

# **POPULATION PROJECTIONS FOR AREAS WITHIN NORTHERN IRELAND: 2016-BASED - ASSUMPTIONS CONSULTATION PAPER**



## **Covering note**

The following paper was circulated to Demographic Statistics Advisory Group (DSAG) members in February 2018 for review and comment. It includes proposals and recommendations relating to the projection assumptions for mortality, fertility, and migration which were used in the development of 2016-based population projections for areas within Northern Ireland (also referred to as sub-national population projections).

**NISRA**

**February 2018**

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**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

Roughly every two years, 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. As such they intentionally do **not** include any anticipated demographic effects of 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-2016 population estimates and will project forward the population 25 years (to mid-2041). As such, they will be referred to as the Population Projections for Areas within Northern Ireland (2016-based). They will replace the current Population Projections for Areas within Northern Ireland (2014-based)<sup>1</sup>. For ease of reading, within this paper these statistics will be referred to as SNPP16 and SNPP14 respectively.

These new projections will be released in April 2018 and, in keeping with past practice, will be constrained to the most recent Northern Ireland level population projections as published in October 2017<sup>2</sup>. The most recent Northern Ireland level population projections project the Northern Ireland population to rise by 42,100 persons in the five years between mid-2016 and mid-2021, an increase of 2.3%. Fifteen years into the projections (i.e. by mid-2031), the population is projected to increase to 1.966 million, a rise of 5.6% from mid-2016.

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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<sup>1</sup> NISRA 2014-based sub-national projections: <https://www.nisra.gov.uk/publications/2014-based-population-projections-areas-within-northern-ireland>

<sup>2</sup> Detailed results and assumptions for 2016-based Northern Ireland Population Projections available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2016basedstatisticalbulletin>

## 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 SNPP16 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. For reference, the recommendations are put in the context of what was agreed for the SNPP14 (and where relevant the 2016-based national projections) by DSAG. **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-2016 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 SNPP16, as was the case for the 2008, 2012 and 2014-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.

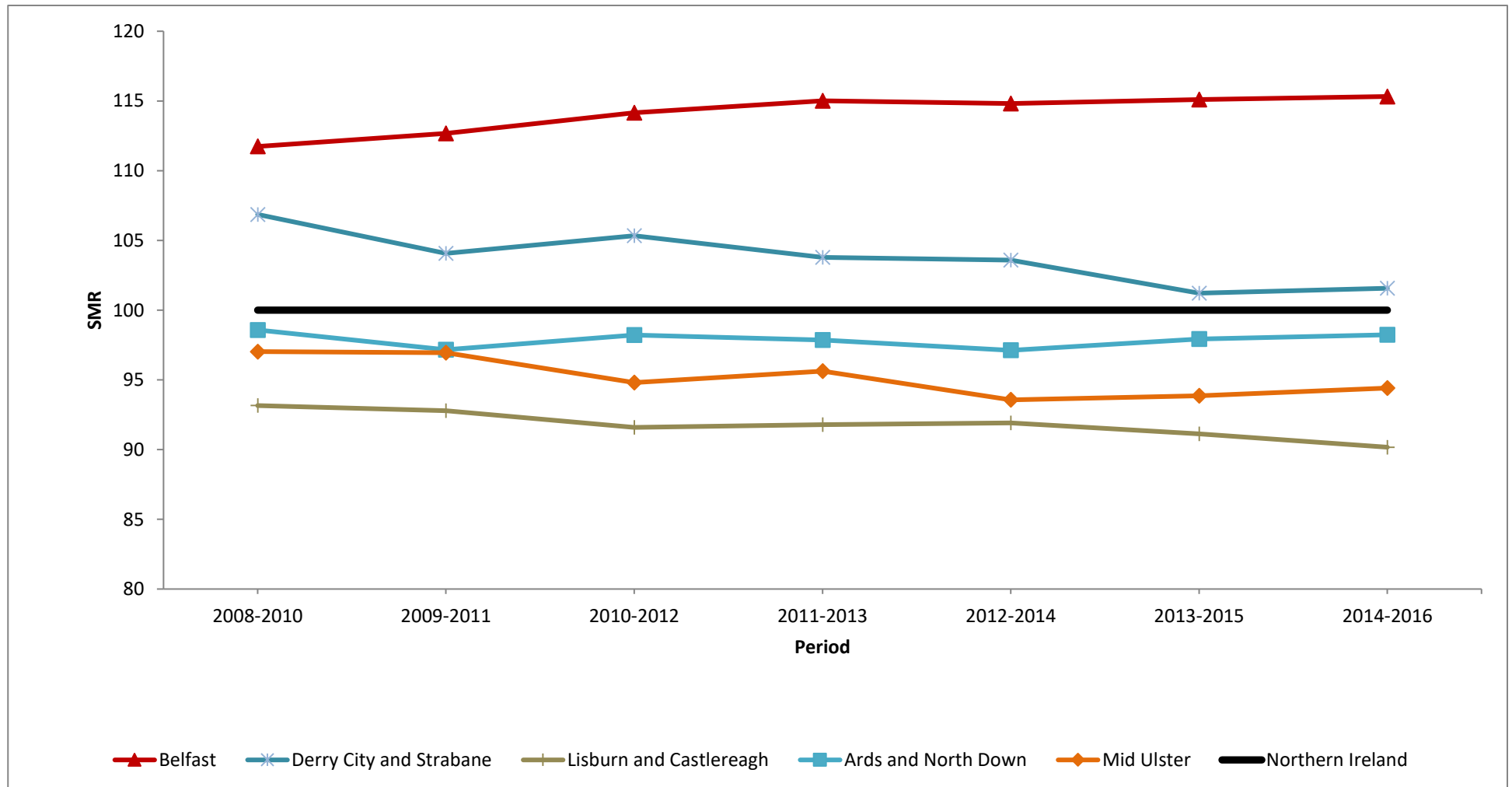
Figure 1 shows the Standardised Mortality Rates (SMRs) of selected LGDs in Northern Ireland<sup>3</sup> for historical data going back to 2008. It can be seen from this chart that the historical figures show significant differences between the SMRs of the selected LGDs, and the trends do not suggest 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 SNPP12 and SNPP14.

Also in line with the approach taken for SNPP14, **it is recommended that the scaling factors for each LGD are determined by analysing local variations observed in mortality rates for the period mid-2011/12 to mid-2015/16 (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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<sup>3</sup> 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 2014/16 (non-zero y-axis)



For the last two sets of sub-national projections (i.e. SNPP12 and SNPP14), DSAG has agreed to use age-sex specific scaling factors to account for the variation in mortality for the 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, the decision was made to create scaling factors 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 SNPP14 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 SNPP14 for comparison – see figures in red). It can be seen that they closely align with those used for SNPP14, as might be expected. **DSAG members are asked to consider and agree these mortality scaling factors.**

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

Area Name	Area Code	Male 0-64	Male 65-79	Male 80+	Female 0-74	Female 75-84	Female 85+
Ards and North Down	N09000011	0.86 (0.85)	0.91 (0.90)	1.02 (1.01)	0.89 (0.91)	0.97 (0.99)	1.03 (1.01)
Antrim and Newtownabbey	N09000001	0.99 (0.94)	0.98 (1.01)	1.03 (0.99)	1.05 (1.02)	1.08 (1.00)	0.98 (1.00)
Armagh City, Banbridge and Craigavon	N09000002	0.95 (1.00)	0.91 (0.94)	0.95 (0.99)	0.94 (0.96)	1.00 (1.00)	1.01 (0.99)
Belfast	N09000003	1.37 (1.35)	1.27 (1.23)	1.03 (1.01)	1.27 (1.25)	1.10 (1.09)	0.99 (0.98)
Causeway Coast and Glens	N09000004	0.83 (0.88)	0.94 (0.95)	0.97 (1.02)	0.92 (0.89)	0.89 (0.94)	0.96 (1.00)
Derry City and Strabane	N09000005	1.07 (1.06)	1.07 (1.04)	1.00 (1.01)	1.11 (1.17)	1.06 (1.03)	1.03 (1.01)
Fermanagh and Omagh	N09000006	0.96 (0.96)	0.95 (0.94)	0.95 (0.98)	0.94 (0.87)	0.95 (0.93)	1.01 (1.00)
Lisburn and Castlereagh	N09000007	0.77 (0.75)	0.87 (0.92)	0.98 (0.95)	0.83 (0.83)	0.93 (0.96)	1.03 (1.07)
Mid and East Antrim	N09000008	0.94 (0.92)	0.95 (0.97)	1.04 (1.03)	0.95 (0.96)	0.97 (0.96)	0.96 (0.96)
Mid Ulster	N09000009	0.82 (0.82)	0.94 (0.91)	1.02 (1.02)	0.85 (0.87)	0.98 (0.97)	0.98 (1.02)
Newry, Mourne and Down	N09000010	0.96 (0.95)	0.99 (0.95)	0.97 (0.98)	0.98 (0.96)	0.93 (0.97)	1.01 (1.01)
<b>Northern Ireland</b>	<b>N92000002</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>

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 1.37 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 37% to reflect the expected levels of mortality in that age-sex group in that area.



## 5 Fertility Assumptions

At the national (i.e. Northern Ireland) 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, as was agreed by the DSAG, the national projections assume that the hypothetical “average woman” in Northern Ireland will have 2.0 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<sup>4</sup> 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-sex 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 TPFRRs of selected LGDs in Northern Ireland<sup>5</sup> for historical data going back to 2008. It can be seen from this chart that the historical figures show significant differences between the TPFRRs 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 SNPP12 and SNPP14.

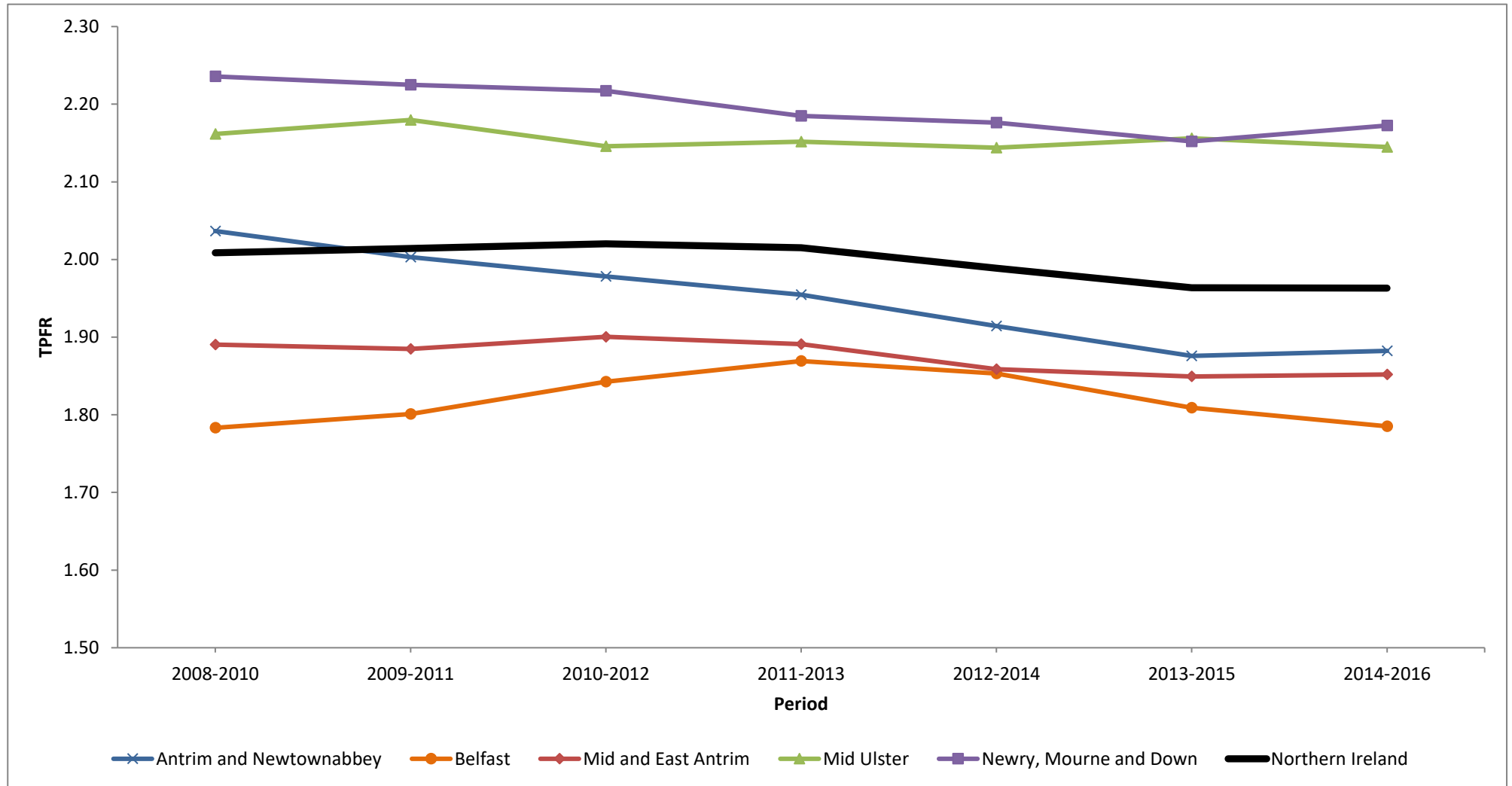
Also in line with the approach taken for SNPP12 and SNPP14, **it is recommended that the scaling factors for each LGD are determined by analysing local variations observed in fertility rates for the period mid-2011/12 to mid-2015/16 (i.e. a five year average).** This is in line with the proposed approach to be taken in the ONS – subject to the outcomes of their consultation.

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<sup>4</sup> See data available in [Principal projection – projection summary \(2016-2066\)](#)

<sup>5</sup> 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 2014/16 (non-zero y-axis)



For the last two sets of sub-national population projections (i.e SNPP12 and SNPP14), DSAG has agreed to adopt single LGD scaling factors to account for the variation in fertility within each LGD and to use the TPFRRs 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 TPFRR and the fertility scaling factors for the 11 LGDs (alongside the figures used for SNPP14 for comparison – see figures in red). It can be seen that they closely align with those used for SNPP14 as might be expected. **DSAG members are asked to consider and agree these fertility scaling factors.**

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

Area Name	Area Code	2016-based projections		2014-based projections
		Five year average TPFRR	Proposed Fertility Scaling Factor	Fertility Scaling factor
Ards and North Down	N09000011	1.87	0.94	0.94
Antrim and Newtownabbey	N09000001	1.91	0.96	0.97
Armagh City, Banbridge and Craigavon	N09000002	2.14	1.08	1.09
Belfast	N09000003	1.82	0.92	0.92
Causeway Coast and Glens	N09000004	1.96	0.99	0.97
Derry City and Strabane	N09000005	2.05	1.03	1.03
Fermanagh and Omagh	N09000006	2.03	1.03	1.03
Lisburn and Castlereagh	N09000007	1.96	0.99	1.01
Mid and East Antrim	N09000008	1.86	0.94	0.94
Mid Ulster	N09000009	2.15	1.08	1.08
Newry, Mourne and Down	N09000010	2.17	1.10	1.10
<b>Northern Ireland</b>	<b>N92000002</b>	<b>1.98</b>	<b>1.00</b>	<b>1.00</b>

Note that the scaling factor is calculated as:

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

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 0.92 means that each NI level single year of age fertility rate for females of child bearing age will be reduced by 8% to reflect the expected levels of fertility in that area.

## 6 Migration Assumptions

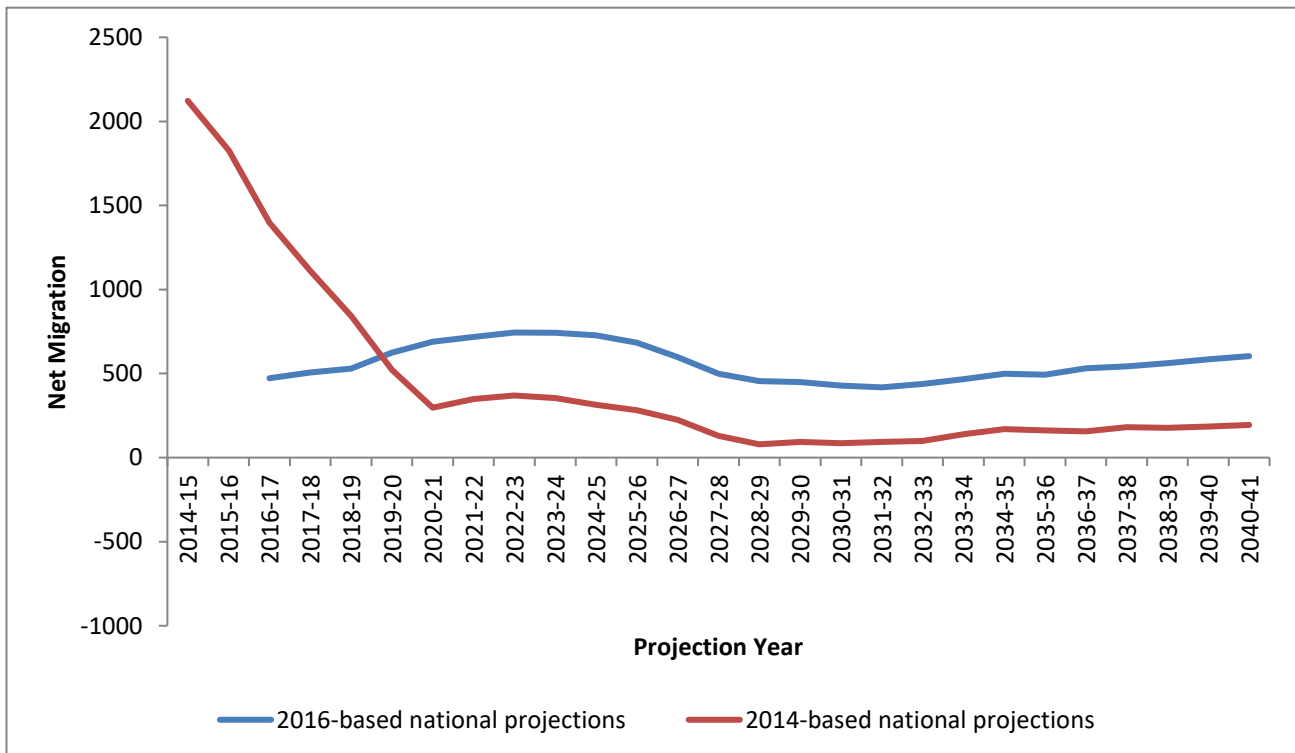
Migration continues to be the most difficult element of the cohort component method to measure or predict. There are three main elements to migration, namely:

- 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 2016-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 2016-based national projections were previously agreed by the DSAG in July of last year and were subsequently published in October 2017. These contrast with the assumptions applied to net migration within the 2014-based national projections and are due to recent observed trends in GB and International migration since mid-2014<sup>6</sup>. For reference, Figure 3 shows the published net migration data at the national level for the 2016 and 2014 based Northern Ireland level projections.

**Figure 3: Net migration at the national level (2014-based vs. 2016-based projections)**



<sup>6</sup> More information on migration can be found in the Long-Term International Migration Statistics for Northern Ireland (2016) report: <https://www.nisra.gov.uk/publications/long-term-international-migration-statistics-northern-ireland-2016>

At the LGD level, there is a notable year on year variation in terms of net migration. For SNPP14 it was agreed that a five year average of net migration should be calculated for each LGD and applied throughout the projection period. **The recommendation is that this approach is used again for the 2016-based sub-national projections.** 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.

For GB and international flows, best estimates for 2016/17 have been calculated as these data are now available. This allows five year averages of GB and international migration estimates over the period 2012/13 to 2016/17 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 five years of data available will be calculated. These averages will be carried forward for each projection year, in line with the methodology adopted for SNPP14. 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 and agree these net migration assumptions for each LGD.**

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**

Area Name	Area Code	Short term		Long-term	First 15 years (to 2030/31)
		2016/17	2021/22	2022/23	
Ards and North Down	N09000011	300	400	400	5,500
Antrim and Newtownabbey	N09000001	100	-50	-50	-1,000
Armagh City, Banbridge and Craigavon	N09000002	300	600	600	8,650
Belfast	N09000003	-750	-700	-650	-10,550
Causeway Coast and Glens	N09000004	-50	-100	-100	-1,600
Derry City and Strabane	N09000005	-250	-700	-700	-10,150
Fermanagh and Omagh	N09000006	50	-50	-50	-900
Lisburn and Castlereagh	N09000007	400	800	800	11,650
Mid and East Antrim	N09000008	50	200	200	2,950
Mid Ulster	N09000009	100	200	200	2,800
Newry, Mourne and Down	N09000010	200	100	100	1,450
<b>Northern Ireland</b>	<b>N92000002</b>	<b>450</b>	<b>700</b>	<b>750</b>	<b>8,850</b>

## 7 Armed Forces

As was the case for SNPP12 and SNPP14, Armed Forces are treated as a special population. However the age structure of the Armed Forces groups 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 2016 mid-year estimates.

## 8 Students

Information from the Higher Education Statistics Agency was used to improve internal migration estimates for the SNPP12 and SNPP14 and it was concluded that there was no longer a need for special treatment of student populations. This continues to be the case for SNPP16.

## 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. A zero migration variant, which is mainly produced for internal purposes to assess the impact of migration, may be produced on request.

## **10 Feedback**

Responses in writing to the following consultation questions are invited **before close of play on Friday 9 March 2018.**

### **Mortality Assumptions**

This paper proposes a continuance of the methodology deployed for the 2014-based sub-national population projections, which was signed off by the DSAG towards the end of April 2016. 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 SNPP14. 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 2014-based sub-national population projections, which was signed off by the DSAG towards the end of April 2016. 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 2014-based sub-national population projections for migration, which was signed off by the DSAG towards the end of April 2016. In summary, this comprises applying LGD net migration assumptions, based on a five year average of observed migration at LGD level. It gives rise to the net migration assumptions summarised in Table 3.

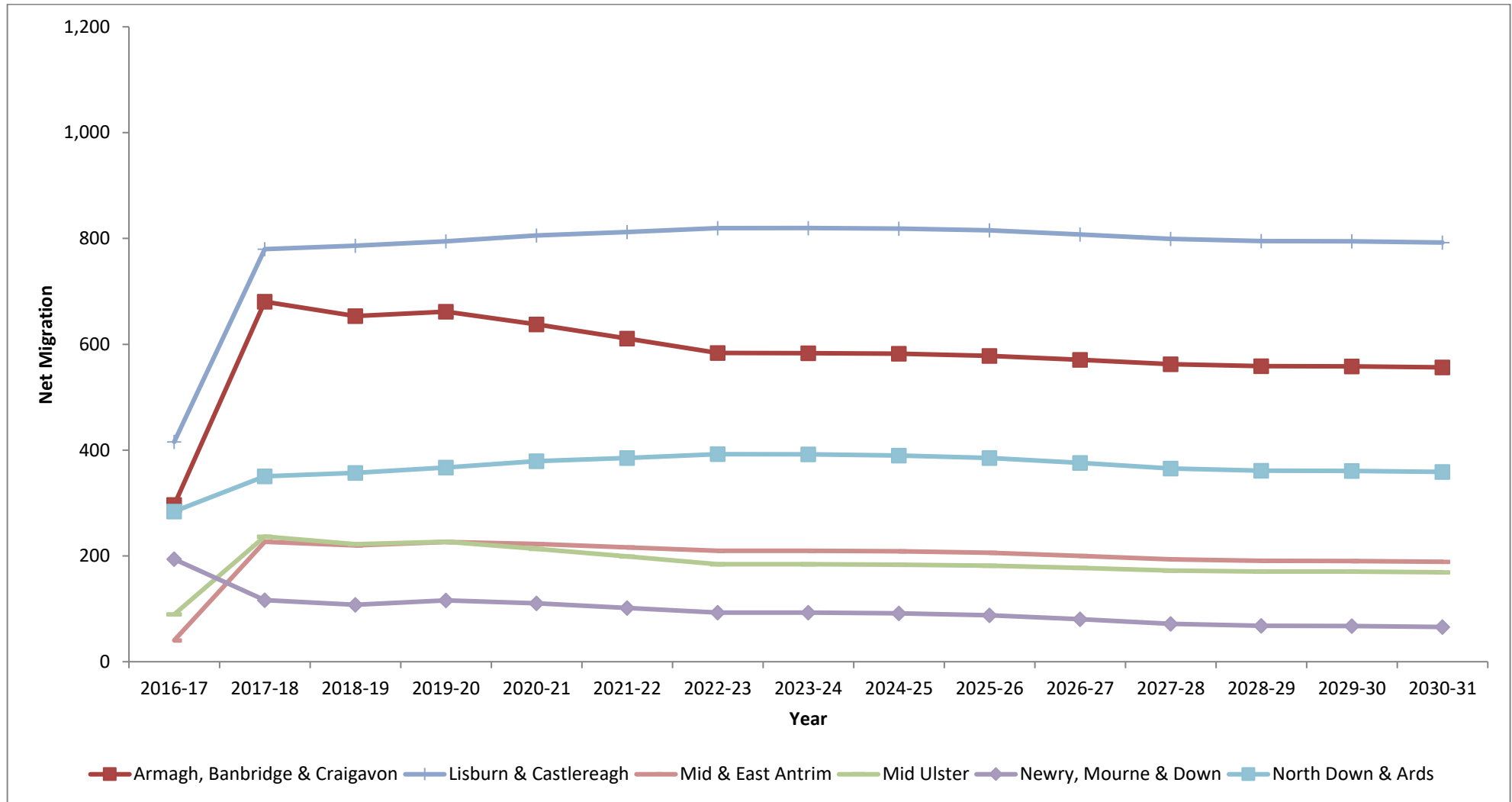
Question 3 – Are you content with the approach to migration assumptions outlined above?

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

**NISRA Demographic Statistics Branch (February 2018)**

## 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)**

