to calculate the number of births in each LGD. However, there are two options to achieve this:

1. Assume that all LGDs behave like Northern Ireland and apply the national level fertility rates by single year of age without adjustment; or

2. Apply the national level fertility rates but adjust them by scaling factors to account for observed variations within each LGD.

Figure 2 shows the TPFRs of selected LGDs in Northern Ireland[5] for historical data going back to 2008. It can be seen from this chart that the historical figures show significant differences between the TPFRs of the selected LGDs and that the trends do not suggest a convergence of fertility rates to the Northern Ireland figure.   As such, **the recommendation is to adopt approach 2 and apply the area-adjusted fertility rates to each LGD when calculating the projected number of births**. This is in keeping with the approach taken to the previous sub national population projections.

Also in line with the approach taken for the previous projections, **it is recommended that the scaling factors for each LGD are determined by analysing local variations observed in fertility rates for the period mid-2013/14 to mid-2017/18 (i.e. a five year average)**. This is in line with the proposed approach to be taken in the ONS – subject to the outcomes of their consultation.

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[4] See data available in Principal projection – projection summary (2018-2068)

[5] The chart figures have been calculated using 5 year age groupings of the female "child bearing" population (i.e. 15-19, 20-24, 25-29, 30-34, 35-39, and 40-44) and are produced for three year moving averages in order to smooth the trends.

Figure 2: Total Period Fertility Rate (TPFR) of selected Local Government Districts, 2008/10 to 2016/18 (non-zero y-axis)
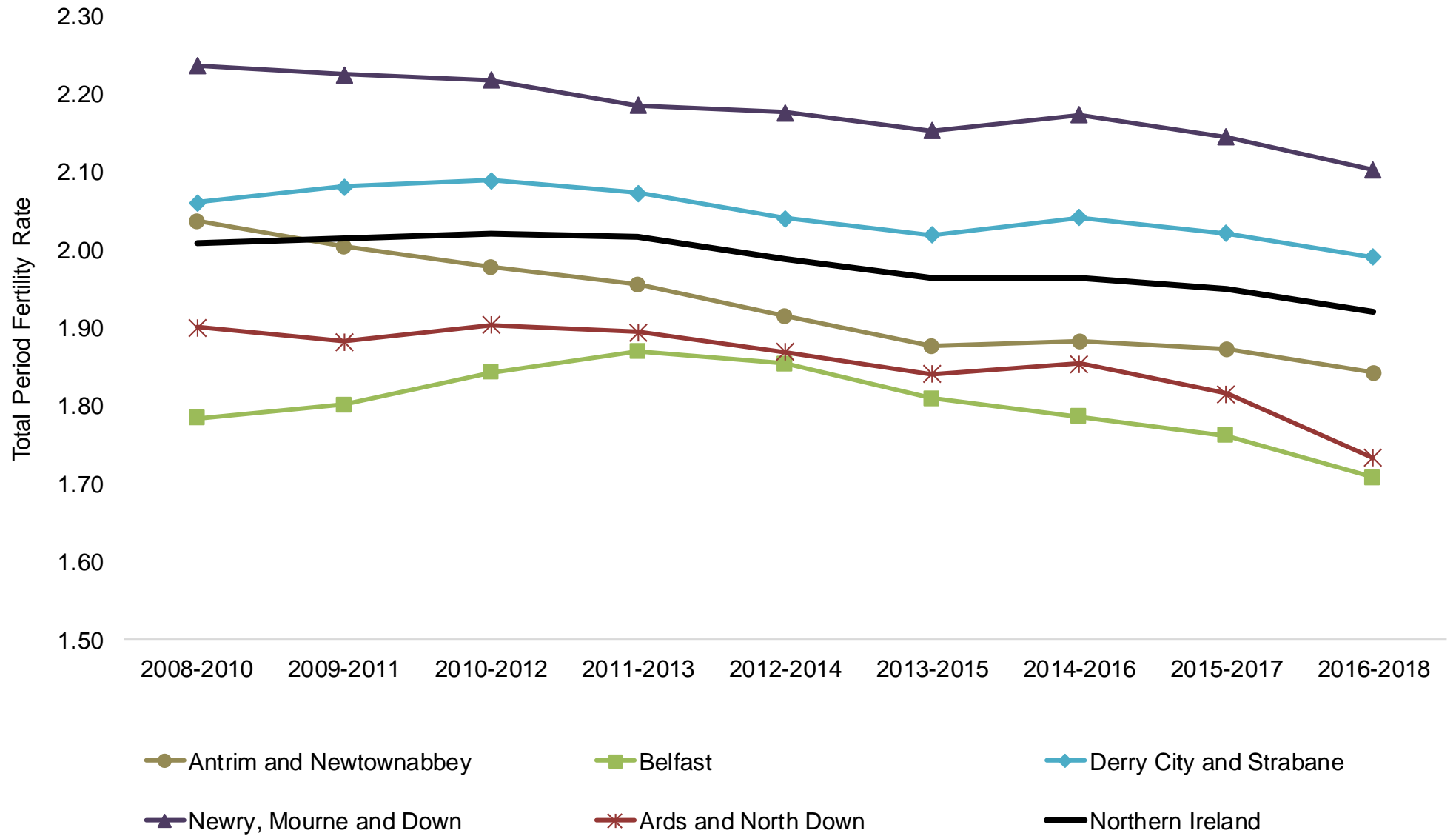
For the previous sets of sub-national population projections, a single LGD scaling factor has been adopted to account for the variation in fertility within each LGD and to use the TPFRs of the areas to calculate these scaling factors. In keeping with this approach, **it is recommended to continue to use a single scaling factor method to calculate fertility rates for each LGD**.

Table 2 shows the five year average TPFR and the fertility scaling factors for the 11 LGDs (alongside the figures used for SNPP16 for comparison – see figures in red). It can be seen that they closely align with those used for SNPP16 as might be expected.

DSAG members are asked to consider these fertility scaling factors for each LGD and respond to the questions in the feedback section.

Table 2: Proposed TPFR and fertility scaling factors for the 11 Local Government Districts (based on a five year average)

Local Government Districts	Area Code	2018-based projections		2016-based projections
		Five year average TPFR	Proposed Fertility Scaling Factor	Fertility Scaling factor
Ards and North Down	N09000011	1.77	0.92	0.94
Antrim and Newtownabbey	N09000001	1.85	0.95	0.96
Armagh City, Banbridge and Craigavon	N09000002	2.09	1.08	1.08
Belfast	N09000003	1.74	0.90	0.92
Causeway Coast and Glens	N09000004	1.93	1.00	0.99
Derry City and Strabane	N09000005	2.01	1.04	1.03
Fermanagh and Omagh	N09000006	2.06	1.06	1.03
Lisburn and Castlereagh	N09000007	1.93	1.00	0.99
Mid and East Antrim	N09000008	1.85	0.96	0.94
Mid Ulster	N09000009	2.15	1.11	1.08
Newry, Mourne and Down	N09000010	2.12	1.10	1.10
Northern Ireland	**N92000002**	**1.93**	**1.00**	**1.00**

Note that the scaling factor is calculated as:

$$\text{Scaling Factor} = \frac{\text{TPFR of LGD}}{\text{TPFR of NI}}$$

The size of the scaling factor indicates how fertility in each of the areas is expected to behave in comparison with the Northern Ireland fertility rates. For example, for Belfast, the scaling factor of 0.90 means that each NI level single year of age fertility rate for females of child bearing age will be reduced by 10% to reflect the lower expected levels of fertility in that area.

6   Migration Assumptions

Migration continues to be the most difficult element of the cohort component method to measure or predict. There are three main elements to migration, namely:

- Migration flows to and from the UK (GB migration);

- Migration flows to and from outside the UK (International migration); and

- Migration within areas of Northern Ireland (Internal migration).

As is the case for fertility and mortality, the sub-national migration projections will be constrained to the figures published in the 2018-based national projections (for GB and International migration only). Internal migration is a sub-national issue and therefore has a net zero affect at the Northern Ireland level.

Note that the migration assumptions for the 2018-based national projections were previously reviewed by the DSAG last year and were subsequently published in October 2019. These contrast with the assumptions applied to net migration within the 2016-based national projections and are due to recent observed trends in GB and International migration since mid-2016[6]. For reference, Figure 3 shows the published net migration data at the national level for the 2018 and 2016 based Northern Ireland level projections.

Figure 3: Net migration at the national level (2016-based vs. 2018-based projections)

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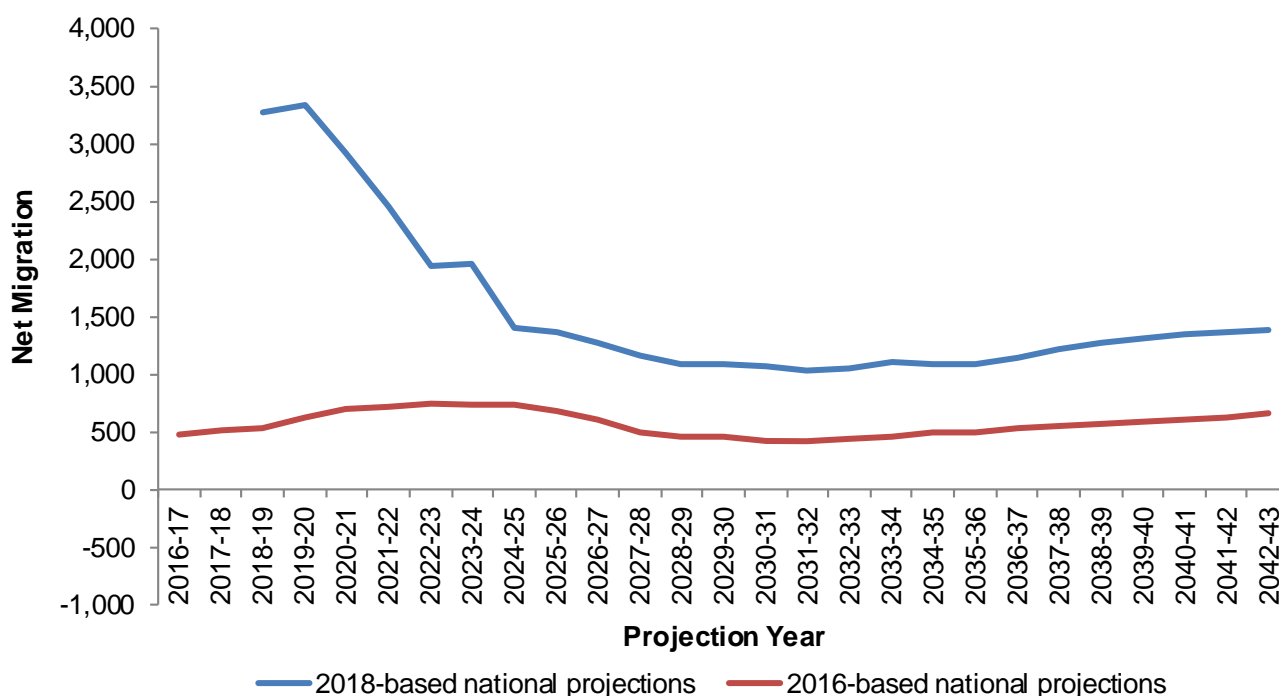
[6] More information on migration can be found in the Mid-year Population Estimates and Long-Term International Migration Statistics for Northern Ireland reports.

At the LGD level, there is a notable year on year variation in terms of net migration. For SNPP16 it was agreed that a five year average of net migration should be calculated for each LGD and applied throughout the projection period. For SNPP18, calculation of a seven year average of net migration for each LGD and its application throughout the projection period is recommended. Domestic and international flows are demonstrating increasing volatility over the last number of years. As this volatility is relatively recent and is uncertain to continue in the long term, a seven year average will be used to dampen effect of this volatility on future projections. For consistency a seven year average will be used for all three elements of migration (international, within UK and domestic). **The recommendation is that this approach is used for the 2018-based sub-national projections**.

For GB and international flows, best estimates for 2018/19 have been calculated as these data are now available. This allows seven year averages of GB and international migration estimates over the period 2012/13 to 2018/19 to be calculated for each LGD. In each projection year, the averages will be scaled to the overall Northern Ireland flows published in the national population projections.

For internal migration, averages of migration estimates for the most recent seven years of data available will be calculated. These averages will be carried forward for each projection year, in line with the methodology adopted for SNPP16. The only constraint on internal migration is a net internal migration flow of zero at the Northern Ireland level.

Table 3 shows the results of the migration analysis by providing net migration assumptions for each LGD in Northern Ireland. The figures account for the three different types of migration (i.e. GB, International and Internal) and are provided for selected stages in the projection period to illustrate the transition from short-term to long-term levels and the effect those levels have on the first fifteen years of projections for each area.

DSAG members are asked to consider these net migration assumptions for each LGD and respond to the questions in the feedback section.

For information, charts outlining the projected annual net migration for each LGD in the first fifteen years of projections have been provided in Annex A.

Table 3: Net migration assumptions for the 11 Local Government Districts

Local Government Districts	Area Code	Short term		Long-term	First 15 years (to 2032/33)
		2018/19	2023/24	2028/29	
Ards and North Down	N09000011	650	600	550	8,600
Antrim and Newtownabbey	N09000001	400	100	50	1,250
Armagh City, Banbridge and Craigavon	N09000002	850	800	700	11,500
Belfast	N09000003	-600	-550	-800	-9,100
Causeway Coast and Glens	N09000004	50	-100	-150	-1,400
Derry City and Strabane	N09000005	-100	-600	-650	-8,550
Fermanagh and Omagh	N09000006	200	0	-50	-300
Lisburn and Castlereagh	N09000007	800	1,000	950	14,300
Mid and East Antrim	N09000008	250	300	250	4,100
Mid Ulster	N09000009	250	200	150	2,950
Newry, Mourne and Down	N09000010	500	200	150	3,050
Northern Ireland	**N92000002**	**3,300**	**1,950**	**1,100**	**26,400**

Figures have been rounded to the nearest 50

7   Armed Forces

As was the case for previous sub-national population projections, Armed Forces are treated as a special population.   However, the age structure of the Armed Forces group is assumed to remain stable each year. The adjustment procedure is to subtract Armed Forces resident in Northern Ireland in the base year's estimates before ageing on the civilian population and then adding in the Armed Forces after the ageing on is complete. As such, in the projection period the Armed Forces presence is set to remain at the level and locations as estimated in the 2018 mid-year estimates.

8   Students

Information from the Higher Education Statistics Agency was used to improve internal migration estimates for the previous projections and it was concluded that there was no longer a need for special treatment of student populations.   This continues to be the case for SNPP18.

9   Variant Projections

At the Northern Ireland level, several variant projections are produced under different assumptions of fertility, mortality and migration. In keeping with past practice, variant projections will **not** be produced for areas within Northern Ireland. Production of variants may be considered in the future based on user need, feasibility of the specific variant and availability of resource needed for production.

10 Feedback

Responses in writing to the following consultation questions are invited **before close of play on Friday 27 March 2020**.

Mortality Assumptions

This paper proposes a continuance of the methodology deployed for the 2016-based sub-national population projections. In summary, this comprises using LGD specific age-sex mortality scaling factors, based on a five year average of observed deaths at LGD level, for selected male/female age groups as used for SNPP16. It gives rise to the LGD age-sex scaling factors outlined in Table 1.

Question 1 – Are you content with the approach to mortality assumptions outlined above?

Fertility Assumptions

This paper proposes a continuance of the methodology deployed for the 2016-based sub-national population projections. In summary, this comprises using LGD specific fertility scaling factors, based on a five year average of observed births at LGD level, for females of childbearing age. It gives rise to the LGD scaling factors outlined in Table 2.

Question 2 – Are you content with the approach to fertility assumptions outlined above?

Migration Assumptions

This paper proposes a continuance of the methodology deployed for the 2016-based sub-national population projections for migration. However, as detailed in the migration assumptions section, we propose applying LGD net migration assumptions, based on a seven year average of observed migration at LGD level, rather than a 5 year average which was used for 2016-based sub-national population projections. It gives rise to the net migration assumptions summarised in Table 3.

Question 3 – Are you content with the approach to migration assumptions outlined above?

If you are responding that you are not content with any of the principles/proposals outlined above, please detail why.

NISRA Population and Migration Statistics (February 2020)

Annex A: Charts showing fifteen years of net migration projections for each LGD

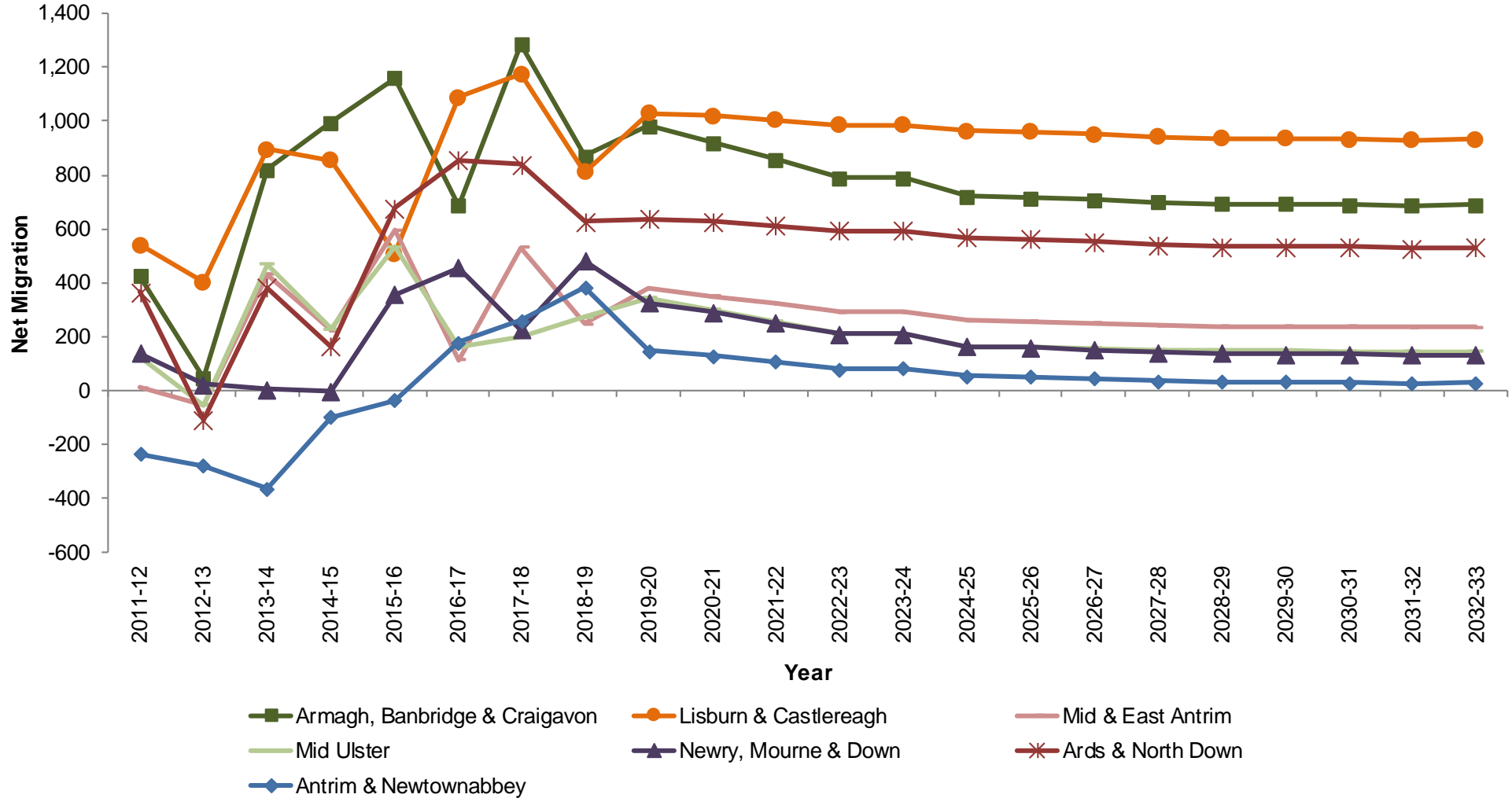**Figure A1: Proposed net migration for LGDs (positive net migration)**

Figure A2: Proposed net migration for LGDs (negative net migration)