NORTHERN IRELAND HOUSEHOLD PROJECTIONS (2012 BASED) – METHODOLOGY

1. Introduction

The 2012-based household projections for Northern Ireland, published in March 2015, are an update of the 2008-based household projections. The methodology remained largely unchanged; however, it uses available information from the 2011 Census and the most recent 2012-based population projections. This document describes the methodology used in the 2012-based household projections. If you have any further questions on the methodology you can contact us at: dmb.nisra@dfpni.gov.uk.

2. 2012-based Population Projections used in Household Projections

Northern Ireland level 2012-based population projections were published in November 2013 and 2012-based population projections for areas within Northern Ireland in October 2014. The latest population projections replace the 2008-based population projections which were the basis for the 2008-based household projections.

In the latest publication, the population projection period has been extended to 2037 for Northern Ireland and large areas within Northern Ireland. For the current 26 Local Government Districts (LGDs), the projection period is 15 years (2012-2027). Assumptions underlying the 2012-based population projections are based on recent demographic trends, full details are available at:
http://www.nisra.gov.uk/archive/demography/population/projections/lgd/SNPP12_Assumptions.pdf

3. Age-Sex Groups used in Household Projections

The methodology used for household projections consisted of applying age-sex specific household membership probabilities to the population projections. As part of the development of the 2006-based household projections, further analysis had been carried out on the 2001 Census to refine age-sex bands so that they are as homogenous as possible in household membership probabilities. As a result, the 2006-based household projections use 28 age-sex groups; the relevant age-bands were:

- Children: 0-3 and 4-15 years;
- Working age: 16-18, 19-24, 25-29, 30-34, 35-44, 45-49, 50-54, 55-59, and 60-64;
- Older population: 65-74, 75-84 and 85 years and over.

The analysis that led to this has been repeated with the 2011 Census (see Annex A for full details). It was found that these age groups are still homogenous and at most, the

age groups 30-34 and 35-44 could be collapsed into one. The age bands are kept unchanged to allow comparability with previous household projections.

Annex B presents the relevant age-sex specific household membership probabilities from the 2001 and 2011 Censuses at the Northern Ireland level. Equivalent proportions have been derived for each area within Northern Ireland, and used in the household projections model.

4. Communal Establishment Population

The projected household population is derived by subtracting the projected population living in communal establishments (e.g. army barracks, prisons, students' halls of residence, and nursing homes) from the published population projections:

Population Projections	−	Communal Population	=	Household Population

Counts of the population, by age and sex, living in communal establishments are taken from the latest Census data and used to calculate age-sex specific proportions of the population living in communal establishments. In previous household projections, 2001 Census data were used. These proportions were kept constant for each year projected into the future. This assumes an identical rate of population change for both household and communal population for a specific age-sex group. It should be noted that the assumption of a constant proportion of the population by age-sex group living in communal establishments takes no account of possible future changes in relevant policies, such as that relating to care of the elderly.

For the 2012-based household projections, the assumption of constant proportions of people living in communal establishments was re-assessed with the availability of 2011 Census data. It was found that these proportions for the older population have been falling over the last 20 years. A consultation paper was written and reviewed by the household projections steering group and those involved with household projection in Great Britain. There was general consensus of the proposal to (1) use constant 2011 Census proportions for the population aged under 75 years, and (2) to use the average of constant 2011 Census proportion and a 2001-2011 trended[1] proportion based on Census data.

Table 1 shows the proportion of the population living in communal establishments by age and sex for those aged under 75, as obtained from the 2011 Census. The proportions are highest at student ages (19-24 years), mainly due to the population

[1] The trend was based on the two-point exponential model. See Section 5 for further detail.

residing in students' halls of residence. In general, the proportions are higher for males as they are much more common in army barracks and prisons. From age 45 onwards, the proportions are slowly increasing, with the vast majority of communal residents in medical and care establishments.

Table 1: Percentage of population living in communal establishments by age and sex (2011 Census)

Age group	Males	Females
0-3	*0.1*	*0.0*
4-15	*0.1*	*0.1*
16-18	*1.2*	*1.4*
19-24	*3.3*	*2.8*
25-29	*1.1*	*0.3*
30-34	*0.7*	*0.2*
35-44	*0.6*	*0.2*
45-49	*0.7*	*0.3*
50-54	*0.7*	*0.4*
55-59	*0.7*	*0.4*
60-64	*0.8*	*0.5*
65-74	*1.1*	*1.2*

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Table 2 shows the proportion of the population in communal establishments by age and sex for those aged 75 and over, according to the last three Censuses and projected for 2021 and 2037.

Table 2: Percentage of population living in communal establishments, by age and sex (1991-2011 Census and projected for 2021 and 2037)

Sex/Age	Census			Projected	
	1991	2001	2011	2021	2037
Males aged 75-79	*5.1*	*3.9*	*2.7*	*2.2*	*1.8*
Males aged 80-84	*8.9*	*6.8*	*5.2*	*4.5*	*3.8*
Males aged 85-89	*17.0*	*13.4*	*9.8*	*8.5*	*7.1*
Males aged 90+	*27.3*	*23.5*	*18.9*	*17.1*	*14.8*
Females aged 75-79	*6.5*	*5.1*	*3.4*	*2.8*	*2.3*
Females aged 80-84	*14.2*	*11.1*	*7.9*	*6.7*	*5.5*
Females aged 85-89	*26.3*	*21.5*	*16.8*	*14.9*	*12.8*
Females aged 90+	*41.3*	*39.0*	*32.5*	*29.8*	*26.4*

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5. Household membership probabilities projection method - Two-point exponential model

The two-point exponential model, based on the 1991 and 2001 Censuses household propensities, emerged as the most robust projections technique in the 2002-based household projections. This model is also used for the 2012-based household projections, but now using 2001 and 2011 Census data. There are several reasons for using this method.

Firstly, the two-point exponential model constrains the projections by slowing down the trend as probabilities approach 0 or 1 and is therefore more in keeping with reality than a linear regression model which would allow projected negative or non-unitary probabilities. Secondly, the use of 2001 and 2011 Census data ensures that projections are based on the latest household formation trends. Thirdly, the use of household propensities takes account of all household members and avoids the older male bias that is inherent in the traditional 'headship' method.

The formula for the two point exponential model is as follows:

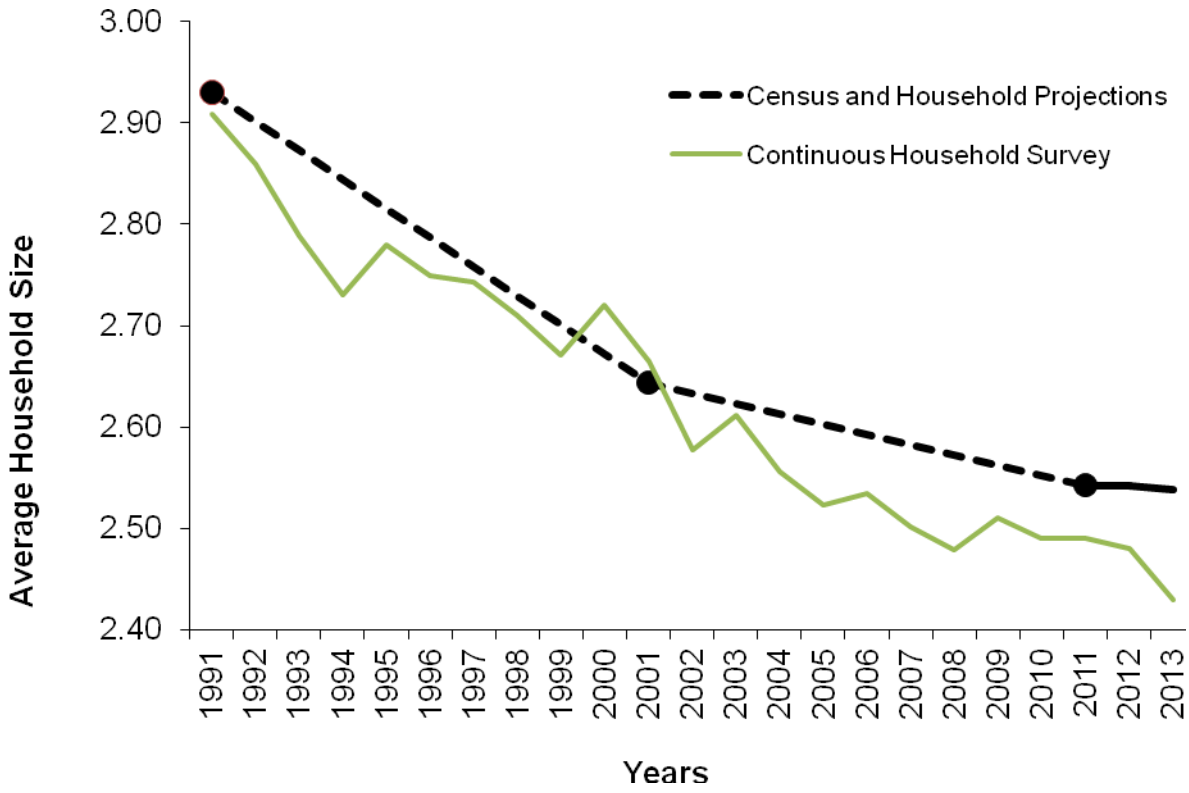
$$p_i = 1 + (p_{2001} - 1) \cdot \left(\frac{p_{2011} - 1}{p_{2001} - 1} \right)^{\frac{i-2001}{10}} \qquad \text{for } p_{2011} >= p_{2001}$$

$$p_i = p_{2001} \cdot \left[\frac{p_{2011}}{p_{2001}} \right]^{\frac{i-2001}{10}} \qquad \text{for } p_{2011} < p_{2001}$$

where i is the projection year (2012, 2013, ….); and
p_i is the household membership probability in year i.

Whilst the two-point exponential model uses two data points (namely the 2001 and 2011 Census data) on which to model household membership probabilities, the results should be no less reliable than those obtained using more data points taken from social survey data (which would contain sampling errors not present with Census data). The Continuous Household Survey, for example, provides a time series of data points, but each data point is subject to sampling variation as shown in Figure 1 below. This variability is yet more pronounced when the Continuous Household Survey is used in sub-groups of the population such as the household types noted in this document. Accordingly, while models could be fitted using Continuous Household Survey time series data, the data would not be able to discriminate easily between competing models. The chosen model, the two-point exponential, has been selected on the basis that it is an excellent mathematical representation of what could reasonably be extrapolated to happen in the future. It is reassuring to note, that the overall trends evident from Continuous Household Survey and 1991 and 2011 Censuses are broadly consistent.

Figure 1: Average household size, 2012-based household projections and observed from Continuous Household Survey, 1991-2013 (non-zero y-axis)



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6. Households with Children

The 2002-based projected household membership probabilities for children tended towards children living in smaller households and more lone adult with children households in the future. This was based on the trend between the 1991 and 2001 Censuses. Recent demographic evidence suggests that these trends have not continued post the 2001 Census. For example, the number of divorces has been stable over recent years; the number of births registered by the mother alone has been constant since the late 1980s, and the distribution of parity of births has changed only for parities of 4 or more.

Therefore, for the 2006-based household projections, the household membership probabilities for persons aged 15 and under are kept at their 2001 Census values. To complete households with children, adults were added to match the number of children according to the age-sex specific proportion within a particular household type (see Annex C for further details). For example, say 100 children are projected to reside in a household type defined as “two adults plus one child”, then these 100 children are matched with (roughly) 100 adult females and 100 adult males with a distribution of ages that corresponds with the age distribution of adults in that household type

according to the 2001 Census[2]. After the allocation of adults to complete households with children, the remaining adults are then distributed over childless household types using their projected household membership probabilities.

For the 2012-based household projections, it was investigated whether this change in the methodology was still required when replacing the 1991-2001 trend with that based on the 2001 and 2011 Census. It was found that, although this issue became less prominent, it was still required to retain the integrity of the projection of households with children.

7. Older two-adult households

The 2006-based household projections also introduced a correction factor for the projected number of females in two-adult households. There is a continued significant improvement in mortality rates, which lead to larger projected populations aged 75 and over. The relative growth in this age group is larger for males, even though the number of females continues to remain higher than males. Applying the 1991-2001-based projected household membership probabilities to this age group leads to the projected number of males in two-adult households being higher than the number of females. This result is unlikely to continue beyond parity between males and females. Therefore the number of females aged 75 and over in two-adult households is projected relative to the number of males in such households. The number of females aged 75 and over in one-person households was used to source the additional females needed to create 2-adult households.

For the 2012-based household projections, it was investigated whether this change in the methodology was still required when replacing the 1991-2001 trend with that based on the 2001 and 2011 Census. It was found that, although this issue became less prominent, it was still required to retain the integrity of the two-adult household projections.

Table 3 presents age-sex-specific probabilities of forming a two-adult household with a female aged (a) 75 to 84 years, and (b) 85 years and over. The probabilities are applied to the number of persons in each age-sex group who form a two-adult household and aggregated to give the number of females of those age groups in two-adult households. For example, for every male aged 85 and over who is projected to live in a two-adult household, there will be 0.274 females aged 85 and over in two-adult households.

[2] These figures are illustrative only. Actual numbers from the 2011 Census show that 41,400 persons aged 15 and under lived in 2-adult-1-child households with 38,100 males aged 16 and over, and 44,700 females aged 16 and over, giving ratios of 92 and 108 adults per 100 children for males and females respectively.

Table 3: Age-sex specific probabilities of sharing a two-adult household with a female aged 75+

Age-sex group	Female, 75-84	Female, 85+
Male, 25-29	0.004	0.001
Male, 30-34	0.006	0.001
Male, 35-44	0.042	0.004
Male, 45-49	0.088	0.019
Male, 50-54	0.057	0.026
Male, 55-59	0.022	0.018
Male, 60-64	0.007	0.012
Male, 65-74	0.040	0.004
Male, 75-84	0.493	0.021
Male, 85+	0.473	0.274
Female, 25-29	0.008	0.000
Female, 30-34	0.006	0.001
Female, 35-44	0.005	0.001
Female, 45-49	0.002	0.001
Female, 50-54	0.004	0.001
Female, 55-59	0.028	0.004
Female, 60-64	0.044	0.010
Female, 65-74	0.025	0.013
Female, 75-84		0.013

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8. Projections for areas within Northern Ireland

The same methodology has been used to create household projections for each Local Government District (LGD) using the associated 2012-based population projections and LGD-specific 2001 and 2011 Census tables on communal establishment population probabilities, household membership probabilities and age-sex structure of adults in households with children. The adjustment for elderly couples is based on Northern Ireland level data, as the number of couple households with females aged 75 and over is too small at LGD level to obtain reliable ratios.

Adjustments were made to remove any discrepancies between the aggregated LGD-level and Northern Ireland household projections for each household type and year (see Annex D). These adjustments made negligible difference to the projected total number of households. This is a net result of small levels of scaling up or down of household projections by size and type.

9. Comparison with household projections across the UK

Household projections are produced separately for each of the countries within the UK. At the time of writing, the latest household projections are:

- England: 2012 based, published in February 2015;
- Scotland: 2012-based, published in July 2014; and
- Wales: 2011-based, published in February 2014.

Table 4 below shows some results of the most recent population and household projections in each country. Northern Ireland has the lowest projected increase in the number of households, despite a population that was projected to grow faster than both Scotland and Wales. One of the explanations for this is that projected population growth in Northern Ireland was largely driven by natural change (i.e. an excess of births over deaths) rather than net inward migration, which was the main driver in other UK countries.

Table 4: Population and household projections by UK country

	England	Northern Ireland	Scotland	Wales
Population projections				
2012	53,494	1,824	5,314	3,074
2022	57,338	1,918	5,520	3,193
2032	60,724	1,985	5,714	3,291
2012-22 change (%)	*7.2*	*5.2*	*3.9*	*3.9*
2012-32 change (%)	*13.5*	*8.8*	*7.5*	*7.0*
Household projections				
2012	22,305	709	2,387	1,313
2022	24,505	753	2,565	1,403
2032	26,605	797	2,717	1,473
2012-22 change (%)	*9.9*	*6.2*	*7.5*	*6.9*
2012-32 change (%)	*19.3*	*12.5*	*13.8*	*12.2*
Average household size				
2012	2.36	2.54	2.18	2.30
2022	2.30	2.52	2.11	2.25
2032	2.24	2.45	2.06	2.20

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10. Sensitivity Analysis – Impact of additional persons

The sensitivity of the methodology was tested by examining the impact on the projected number of households when adding 1,000 people to the population (see Table 5).

Table 5: Additional households generated by additional 1,000 persons, by age and sex, 2012 and 2032

Age band	Additional households when adding 1,000 persons (2012)		Additional households when adding 1,000 persons (2032)	
	Males	Females	Males	Females
Aged 0-3	0	1	-3	-3
Aged 4-15	-35	-34	-40	-39
Aged 16-18	305	304	311	307
Aged 19-24	323	336	308	317
Aged 25-29	424	450	373	411
Aged 30-34	515	547	460	531
Aged 35-44	586	547	594	582
Aged 45-49	518	453	561	475
Aged 50-54	476	456	501	464
Aged 55-59	484	489	497	484
Aged 60-64	513	536	526	524
Aged 65-74	531	597	534	550
Aged 75-84	411	894	348	894
Aged 85+	391	626	358	683

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It shows that, when adding 1,000 children aged 0 to 3 years, there is a negligible impact on the number of households. This suggests that the added children are absorbed within existing households. When adding 1,000 children aged 4 to 15 years, the number of households falls slightly as a result of adults being sourced from childless households (including one-person households) to complete household types with children.

It is important to note additional adults aged 16 and over will be distributed over childless household types, as adults to complete households with children have already been allocated (see Section 6). The differences reflect the average size of childless households that people of these ages reside in. Broadly speaking, the average size of a childless household falls from 3 people for those aged 16 to 24 years, to 2 people for those aged 30 to 74 years. In other words, one household is being created for every additional two adults aged 30 to 74 years. There are relatively small differences in the findings between males and females aged under 75.

For males aged 75 and over, the increasing proportion of the population in communal establishments reduces the number of additional households created for every 1,000 added males. However, roughly twice as many households are created for each added female compared to added males in that age group. This is a direct result of the adjustment made in the model for elderly couples (see Section 7). This means that, in effect, an additional 1,000 females aged 75 and over will be allocated to either communal establishments, single adult households or 3+ adult households.

11. Sensitivity Analysis - comparison of 2012-based and 2008-based household projections

A further comparison has been made between the 2012-based and the previously published 2008-based household projections, which differ as a result of both the updated population projections and the changes made to the methodology. Figure 2 plots the two series of household projections for Northern Ireland.

Figure 2: 2008-based and 2012-based household projections, Northern Ireland, 1991-2037 (non-zero y-axis)

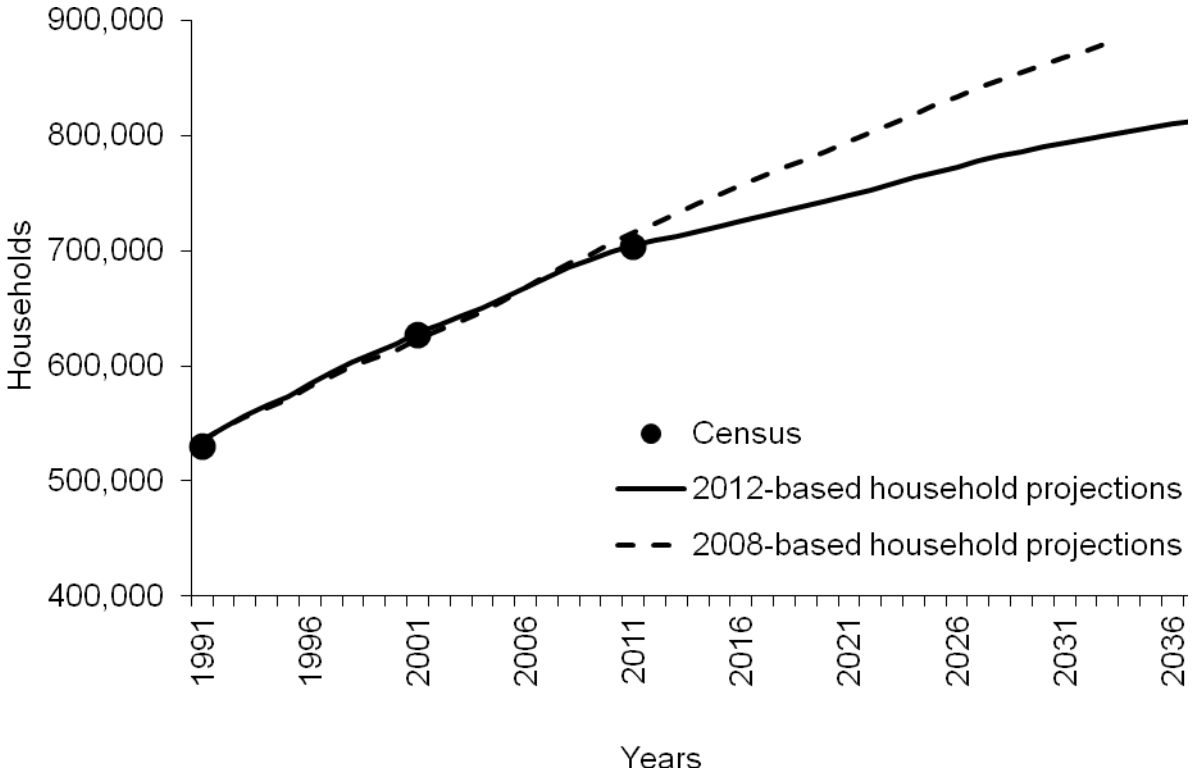

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Table 6 provides a breakdown of the differences for several years. The main driving force behind the 2012-based projections being lower than the 2008-based projections was the change from the 1991-2001 to the 2001-2011 trend for adults in households without children. Initially, the change from 2001 to 2011 household propensities for

children was the second biggest driver, but this was overtaken from 2016 and 2023 onwards by the population size and structure respectively.

Table 6: Breakdown of difference between 2008-based and 2012-based household projections

	2012	2022	2032
2008-based projections	724,000	802,300	874,200
2012-based projections	709,000	753,800	797,400
Difference	**-15,000**	**-48,500**	**-76,800**
Population size	-1,400	-7,500	-11,200
Population structure	1,200	-4,800	-7,300
2011 propensity for children	5,100	5,100	5,400
2011 Household structure (with children)	-1,100	-1,700	-2,100
2001-2011 trend for adults	-20,200	-42,200	-64,400
2011 older couple adjustment	1,000	300	-800
Communal proportion	500	1,400	3,700

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Annex F shows the difference between the 2008-based and 2012-based household projections for the current 26 Local Government Districts[3]. In the year 2012, only for Armagh, Belfast and Strabane Local Government Districts are the 2012-based projections higher than the 2008-based household projections. However, from 2016 onwards the projected number of households in the 2012-based projections is lower than those in the 2008-based projections for each Local Government District. Over time, the difference between the two sets of projections is widening.

The observed difference in household projections is not unique to Northern Ireland. Table 7 shows the difference between the 2008-based and 2012-based population and household projections for each UK country.

[3] The 2008-based household projections are not available for the new 11 Local Government Districts.

Table 7: Comparison of 2008-based and 2012-based population and household projections by UK country

	England	Northern Ireland	Scotland	Wales
Population (2021)				
2008-based	56,433	1,927	5,411	3,187
2012-based	56,962	1,910	5,497	3,181
Percentage difference	*0.9*	*-0.9*	*1.6*	*-0.2*
Households (2021)				
2008-based	24,843	794	2,608	1,482
2012-based	24,290	748	2,548	1,394
Percentage difference	*-2.2*	*-5.8*	*-2.3*	*-5.9*

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The relative difference in household projections for Northern Ireland and Wales was similar, with 2012-based household projections being 6 per cent lower than the 2008-based projections for 2021. England and Scotland have also similar differences, but unlike Wales and Northern Ireland, their 2012-based population projections were higher than the 2008-based population projections.

Northern Ireland Statistics and Research Agency
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Annex A Chi-square test for homogeneity of household membership probabilities, by age and sex

For each pair of single ages, a chi-square statistic is calculated on the differences between the household membership probabilities as derived from the 2011 Census (see figures below). Note that these findings are only valid for the chosen number and definition of household types. Shading has been applied to highlight the pairs that are most homogenous (dark grey).

It is obvious that pairs of close ages are most homogenous. The age bands used in the 2002-based household projections are marked with red borders. Four of these age bands (0-15, 16-24, 45-54 and 75+) were split for the 2006-based household projections and are marked with dotted red lines. It is clear that this split is still valid for the 2011 Census as it was for the 2001 Census.

Figure A.1. Chi-square statistics by age, males, household membership probabilities 2011 Census

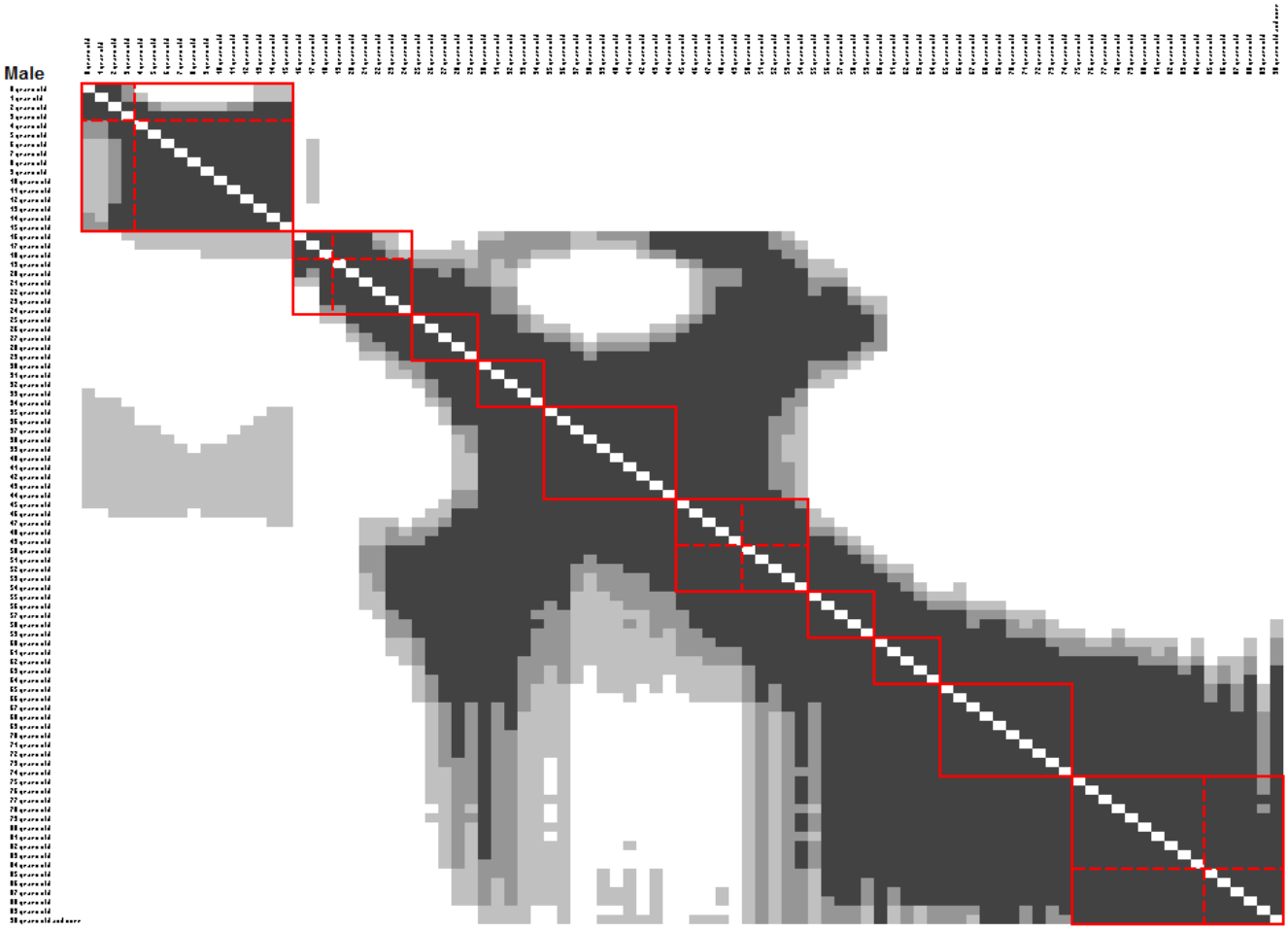
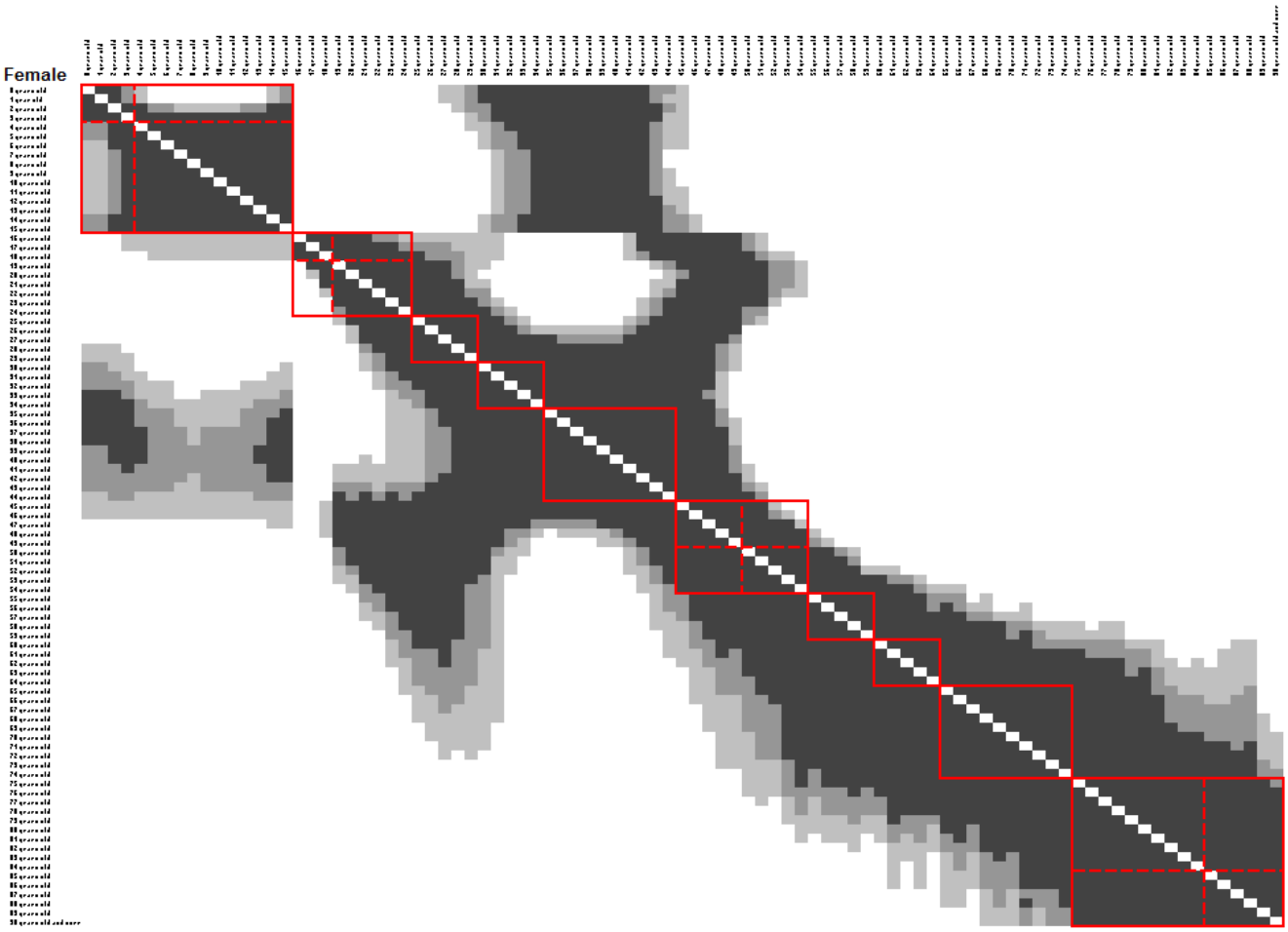


Figure A.2. Chi-square statistics by age, females, household membership probabilities 2011 Census



Annex B 2001 and 2011 Census Household Membership Probabilities

Table B.1. 2001 Household Membership Probabilities

	1 adult (no children)	2 adults (no children)	2 Person with children (1 adult)	3 adults (no children)	3 Person with children (2 adults)	3 Person with children (1 adult)	4 adults (no children)	4 Person with children (2+ adult)	4 Person with children (1 adult)	5 adults (no children)	5 Person with children (2+ adult)	5 Person with children (1 adult)	6 adults (no children)	6 Person with children (2+ adult)	6 Person with children (1 adult)	7+ adults (no children)	7+ Person with children (2+ adult)	7+ Person with children (1 adult)
Males Aged 0-3	-	-	0.070	-	0.191	0.061	-	0.306	0.030	-	0.185	0.013	-	0.092	0.007	-	0.044	0.002
Males Aged 4-15	-	-	0.039	-	0.066	0.063	-	0.281	0.040	-	0.257	0.017	-	0.149	0.007	-	0.077	0.003
Males Aged 16-18	0.005	0.052	0.000	0.137	0.036	0.000	0.138	0.151	0.000	0.061	0.184	0.000	0.023	0.131	0.000	0.006	0.077	0.000
Males Aged 19-24	0.046	0.113	0.001	0.187	0.032	0.000	0.200	0.058	0.000	0.102	0.087	0.000	0.041	0.072	0.000	0.011	0.050	0.000
Males Aged 25-29	0.126	0.252	0.002	0.161	0.100	0.001	0.116	0.079	0.000	0.053	0.040	0.000	0.025	0.023	0.000	0.008	0.014	0.000
Males Aged 30-34	0.142	0.208	0.004	0.092	0.141	0.002	0.049	0.201	0.001	0.019	0.091	0.000	0.007	0.032	0.000	0.003	0.010	0.000
Males Aged 35-44	0.117	0.136	0.005	0.068	0.092	0.003	0.034	0.254	0.001	0.010	0.168	0.000	0.003	0.080	0.000	0.001	0.029	0.000
Males Aged 45-49	0.120	0.158	0.004	0.121	0.063	0.002	0.093	0.163	0.000	0.031	0.132	0.000	0.009	0.071	0.000	0.001	0.032	0.000
Males Aged 50-54	0.125	0.243	0.003	0.195	0.045	0.001	0.120	0.087	0.000	0.042	0.067	0.000	0.014	0.036	0.000	0.003	0.020	0.000
Males Aged 55-59	0.134	0.377	0.001	0.218	0.023	0.000	0.107	0.036	0.000	0.034	0.029	0.000	0.012	0.017	0.000	0.003	0.009	0.000
Males Aged 60-64	0.149	0.494	0.001	0.198	0.010	0.000	0.073	0.016	0.000	0.023	0.013	0.000	0.009	0.008	0.000	0.002	0.005	0.000
Males Aged 65-74	0.185	0.561	0.001	0.157	0.005	0.000	0.046	0.009	0.000	0.013	0.007	0.000	0.005	0.006	0.000	0.001	0.003	0.000
Males Aged 75-84	0.273	0.544	0.001	0.114	0.003	0.000	0.030	0.006	0.000	0.009	0.008	0.000	0.003	0.006	0.000	0.001	0.004	0.000
Males Aged 85+	0.397	0.424	0.001	0.095	0.003	0.000	0.029	0.006	0.000	0.010	0.011	0.000	0.004	0.010	0.000	0.001	0.007	0.000
Females Aged 0-3	-	-	0.068	-	0.196	0.059	-	0.303	0.031	-	0.186	0.013	-	0.089	0.006	-	0.046	0.002
Females Aged 4-15	-	-	0.040	-	0.066	0.063	-	0.283	0.040	-	0.253	0.017	-	0.151	0.008	-	0.077	0.002
Females Aged 16-18	0.007	0.052	0.009	0.129	0.037	0.001	0.137	0.150	0.000	0.056	0.187	0.000	0.022	0.129	0.000	0.005	0.079	0.000
Females Aged 19-24	0.037	0.144	0.066	0.141	0.058	0.021	0.165	0.063	0.004	0.082	0.073	0.000	0.034	0.060	0.000	0.010	0.041	0.000
Females Aged 25-29	0.074	0.246	0.061	0.089	0.131	0.043	0.069	0.120	0.016	0.033	0.054	0.005	0.014	0.025	0.001	0.005	0.013	0.000
Females Aged 30-34	0.071	0.152	0.048	0.042	0.139	0.053	0.022	0.236	0.027	0.008	0.118	0.011	0.004	0.046	0.005	0.001	0.015	0.001
Females Aged 35-44	0.061	0.109	0.031	0.056	0.092	0.030	0.036	0.252	0.014	0.010	0.179	0.004	0.003	0.087	0.001	0.000	0.034	0.000
Females Aged 45-49	0.080	0.182	0.019	0.154	0.068	0.007	0.110	0.137	0.002	0.038	0.105	0.001	0.011	0.056	0.000	0.002	0.029	0.000
Females Aged 50-54	0.107	0.302	0.009	0.219	0.038	0.003	0.122	0.057	0.000	0.042	0.043	0.000	0.014	0.026	0.000	0.003	0.014	0.000
Females Aged 55-59	0.144	0.433	0.003	0.222	0.014	0.000	0.094	0.018	0.000	0.030	0.014	0.000	0.010	0.009	0.000	0.003	0.004	0.000
Females Aged 60-64	0.197	0.515	0.001	0.174	0.007	0.000	0.057	0.010	0.000	0.016	0.008	0.000	0.006	0.005	0.000	0.002	0.003	0.000
Females Aged 65-74	0.336	0.481	0.001	0.116	0.004	0.000	0.029	0.007	0.000	0.008	0.007	0.000	0.003	0.005	0.000	0.001	0.002	0.000
Females Aged 75-84	0.529	0.343	0.001	0.072	0.003	0.000	0.019	0.006	0.000	0.006	0.008	0.000	0.002	0.006	0.000	0.000	0.005	0.000
Females Aged 85+	0.618	0.228	0.001	0.077	0.002	0.001	0.025	0.007	0.000	0.013	0.007	0.000	0.005	0.007	0.000	0.002	0.007	0.000

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Table B.2. 2011 Census Household Membership Probabilities

	1 adult (no children)	2 adults (no children)	2 Person with children (1 adult)	3 adults (no children)	3 Person with children (2 adults)	3 Person with children (1 adult)	4 adults (no children)	4 Person with children (2+ adult)	4 Person with children (1 adult)	5 adults (no children)	5 Person with children (2+ adult)	5 Person with children (1 adult)	6 adults (no children)	6 Person with children (2+ adult)	6 Person with children (1 adult)	7+ adults (no children)	7+ Person with children (2+ adult)	7+ Person with children (1 adult)
Males Aged 0-3	-	-	0.085	-	0.192	0.070	-	0.311	0.035	-	0.176	0.014	-	0.075	0.004	-	0.037	0.002
Males Aged 4-15	-	-	0.057	-	0.079	0.071	-	0.301	0.041	-	0.251	0.017	-	0.124	0.005	-	0.052	0.002
Males Aged 16-18	0.005	0.068	0.000	0.153	0.045	0.000	0.159	0.168	0.000	0.063	0.169	0.000	0.023	0.095	0.000	0.005	0.045	0.000
Males Aged 19-24	0.035	0.122	0.001	0.200	0.030	0.000	0.227	0.058	0.000	0.111	0.079	0.000	0.041	0.053	0.000	0.011	0.030	0.000
Males Aged 25-29	0.096	0.253	0.003	0.179	0.079	0.001	0.148	0.064	0.000	0.071	0.035	0.000	0.029	0.021	0.000	0.008	0.014	0.000
Males Aged 30-34	0.124	0.238	0.005	0.111	0.144	0.002	0.067	0.162	0.000	0.028	0.070	0.000	0.012	0.024	0.000	0.003	0.011	0.000
Males Aged 35-44	0.140	0.158	0.007	0.079	0.103	0.003	0.038	0.240	0.001	0.012	0.143	0.001	0.004	0.053	0.000	0.001	0.019	0.000
Males Aged 45-49	0.148	0.164	0.006	0.115	0.062	0.002	0.091	0.177	0.001	0.029	0.123	0.000	0.008	0.053	0.000	0.002	0.020	0.000
Males Aged 50-54	0.155	0.219	0.005	0.178	0.041	0.001	0.135	0.089	0.000	0.049	0.063	0.000	0.015	0.031	0.000	0.003	0.015	0.000
Males Aged 55-59	0.161	0.332	0.003	0.218	0.022	0.001	0.122	0.036	0.000	0.044	0.026	0.000	0.013	0.015	0.000	0.003	0.007	0.000
Males Aged 60-64	0.168	0.466	0.003	0.198	0.010	0.000	0.083	0.015	0.000	0.025	0.011	0.000	0.007	0.007	0.000	0.002	0.005	0.000
Males Aged 65-74	0.180	0.582	0.002	0.149	0.004	0.000	0.042	0.007	0.000	0.012	0.007	0.000	0.004	0.005	0.000	0.001	0.003	0.000
Males Aged 75-84	0.247	0.583	0.002	0.110	0.002	0.000	0.028	0.004	0.000	0.007	0.004	0.000	0.004	0.004	0.000	0.001	0.003	0.000
Males Aged 85+	0.385	0.465	0.002	0.090	0.002	0.000	0.025	0.004	0.000	0.008	0.005	0.000	0.003	0.005	0.000	0.001	0.004	0.000
Females Aged 0-3	-	-	0.086	-	0.190	0.070	-	0.312	0.038	-	0.174	0.013	-	0.075	0.005	-	0.036	0.002
Females Aged 4-15	-	-	0.059	-	0.081	0.071	-	0.302	0.040	-	0.251	0.016	-	0.121	0.006	-	0.052	0.002
Females Aged 16-18	0.005	0.067	0.006	0.145	0.051	0.001	0.154	0.167	0.000	0.065	0.171	0.000	0.021	0.096	0.000	0.005	0.045	0.000
Females Aged 19-24	0.033	0.137	0.067	0.161	0.049	0.019	0.180	0.062	0.004	0.095	0.071	0.001	0.034	0.048	0.000	0.012	0.027	0.000
Females Aged 25-29	0.065	0.241	0.079	0.102	0.115	0.048	0.085	0.096	0.018	0.041	0.046	0.004	0.018	0.024	0.001	0.004	0.013	0.000
Females Aged 30-34	0.079	0.180	0.058	0.050	0.153	0.051	0.029	0.205	0.026	0.012	0.091	0.009	0.005	0.032	0.003	0.001	0.014	0.001
Females Aged 35-44	0.075	0.123	0.041	0.058	0.108	0.032	0.033	0.256	0.012	0.010	0.160	0.004	0.002	0.062	0.001	0.001	0.021	0.000
Females Aged 45-49	0.090	0.171	0.025	0.141	0.075	0.011	0.113	0.155	0.003	0.037	0.103	0.001	0.010	0.046	0.000	0.002	0.018	0.000
Females Aged 50-54	0.123	0.274	0.013	0.211	0.039	0.003	0.138	0.060	0.000	0.050	0.042	0.000	0.015	0.021	0.000	0.003	0.010	0.000
Females Aged 55-59	0.154	0.399	0.004	0.223	0.012	0.001	0.111	0.017	0.000	0.037	0.013	0.000	0.011	0.009	0.000	0.003	0.005	0.000
Females Aged 60-64	0.189	0.509	0.002	0.181	0.006	0.000	0.060	0.009	0.000	0.017	0.009	0.000	0.006	0.005	0.000	0.001	0.003	0.000
Females Aged 65-74	0.274	0.539	0.002	0.120	0.004	0.000	0.030	0.006	0.000	0.008	0.006	0.000	0.002	0.004	0.000	0.001	0.003	0.000
Females Aged 75-84	0.475	0.397	0.003	0.076	0.002	0.000	0.019	0.004	0.000	0.006	0.006	0.000	0.003	0.005	0.000	0.001	0.003	0.000
Females Aged 85+	0.617	0.253	0.004	0.069	0.002	0.000	0.022	0.003	0.000	0.009	0.005	0.000	0.005	0.004	0.000	0.002	0.004	0.000

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Annex C Age-sex structure of adults in households with children

The table below presents the ratios of adults per person aged under 16 by household type and age-sex of the adult, as derived from the 2011 Census. For example, for every person aged under 16 in a two-person household there are 0.217 females aged 35-44 years. Similarly, for every person aged under 16 in a four-person household with children (2+ adults) there are 0.258 males aged 35-44 years.

Note that the column total do not add up to the expected figures, as the number of adults is unknown in household types with 2+ adults and some persons aged 16-17 are not in full-time education and thus classified as adults.

Table C.1. Age-sex distribution of household members, by household type (2011 Census)

	2 Person with children (1 adult)	3 Person with children (2 adults)	3 Person with children (1 adult)	4 Person with children (2+ adult)	4 Person with children (1 adult)	5 Person with children (2+ adult)	5 Person with children (1 adult)	6 Person with children (2+ adult)	6 Person with children (1 adult)	7+ Person with children (2+ adult)	7+ Person with children (1 adult)
Males 16-18	0.001	0.042	0.000	0.056	0.000	0.075	0.000	0.088	0.000	0.097	0.000
Males 19-24	0.003	0.054	0.001	0.037	0.000	0.067	0.000	0.095	0.000	0.122	0.000
Males 25-29	0.008	0.114	0.002	0.033	0.000	0.024	0.000	0.030	0.000	0.047	0.000
Males 30-34	0.011	0.202	0.004	0.081	0.002	0.046	0.002	0.034	0.001	0.034	0.000
Males 35-44	0.034	0.307	0.015	0.258	0.008	0.203	0.011	0.159	0.004	0.128	0.002
Males 45-49	0.015	0.097	0.005	0.099	0.002	0.091	0.002	0.082	0.000	0.071	0.000
Males 50-54	0.012	0.057	0.002	0.044	0.001	0.041	0.001	0.043	0.000	0.048	0.002
Males 55-59	0.006	0.026	0.001	0.015	0.000	0.014	0.000	0.017	0.000	0.020	0.000
Males 60-64	0.005	0.011	0.000	0.006	0.000	0.006	0.000	0.008	0.000	0.012	0.000
Males 65-74	0.005	0.007	0.000	0.004	0.000	0.005	0.000	0.008	0.000	0.012	0.000
Males 75-84	0.002	0.002	0.000	0.001	0.000	0.002	0.000	0.003	0.000	0.005	0.000
Males 85+	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.000
Females 16-18	0.010	0.045	0.001	0.054	0.000	0.073	0.000	0.086	0.000	0.092	0.000
Females 19-24	0.197	0.086	0.050	0.039	0.020	0.058	0.007	0.083	0.004	0.109	0.000
Females 25-29	0.201	0.175	0.114	0.053	0.075	0.033	0.048	0.037	0.033	0.046	0.023
Females 30-34	0.146	0.227	0.118	0.110	0.105	0.064	0.090	0.048	0.091	0.046	0.086
Females 35-44	0.217	0.338	0.153	0.287	0.104	0.236	0.082	0.193	0.060	0.154	0.045
Females 45-49	0.067	0.121	0.027	0.089	0.011	0.078	0.007	0.073	0.006	0.066	0.003
Females 50-54	0.031	0.056	0.006	0.030	0.001	0.028	0.001	0.029	0.000	0.032	0.000
Females 55-59	0.009	0.015	0.001	0.007	0.000	0.007	0.000	0.010	0.000	0.014	0.000
Females 60-64	0.005	0.007	0.000	0.004	0.000	0.005	0.000	0.006	0.000	0.009	0.000
Females 65-74	0.008	0.008	0.000	0.004	0.000	0.005	0.000	0.008	0.000	0.014	0.000
Females 75-84	0.005	0.003	0.000	0.002	0.000	0.003	0.000	0.006	0.000	0.008	0.000
Females 85+	0.002	0.001	0.000	0.001	0.000	0.001	0.000	0.002	0.000	0.004	0.000

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Annex D Adjustment for discrepancies between aggregate LGD and Northern Ireland projections, by type and year

The coefficients in the table below are multiplied by the LGD-level household projections by household type and year. For example, the projected number of two-person (one child and one adult) households in 2012 from each LGD model is multiplied by 0.999 so that the aggregate number of all LGDs equals the Northern Ireland projection of two-person (one child and one adult) households in 2012.

Table D.1. Adjustments for discrepancies between aggregate LGD-level and Northern Ireland projections, by size/type and projection year

Household Type	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1 person	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.997
2 person (no children)	1.000	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000	1.000	1.001	1.001	1.002
2 person (1 adult + 1 child)	0.999	0.999	0.998	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.998
3 person (no children)	1.000	0.999	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003
3 person (2 adults + 1 child)	1.001	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002
3 person (1 adult + 2 children)	0.999	0.999	0.998	0.998	0.997	0.997	0.996	0.996	0.996	0.995	0.995	0.995	0.996	0.996	0.997	0.998
4 person (no children)	0.999	0.999	0.999	0.999	0.999	0.999	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999
4 person (2+ adults + 1+ children)	1.001	1.001	1.002	1.002	1.002	1.002	1.002	1.003	1.003	1.003	1.003	1.004	1.004	1.004	1.004	1.004
4 person (1 adult + 3 children)	0.999	0.998	0.998	0.997	0.996	0.995	0.994	0.994	0.993	0.993	0.992	0.992	0.993	0.993	0.994	0.994
5 person (no children)	0.999	1.000	1.001	1.001	1.002	1.001	1.001	1.001	1.000	0.999	0.999	0.998	0.997	0.996	0.994	0.994
5 person (2+ adults + 1+ children)	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.000
5 person (1 adult + 4 children)	1.000	1.000	1.000	1.000	0.999	0.999	0.999	0.999	0.999	0.998	0.998	0.999	0.999	1.000	1.000	1.001
6 person (no children)	0.999	1.001	1.001	1.001	1.001	1.001	1.000	0.999	0.998	0.995	0.992	0.989	0.986	0.983	0.978	0.975
6 person (2+ adults + 1+ children)	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.999	0.999	0.999	0.998	0.998	0.998
6 person (1 adult + 5 children)	0.999	0.999	0.998	0.998	0.997	0.996	0.995	0.995	0.994	0.994	0.993	0.993	0.993	0.993	0.993	0.994
7+ person (no children)	0.999	0.996	0.993	0.990	0.989	0.987	0.985	0.984	0.981	0.978	0.975	0.971	0.966	0.961	0.956	0.950
7+ person (2+ adults + 1+ children)	0.999	0.999	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.996
7+ person (1 adult + 6+ children)	0.991	0.991	0.991	0.991	0.990	0.990	0.989	0.989	0.988	0.988	0.987	0.987	0.987	0.987	0.987	0.987
All Households	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

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Table D.2 Adjustment for discrepancies between aggregate LGD-level and Northern Ireland projections, by size, type and projection year

Household	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1 person household	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.997
2 person household	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000	1.001	1.001
3 person household	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002
4 person household	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.002	1.002
5+ person household	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.000	1.000	1.000	1.000	0.999	0.999	0.998	0.998	0.997
One adult without children	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.997
Two adults without children	1.000	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000	1.000	1.001	1.001	1.002
Other households without children	0.999	0.999	0.999	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
One adult with children	0.999	0.999	0.998	0.998	0.997	0.997	0.996	0.996	0.996	0.995	0.995	0.995	0.996	0.996	0.997	0.998
Other households with children	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002
All Households	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

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Annex E Comparison of projected household change (2012-2022) between the 2008-based and 2012-based household projections, by Local Government District

Local Government District	2008-based household projections ('000)		2012-based household projections ('000)		Difference ('000)	
	2012	2022	2012	2022	2012	2022
Antrim	20.9	24.2	20.2	21.8	-0.7	-2.3
Ards	33.2	36.3	31.7	33.2	-1.5	-3.1
Armagh	21.5	24.1	21.8	23.6	0.3	-0.5
Ballymena	25.7	28.3	25.1	26.6	-0.7	-1.7
Ballymoney	12.1	13.9	11.7	12.5	-0.4	-1.4
Banbridge	19.3	22.1	18.5	20.0	-0.8	-2.2
Belfast	119.3	127.6	120.3	123.0	0.9	-4.7
Carrickfergus	17.3	18.9	16.3	16.6	-1.1	-2.3
Castlereagh	29.1	31.5	27.9	29.5	-1.2	-2.0
Coleraine	23.5	24.6	23.5	24.2	0.0	-0.3
Cookstown	13.5	15.8	13.1	14.2	-0.5	-1.6
Craigavon	39.1	46.6	36.5	40.8	-2.6	-5.8
Derry	41.4	45.2	41.2	43.0	-0.2	-2.1
Down	27.2	30.2	26.6	28.7	-0.6	-1.5
Dungannon	21.4	25.5	20.6	23.2	-0.8	-2.2
Fermanagh	24.2	26.6	23.3	24.8	-0.9	-1.8
Larne	13.6	14.5	13.4	13.9	-0.2	-0.6
Limavady	12.4	13.4	12.2	13.1	-0.2	-0.3
Lisburn	46.4	52.5	46.4	51.2	0.0	-1.3
Magherafelt	15.9	18.2	15.2	16.6	-0.7	-1.6
Moyle	6.8	7.5	6.6	6.9	-0.2	-0.5
Newry and Mourne	36.2	42.3	35.5	39.4	-0.7	-2.9
Newtownabbey	35.1	37.9	34.1	35.5	-1.1	-2.4
North Down	34.4	36.3	33.4	34.8	-1.0	-1.6
Omagh	19.5	21.9	18.7	20.0	-0.8	-1.9
Strabane	14.8	16.4	15.0	15.7	0.2	-0.7
Northern Ireland	**724.0**	**802.3**	**708.6**	**752.9**	**-15.4**	**-49.4**

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