Household Analysis Review Group (HARG)

HARG (2020) 2

Household projections (2018-based) for Scotland
Proposed changes to methodology

Introduction

1.   This paper summarises the modifications we intend to make to the NRS methodology for producing household projections for Scotland. These modifications were trailed in paper HARG (2019) 03. This paper provides further background on the reasoning behind them, including an indication of their impact on the projections compared with the previous methodology. Subject to any comments HARG members may have, we plan to implement these changes in the projections due to be published on **29 September**.

2.   The proposed modifications relate only to the calculation of '**headship rates[1]**', and on how these rates are trended forwards over time. In all other respects the basic overall approach of the projections methodology remains unchanged, as summarised in the diagram at Annex A.

Calculating base household representative rates (HRRs)

3.   The previous (2016-based) household projections methodology used data from the 1991, 2001 and 2011 Censuses on 'head of household' as the basis for calculating household representative (or headship) rates by age group and household type. The headship rate for a particular category is defined as the proportion of the household population who head up a household. 'Head of household' is defined as the first person on the census form for a household who is aged 16 or over and usually resident at the address of enumeration, irrespective of any other characteristics of that person, or the other people in that household. In the last resort the oldest resident aged under 16 is taken as the head.

4.   Head of household is therefore a bit of a subjective metric as there will not necessarily be a consistency of approach across households as to who is the first (adult) person entered on the census form. It can also lead to inconsistencies between censuses. For example, a higher proportion of women were recorded as the first person in 1991 than in 1981, resulting in a spurious increase in the projected headship rates for married women, compensated for by a decrease in households headed by married men.

5.   For the 2018-based projections we will therefore switch to using the household reference person (HRP) data from the census as the variable for calculating headship rates. This uses a well-defined set of rules regarding economic status and age to choose the relevant person as the household 'head' and is not affected by the behaviour of whoever happens to complete the census form for a household. A full definition of HRP is available on the Scotland's Census website. HRP will be a variable available for analysis from the next (2022) census, hence data for it can be incorporated

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[1] The headship rate describes, for each age group, the proportion of the population that is designated the household head in each household type.

into any future updating of the household projections methodology. The Office for National Statistics (ONS) use HRP data from the census when calculating headship rates in the household projections for England, so doing likewise for the NRS household projections would improve consistency between the two methodologies. (Note that ONS smooth the headship rates by age group to remove generational 'baby boomer' effects. We have not established the same need for this smoothing in the data used in the projections methodology for Scotland, and indeed smoothing may result in some loss of accuracy.)

6.   The chart below compares, from the 2011 Census data, headship rates by age derived from HRP and from head of household (HoH) data. The two rates are generally very close up to age 50, and the overall pattern is broadly similar across all age groups. The HRP-derived headship rates are slightly higher than the HoH-derived rates for the 50 to 59 age group and slightly lower for the 65-69 age group. This may reflect instances of couple households where the older person in the couple is entered first on the census form (and so is designated the 'head of household) but is retired in recent years while their (younger) partner is still economically active (and so would be the HRP for the household). For households in the 75 and over age group, the slightly higher headship rates on the HRP basis are thought to reflect instances of older couple households where the younger person in the couple may be more likely to complete the census form for the household and enter their details first (and hence be designated as the HoH) while the older person would be defined as the HRP.

Headship rates by age group for all households - Scotland 2011
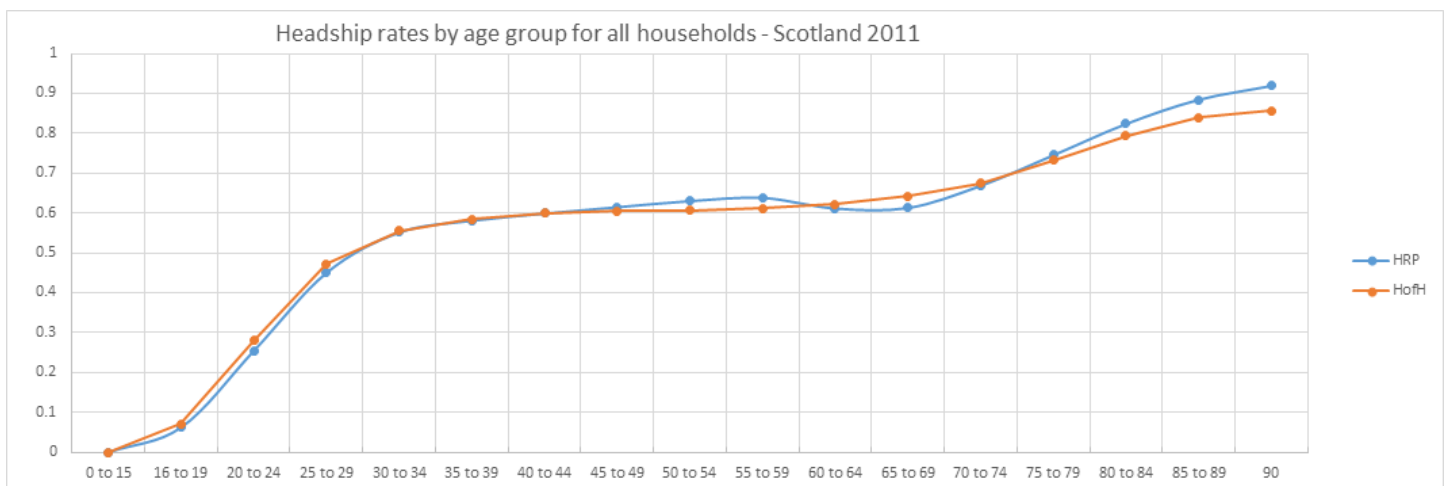
7.   In terms of projected numbers of households, the table below gives an illustrative comparison of the percentage change between 2018 and 2028 in number of households using projected headship rates based on HRP and on HoH. (Note that the projected changes to 2028 are illustrative only and are **not** based on any final set of projections.) The projected percentage changes in number of households are generally very similar for age groups. Overall, around of 2,000 more households are projected using headship rates based on HRP data rather than on HoH data.

Projected percentage change (illustrative) in number of households by age of household head, Scotland, 2018-2028

Age of HRP/HoH	HRP	HoH
16-19	12.5	12.6
20-24	-6.5	-6.2
25-29	-15.5	-15.1
30-34	1.3	1.4
35-39	13.5	13.9
40-44	16.6	17.1
45-49	-5.9	-5.9
50-54	-21.4	-21.5
55-59	-4.1	-4.4
60-64	16.1	16.0
65-69	17.5	18.8
70-74	2.8	7.1
75-79	28.2	23.1
80-84	32.3	30.3
85-89	19.0	18.3
90+	27.9	27.9
Total	**4.9**	**4.8**

8.   The table below shows that the (illustrative) projection of households in 2028 by household type is very similar regardless of whether HRP-based or HoH-based headship rates are used.

Projected (illustrative) households, percentage by household type, Scotland, 2028

Household type	HRP	HoH
1 adult 2+ children	2.6	2.6
1 adult, 1 child	3.5	3.5
1 person female	19.2	19.3
1 person male	18.0	18.0
2 person all adult	32.0	31.8
2+ adult 1+ children	17.0	17.1
3+ person all adults	7.8	7.7
Scotland	**100.0**	**100.0**

Projecting household representative (headship) rates

9.   The 2016-based household projections methodology used a weighted combination of two sets of projected headship rates which were produced using a modified two-point exponential model: one used headship rates from the 1991 and 2001 Censuses, and the other used headship rates from the 2001 and 2011 Censuses. The weights were chosen so that the projection for 2016 had a distribution of households across the seven household types that is as close as possible to the distribution found in the adjusted 2016 Scottish Household Survey data. The 1991-2001 component carried a 21% weight.

10.   The results of the 2011 Census showed that there was less change in the types of household that people in Scotland live in between 2001 and 2011 than there was between 1991 and 2001. Labour Force Survey data also show that, at Scotland level, the downward trend in average household size slowed markedly at the turn of the century, as illustrated in the chart below. While average household sizes in most council areas have continued to drift downwards since 2001, it has actually increased in Edinburgh and Glasgow over the last ten years.

Aveage household size, Scotland, 1996 - 2018
LFS data
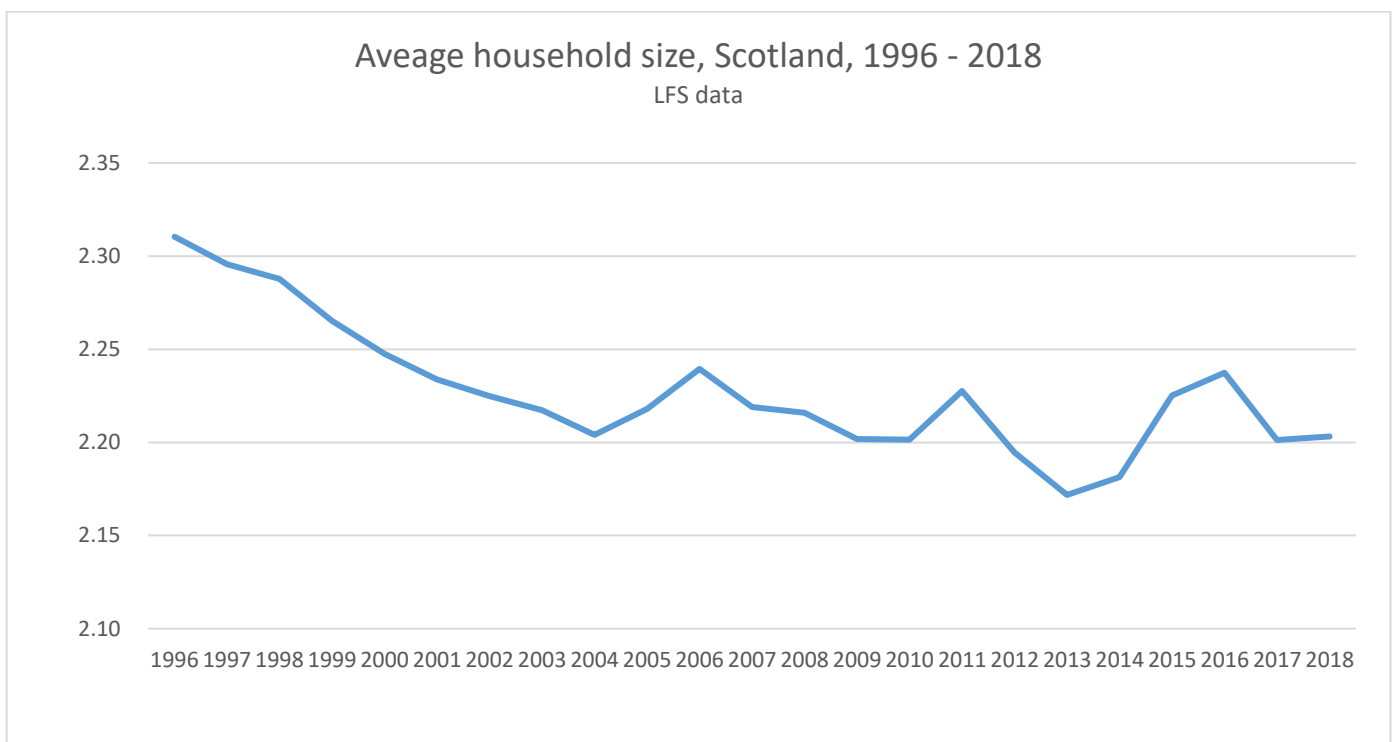
11.   Given these trends, and the relatively low weight attaching to the 1991-2001 headship rate trend component, we have concluded that the latter should be not be used in the 2018-based projections as they will not be so relevant for making projections over the period 2018 to 2043. An additional consideration is that HRP data are not available from the 1991 Census. Instead the 2018-based projections will use a two-point exponential model based on just the 2001 and 2011 Censuses for projecting forward trends in headship rates. This makes the projection more reactive to recent trends, while the model is a little clearer and easier to understand and is also consistent with the model used by ONS in their 2018-based household projections for England.

12.   An illustrative 10-year projection indicates that the increase in the number of households using a two-point exponential model based on the 2001 and 2011 Censuses is around 11,000 (0.4%) lower compared with the increase resulting from using a modified two-point exponential model based on 1991, 2001 and 2011 Censuses.

Number of years household representative (headship) rates are projected for

13.   The methodology used for the 2016-based household projections trended forward headship rates for the whole of the projection period, 2016 to 2041. Given that for the 2018-based projections we will be using a shorter trend (2001 to 2011) to project forward headship rates, limiting the length of this projected trend to a maximum of 10 years (that is, from 2011 to 2021), and then holding these constant for the remainder of the projection period, mitigates the risks of projecting forward a potentially more uncertain trend for the entire projection period. This implicitly recognises an uncertainty in how headship trends will continue and potentially avoids over-projecting these trends. It is not yet clear, for example on how the economic and other consequences of the Covid-19 pandemic will affect things. We also plan to develop an interactive application that will allow users to vary for to allow comparison with the principal projection.

Projected(1) percentage change (illustrative) in number of households by age of household head, Scotland, 2018-2028

Age of HRP	Headship rate projected to 2021 (2)	Headship rate projected to 2043
16-19	12.5	21.4
20-24	-6.5	-4.6
25-29	-15.5	-16.6
30-34	1.3	1.5
35-39	13.5	14.5
40-44	16.6	18.5
45-49	-5.9	-3.8
50-54	-21.4	-19.1
55-59	-4.1	-1.7
60-64	16.1	17.1
65-69	17.5	13.0
70-74	2.8	-9.5
75-79	28.2	35.0
80-84	32.3	34.7
85-89	19.0	19.9
90+	27.9	29.9
Scotland	**4.9**	**5.4**

(1) Projection using a two-point exponential trend for headship rates from 2001 and 2011 Census data.
(2) Projected headship rates for years after 2021 same as values in 2021.

14.   The table above shows relatively small differences for age groups in the illustrative projected percentage change between 2018 and 2028 in the number of households. Overall, of the order of 12,000 fewer households are projected for 2028 where headship rates are projected forward as far as 2021 compared to being projected forward to the end of the projection period in 2043. Under either scenario a 5% (rounded) increase is projected.

Changes to the methodology in the future

15.   To make the household projections more responsive to recent trends, we would like to include the Scottish Household Survey (SHS) breakdown of household types in the projections. This would involve varying the line projected from the census by some factor to account for the SHS data points for more recent years. The exact method for incorporating SHS data into the household projections has not yet been determined

16.   We currently produce household projections on a two-yearly cycle, following on from the population projections which are produced separately by NRS. So there will be further opportunities to revise and update the methodology for each set of projections. Between projection rounds we will also be happy to engage collaboratively with others to develop the methodology further, for example to produce additional variant projections using different sets of input assumptions and/ or potentially drawing on other data sources such as the Labour Force Survey or Scottish Household Survey. Results from the next Census (now delayed to 2022) will also provide an opportunity to revisit the methodology, for example to consider whether it would be worthwhile reverting to the approach of the modified two-point exponential model used in the 2016-based projections (that is, using a weighted combination of the 2001-2011 and 2011-2022 headship rate trends).

Summary

17.   The three areas of modifications to the NRS methodology for household projections described above will be introduced into the 2018-based set of projections which are due to be published at the end of September. We would welcome confirmation from HARG members that they are content with this, or to hear of any concerns or questions they may have. **It would be helpful to have any comments by Friday 4 September.**

National Records of Scotland
August 2020

Annex: Overview of 2018-based household projections methodology

Read in subnational population projections for the base year (y) by area, age, sex, variant, year of projection

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Estimate the population living in private households (by subtracting residents living in communal establishment) by area, age group, sex, year of projection

← Estimate the CE rates by type of establishment, area, age and sex.

Calculate CE rates by area, age group and sex

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Project the HRs forward using a two-point exponential model by area, age group, household type and year of projection.
Hold HRs constant at 2021 values through to 2043

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Multiply population living in private households by headship rates to produce household projections at area level by age groups, household type and year of projections

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Derive Headship Rates (HRs) by household type and age group of the Household Reference Person (HRP) from 2001 and 2011 Census data

↓

Control to Scotland Total

↓

Constrain to household estimates

For (y+2) year onwards the constraining rate is constant and equal to the one for (y+1) year

→ Apply (if needed) minimum adult/children adjustment

↓

Sum up to get Scotland total

↓

Household projections for Scotland/areas by age group, household type and year of projections