

Article

# Comparing the differences between the 2014-based and 2016-based household projections for local authorities in England

Analysis and guidance, using existing data, of differences between the 2014-based and 2016-based releases at the local authority level.

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# 1 . Main points

- The recent 2016-based household projections for England incorporate updated input data and include methodological improvements; these changes have created differences when compared with the 2014-based projections.
- In the 2016-based household projections, roughly five out of six local authorities had their projected number of households by 2039 revised downwards.
- The projected number of households by 2039 in 88.0% of local authorities was revised by 10% or less in the 2016-based household projection.
- London is the region that experienced the largest reduction in projected households by 2039 in the 2016-based household projection compared with the 2014-based.

# 2 . Things you need to know about this release

This article provides supplementary analysis and guidance about the differences between the 2014-based and 2016-based household projections at the local authority level, following on from the publication of the [2016-based household projections](#) on 20 September 2018 and the [2016-based projections by household type](#) on 3 December 2018.

These additional analyses also address the Office for Statistics Regulation's recommendation in their [Compliance Check of Household Projections for England](#) that the Office for National Statistics (ONS) should investigate local authority-level projection outliers, and provide supplementary analysis and guidance about the main drivers for these results.

## What are household projections?

The 2016-based household projections provide statistics on the potential future number of households in England and its local authorities up to 2041. They show the household numbers that would result if the assumptions based on previous demographic trends in population and household formation were to be realised in practice.

Household projections are not forecasts. They do not attempt to predict the impact of future government or local policies, changing economic circumstances or other factors that may influence household growth, such as the number of houses built. Instead, they show how many additional households would form if the population of England keeps growing as it did between 2011 and 2016 and keeps forming households as it did between 2001 and 2011. Therefore, household projections should be used as a starting point for calculating the future housing needs of a local area.

## Scope of this analysis

The differences between the 2014-based and 2016-based household projections can be attributed to a combination of the updated input data ([subnational population projections, revised mid-year population estimates and prisoner counts](#)) and methodological changes implemented in the 2016-based methodology, which affect the household representative rates (HRRs)<sup>1</sup> – see Table 1.

Differences between the 2014-based and 2016-based subnational population projections (SNPPs) are generally expected and the reasons include changes in the:

- subnational trends (births, deaths and migration)
- assumptions for fertility, mortality and migration at national level
- source data (the revised population estimates and underlying components of change from years ending mid-2012 to mid-2016)
- methods used to produce the 2016-based SNPPs in the following areas: international emigration; dependants of US foreign armed forces; UK armed forces (and dependants) returning from Germany; cross-border migration; people granted humanitarian protection; and asylum seekers

Further details about the [2016-based subnational population projection methodology](#) are available.

Table 1: Changes to 2016-based household projections methodology compared with the 2014-based household projections

<b>Element of method</b>	<b>2014-based household projections</b>	<b>2016-based household projections</b>	<b>Rationale for methodological changes</b>
Calculating base household representative rates (HRRs) <sup>1</sup>	Used data from the 1971, 1981, 1991, 2001 and 2011 Censuses, supplemented by Labour Force Survey (LFS) data.	Uses data from the 2001 and 2011 Censuses only. HRRs broken down by age and sex are smoothed across age groups.	Census years prior to 2001 define household reference person (HRP) <sup>2</sup> used in the calculation of HRRs based on the oldest male, whereas the 2001 and the 2011 definition is based primarily on economic activity, which makes these historical data less comparable. Using only 2001 and 2011 Census data requires fewer complex adjustments to the methodology to account for the different definitions.
Projecting HRRs	HRRs were projected forward using a combination of two fitted trends, combined using assumptions based on Labour Force Survey (LFS) data.	HRRs are projected forward using a two-point exponential model.	A combination of two trends were needed in the 2014-based projection to smooth out irregularities with historical census points (prior to 2001). As the 2016-based projection used the 2001 and 2011 censuses, a two-point exponential trend was considered appropriate. The exponential model was already used in stage two <sup>3</sup> of the 2014-based methodology and in the production of household projections for Wales, Scotland and Northern Ireland.
Number of years HRRs are projected for	Projected for the entirety of the projection period.	Projected 2001-2021, then held constant for the remainder of the projection.	Given we are using a shorter trend for projecting HRRs because of the changing HRP definition, limiting the use of this projected trend to a maximum of 10 years forward mitigates the risks of projecting forward a potentially more uncertain trend for the entire projection period. Therefore, the 2016-based household projections method assumes that these trends continue for a maximum of another 10 years (that is, from 2011 to 2021).
Marital status projections	Included in model and breakdowns of numbers of households.	Excluded from model and breakdowns of numbers of households.	Marital status projections were excluded from the 2016-based household projections because the most recent marital status projections are 2008-based. These are unlikely to reflect more recent trends in marital and relationship status. There are currently no plans to recommence production of official marital status projections.

Age groups used in projection	<p>Stage one used quinary age bands from ages 15 to 19 years through to 85 years and over.</p> <p>Stage two used the following age bands: 15-24, 25-34, 35-44, 45-54, 55-59, 60-64, 65-74, 75-84, 85+.</p>	<p>Uses 16 to 19 years age band instead of 15 to 19 years, after which quinary age bands are used for 20 to 24 years through to 90 years and over.</p>	<p>The age groups were changed in response to consultation feedback that the age groups used in 2014-based method were not appropriate for young adults, students and the elderly population. Those consulted felt there is greater variation in how households were formed for these age groups. The change to the older age groups also provides consistency with the age breakdowns used in the mid-year estimates and SNPPs, which include breakdowns for 85 to 89-year-olds and those aged 90 years and over.</p>
Survey data	<p>LFS data used to determine the weights to combine the HRRs using two fitted trends.</p>	<p>The Annual Population Survey (APS) is used in the checks to ensure that the minimum number of adults and children implied by the projected household type breakdown for each geography and year does not exceed the number of adults and children in the projected household population.</p>	<p>The APS was used instead of the LFS in the 2016-based household projections to provide data used in the minimum adults and children checks because it has a larger sample size and therefore is considered more reliable when broken down to smaller population subgroups.</p> <p>The LFS was not needed to combine the two trends of HRRs in the 2016-based method as they were projected using a two-point exponential model.</p>
Prison population adjustments	<p>In previous sets of household projections for England, one-off adjustments have been made to the prison population (which are excluded from the household population), using MYEs components of change, to better reflect the growth of the prison population (for example, for young males in the years 2002 to 2008 for the 2008-based household projections).</p>	<p>Data about the prison population from the Ministry of Justice has been used to update the number of prisoners in the population for the years 2012 to 2016.</p>	<p>As a high proportion of change in the prison population is because of legislative change concerning custody, sentence lengths and prison openings and closures, rather than demographic patterns, it was considered impractical to build this into the model for projecting the prison population. Instead efforts have been made to update the prisoner numbers until the base year of the projection, to better reflect changes in the prison population.</p>

Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

Notes

1. The household representative rate (HRR) is the proportion of people in a particular demographic group who were the household reference person (HRP). [Back to table](#)
2. The HRP is a person chosen for statistical reasons by virtue of economic activity, age and/or sex as the representative of a household. The 2016-based household projections use the 2011 Census definition of HRP; that is, the eldest economically active person in the household, then the eldest inactive person if there was no economically active person. [Back to table](#)
3. Stage 2 of the household projections methodology provides breakdowns of the projected number of households by household type. [Back to table](#)

## Interpreting this analysis

Sensitivity analyses have been carried out to help distinguish between the effects of the methodological changes and updated SNPPs. In each sensitivity analysis we have altered one input variable; either the input data or the HRRs to observe the impact on the resulting projections.

In the first sensitivity analysis, the 2014-based SNPPs have been input into the 2016-based projection method instead of the 2016-based SNPPs, to isolate the effects of changes to the underlying population on the projected number of households. While the second sensitivity analysis was carried out by applying the Stage 2 2014-based HRRs to the 2016-based household population, to determine the impact of the methodological changes implemented, which affect household formation on the projected number of households.

It should also be noted that while the sensitivity analyses are useful in helping to understand the differences between the projections, they cannot provide a complete account. This is because of interactions between the changes to the input data and methodology, and the adjustments necessary to run the sensitivity analyses.

The following analysis will focus primarily on the differences between the 2014-based and 2016-based household projections at projection year 2039. This is the last comparable time period between the two sets of projections and therefore the point we would expect the projections to diverge the most.

### Notes for: Things you need to know about this release

1. The household representative rate (HRR) is the proportion of people in a particular demographic group who were the household reference person (HRP).

## 3 . Regional-level differences

In the 2016-based household projections for England as a whole, there were 5.1% (1.4 million) fewer households than the 2014-based household projections, by 2039. The 2016-based household projections projected fewer households than the 2014-based across all regions in England by 2039. However, some regions contained local authorities projected to have a greater number of households in the 2016-based household projections than the 2014-based.

London showed the largest deficit in the 2016-based household projections compared with the 2014-based; it is projected to have 12.6% (611,200) fewer households by 2039. For the remaining regions the 2016-based projection is a maximum of 4.8% below the 2014-based household projections by 2039, as shown in Table 2.

Table 2: Projected households for 2014-based and 2016-based household projections for English regions, mid-2039

Region	Projected households mid-2039			
	2014-based	2016-based	Difference	Percentage difference
London	4,841,900	4,230,700	-611,200	-12.6%
South East	4,597,800	4,379,200	-218,500	-4.8%
East of England	3,163,200	3,025,300	-137,900	-4.4%
North East	1,286,200	1,238,500	-47,700	-3.7%
Yorkshire and The Humber	2,621,200	2,526,900	-94,300	-3.6%
North West	3,510,100	3,400,500	-109,600	-3.1%
West Midlands	2,800,900	2,714,300	-86,600	-3.1%
South West	2,838,500	2,768,700	-69,900	-2.5%
East Midlands	2,343,800	2,288,200	-55,600	-2.4%
England	28,003,600	26,572,300	-1,431,300	-5.1%

Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

#### Notes

1. Because of rounding figures may not sum. [Back to table](#)

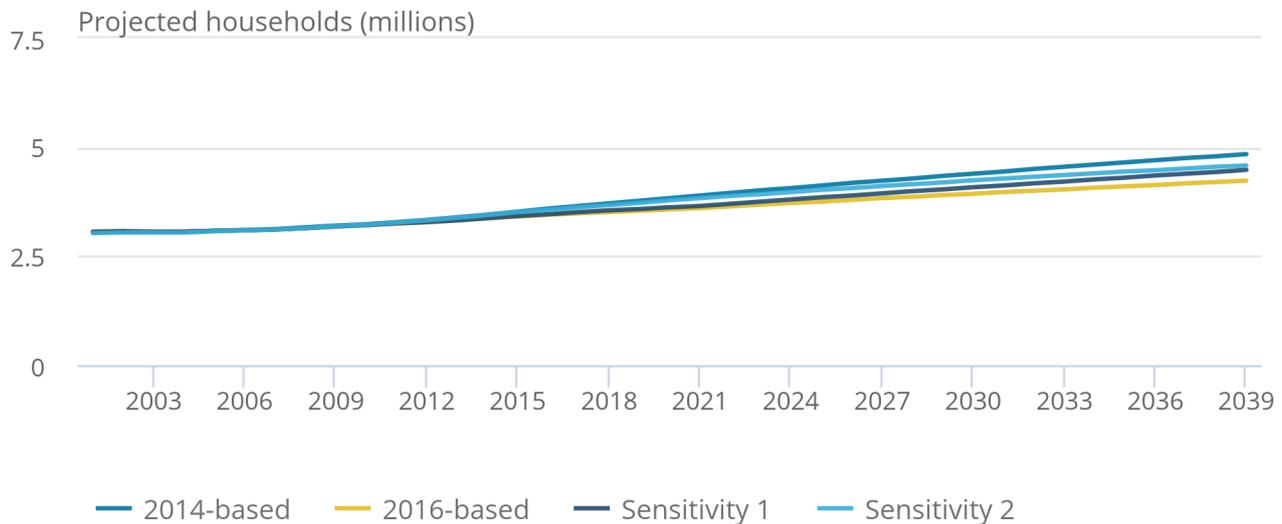
Sensitivity analyses have shown that the lower number of projected households for London in the 2016-based release was because of a combination of the lower 2016-based subnational population projections (SNPPs) and methodological changes affecting the household representative rates (HRRs). However, the methodological changes that affected the HRRs had a slightly greater impact. This is demonstrated by Figure 1, which shows sensitivity analysis 2 (using the 2014-based HRRs) produces a projection greater than sensitivity analysis 1 (2014-based SNPPs) and is most similar to the 2014-based household projections.

**Figure 1: Sensitivity analysis 2 (using 2014-based household representative rates) produces a projection closest to the 2014-based household projection for London**

Projected households 2014-based and 2016-based household projections, sensitivity analyses, London, mid-2001 to mid-2039

Figure 1: Sensitivity analysis 2 (using 2014-based household representative rates) produces a projection closest to the 2014-based household projection for London

Projected households 2014-based and 2016-based household projections, sensitivity analyses, London, mid-2001 to mid-2039



Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

Notes:

1. 2014-based: 2014-based household projections
2. 2016-based: 2016-based household projections
3. Sensitivity 1: 2014-based SNPPs input into 2016-based method
4. Sensitivity 2: 2014-based HRRs input into the 2016-based method

## 4 . Local authorities by census area classification

A useful approach to understanding the impact of the updated model on local authorities is to group similar areas together. One of the most relevant groupings for these data is the [2011 Census area classification](#). This is a hierarchical classification consisting of three tiers of supergroups, groups and subgroups. The labels for the groupings are intended to reflect each area's characteristics in terms of demographic structure, household composition, housing, socio-economic characteristics and employment patterns. [Pen portraits](#), which provide an informal view of the characteristics of each area, are available.

The following analysis makes use of the top tier of the 2011 Census area classification hierarchy, supergroups. The largest percentage differences between the 2014-based and 2016-based household projections were seen for the supergroups Ethnically diverse metropolitan living and London cosmopolitan areas.

Ethnically diverse metropolitan living is made up of mainly local authorities within London, but also includes Birmingham, Leicester, Luton and Slough. This supergroup was projected to have 13.3% fewer households than the 2014-based projection. While London cosmopolitan, which consists of inner London boroughs, was projected to have 11.6% fewer households than the 2014-based projection.

Town and country living and Countryside living, areas characterised by a lower population density than the UK as a whole, showed the smallest differences between the 2014-based and 2016-based projections. The 2016-based projection was between 1.1 and 1.4% lower than the 2014-based projection for these areas (Figure 2).

Sensitivity analyses showed for Ethnically diverse metropolitan living and London cosmopolitan areas that sensitivity analysis 2 (2014-based HRRs) produces a projection greater than the 2016-based projection and is closest to the 2014-based. This demonstrates changes affecting household formation in the 2016-based household projections had a larger impact than the lower 2016-based subnational population projections (SNPPs) in lowering the 2016-based household projections for these areas.

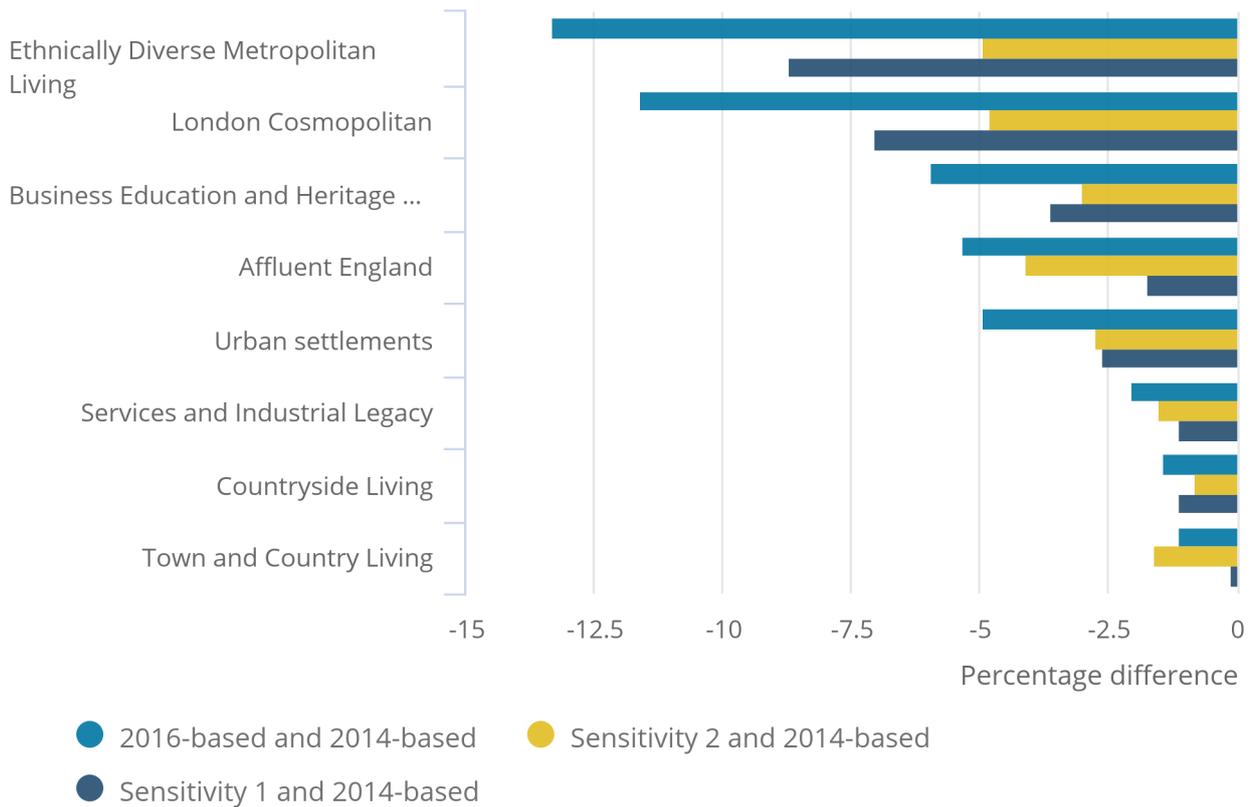
The lower 2016-based SNPPs made a greater contribution to the lower 2016-based projections for Affluent England, than changes to household formation. Figure 2 shows sensitivity analysis 1 (2014-based SNPPs) produces a higher projection than the 2016-based and is most similar to the 2014-based (1.7% lower). While sensitivity analysis 2 (2014-based HRRs) although greater than the 2016-based, is 4.1% lower than the 2014-based household projections.

**Figure 2: For Ethnically diverse metropolitan living areas, changes affecting household formation played a larger role in lowering the 2016-based household projections than the subnational population projections**

Percentage difference between 2014-based, 2016-based household projections and sensitivity analyses, by 2011 Census area classification supergroups, mid-2039

Figure 2: For Ethnically diverse metropolitan living areas, changes affecting household formation played a larger role in lowering the 2016-based household projections than the subnational population projections

Percentage difference between 2014-based, 2016-based household projections and sensitivity analyses, by 2011 Census area classification supergroups, mid-2039



Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

Notes:

1. Sensitivity 1: 2014-based SNPPs input into 2016-based method
2. Sensitivity 2: 2014-based HRRs input into the 2016-based method

## 5 . Differences by local authority

When comparing the 2014-based and 2016-based household projections the main findings at the local authority level include:

- 268 of 326 (82.2%) local authorities had their projected number of households revised downwards and 58 (17.8%) upwards, at 2039
- there were 287 (88.0%) local authorities revised by 10% or less
- the largest revision upwards was 7.0% and revision downwards was 22.2%; excluding the City of London and Isles of Scilly, which often appear among the largest-changing areas because of their small population size

The majority of the top 10 local authorities with the largest percentage decreases between the 2016-based and 2014-based household projections, at 2039, were in London, except Oxford and Cambridge.

Table 3: Local authorities with largest percentage decreases in projected households between 2014-based and 2016-based household projections, England, mid-2039

Local authority	Region	Projected households mid-2039			Percentage difference
		2014-based	2016-based	Difference	
City of London	London	6,600	3,600	-3,000	-45.6%
Cambridge	East of England	59,600	46,300	-13,200	-22.2%
Hounslow	London	145,800	116,700	-29,100	-19.9%
Oxford	South East	71,700	57,800	-14,000	-19.5%
Harrow	London	121,300	98,400	-23,000	-18.9%
Brent	London	163,400	132,900	-30,500	-18.6%
Ealing	London	169,500	138,300	-31,200	-18.4%
Newham	London	172,200	142,800	-29,400	-17.1%
Merton	London	108,800	91,100	-17,700	-16.3%
Haringey	London	157,900	133,800	-24,000	-15.2%

Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

#### Notes

1. Because of rounding figures may not sum. [Back to table](#)

Figure 3 is an interactive tool that shows the impact of revisions to the household projections. By choosing a local authority you will see the total and percentage change in the number of projected households, alongside the number of projected households in the 2014-based and 2016-based household projections, in 2039.

### Figure 3: Most local authorities with the largest percent downwards revisions were in London

Change in projected households for local authorities in England between 2014-based and 2016-based household projections, mid-2039

[Download the data.](#)

## Case study: Oxford and Cambridge

The differences between the 2014-based and 2016-based projections for Oxford and Cambridge are driven mainly by the updated subnational population projections (SNPPs). Figures 4 and 5 show sensitivity analysis 1 (2014-based SNPPs' input into the 2016-based method) produces a projection closest to the 2014-based household projection for both Oxford and Cambridge.

For Oxford the 2016-based SNPPs projected 24,700 fewer people than the 2014-based SNPPs by 2039, which is translated into 10,400 fewer households in the 2016-based household projections by 2039. While for Cambridge the 2016-based SNPPs projected 20,800 fewer people than the 2014-based SNPP by 2039, which results in 10,600 fewer households in the 2016-based household projections by 2039.

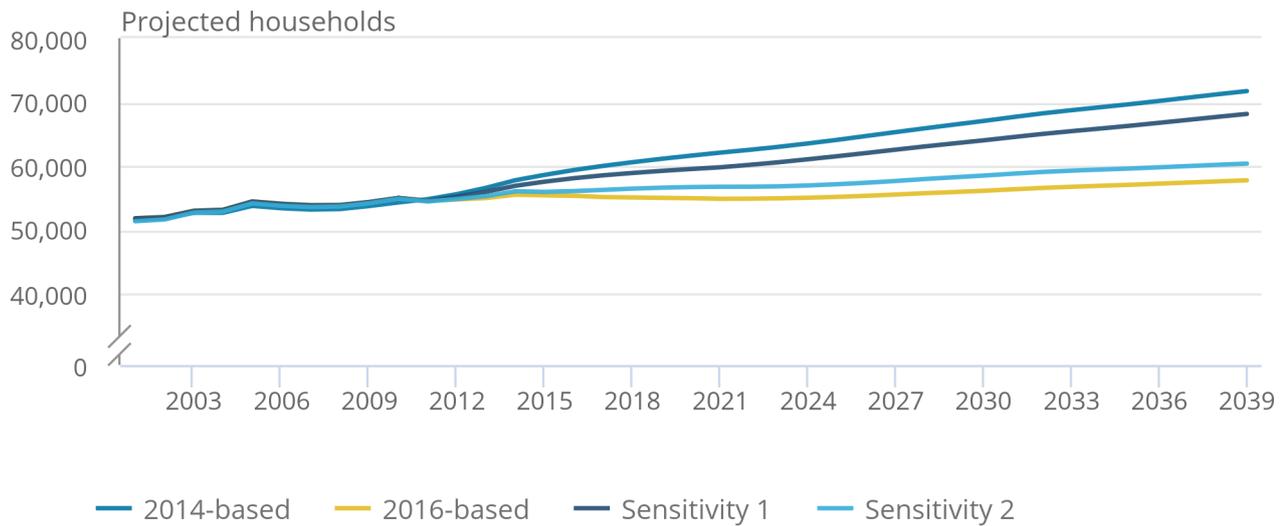
Revisions to the mid-year population estimates, mid-2012 to mid-2016, are known to have particularly affected Oxford and Cambridge. The population estimates for these local authorities were revised downwards by 6,000 and 7,200 people respectively, mostly because of the use of an improved emigration model making use of a wider range of administrative and survey data. Amongst other things the new model includes new data that more explicitly accounts for the numbers of international students.

**Figure 4: Oxford's lower 2016-based projection was mainly because of the lower subnational population projections**

Projected households in the 2014-based and 2016-based household projections, sensitivity analyses, Oxford, mid-2001 to mid-2039

Figure 4: Oxford's lower 2016-based projection was mainly because of the lower subnational population projections

Projected households in the 2014-based and 2016-based household projections, sensitivity analyses, Oxford, mid-2001 to mid-2039



Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

Notes:

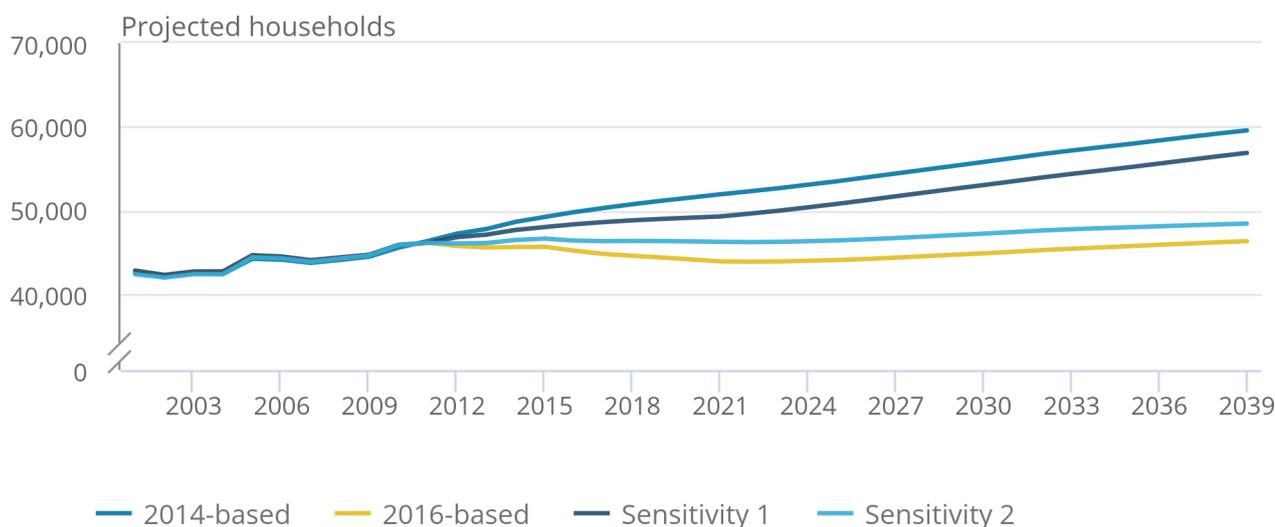
1. 2014-based: 2014-based household projections
2. 2016-based: 2016-based household projections
3. Sensitivity 1: 2014-based SNPPs input into 2016-based method
4. Sensitivity 2: 2014-based HRRs input into the 2016-based method

**Figure 5: Cambridge’s lower 2016-based household projection was mainly because of the lower subnational population projections**

Projected households in 2014-based and 2016-based household projections, sensitivity analyses, Cambridge, mid-2001 to mid-2039

Figure 5: Cambridge’s lower 2016-based household projection was mainly because of the lower subnational population projections

Projected households in 2014-based and 2016-based household projections, sensitivity analyses, Cambridge, mid-2001 to mid-2039



Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

**Notes:**

1. 2014-based: 2014-based household projections
2. 2016-based: 2016-based household projections
3. Sensitivity 1: 2014-based SNPPs input into 2016-based method
4. Sensitivity 2: 2014-based HRRs input into the 2016-based method

**Case study: Newham**

The 2016-based household projections projected 29,400 (17.1%) fewer households than the 2014-based, by 2039. Of the 10 local authorities with the largest percentage decreases between the 2016-based and 2014-based household projections, in 2039, Newham was most affected by the methodological changes to the 2016-based method, which affect household formation.

Figure 6 shows sensitivity analysis 1 (2014-based SNPPs) remains very similar to the 2016-based household projection, suggesting the lower 2016-based SNPPs did not have a large impact for this local authority. The 2016-based SNPPs projected 22,700 fewer people than the 2014-based, by 2039, which translates into 1,200 (0.8%) fewer households in the 2016-based projection.

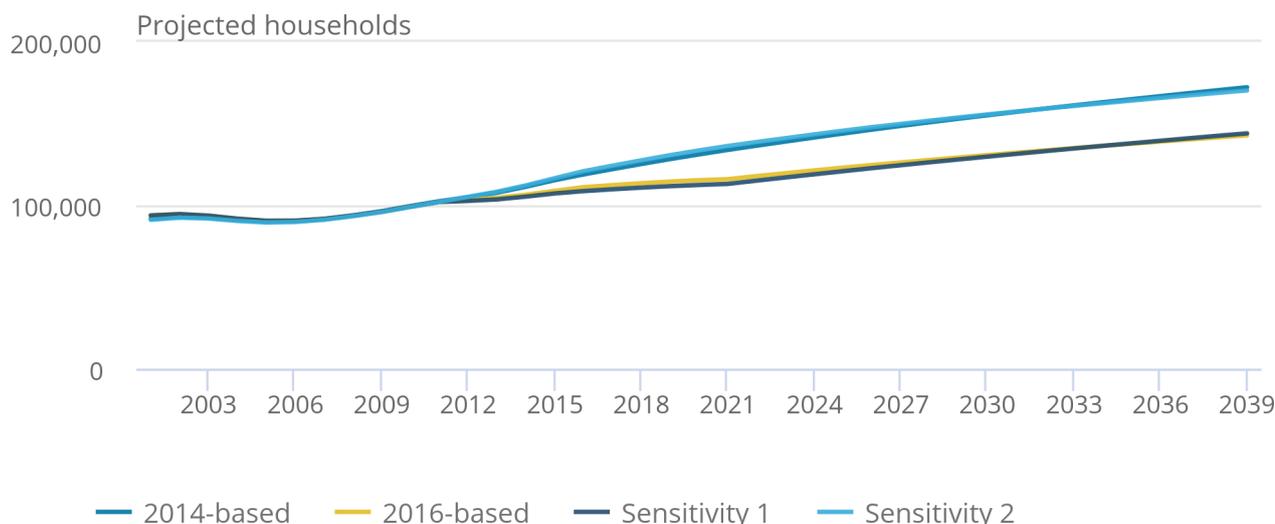
In comparison, sensitivity analysis 2 (2014-based HRRs) produces a projection that is almost identical to the 2014-based household projection. This shows applying the 2014-based HRRs has a much larger effect.

**Figure 6: Newham’s lower 2016-based household projection was mainly because of changes affecting household formation**

Projected households in 2014-based and 2016-based household projections, sensitivity analyses, Newham, mid-2001 to mid-2039

Figure 6: Newham’s lower 2016-based household projection was mainly because of changes affecting household formation

Projected households in 2014-based and 2016-based household projections, sensitivity analyses, Newham, mid-2001 to mid-2039



Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

Notes:

1. 2014-based: 2014-based household projections
2. 2016-based: 2016-based household projections
3. Sensitivity 1: 2014-based SNPPs input into 2016-based method
4. Sensitivity 2: 2014-based HRRs input into the 2016-based method

Table 4 shows the top 10 local authorities with the largest percentage increases between the 2014-based and 2016-based household projections, in 2039. The higher 2016-based SNPPs made a larger contribution to the higher number of projected households in the 2016-based household projections compared with the 2014-based for all local authorities, except Blaby, and Hinckley and Bosworth. For these two local authorities changes affecting household representative rates (HRRs) had a larger impact.

Table 4: Local authorities with largest percentage increases in projected households between 2014-based and 2016-based household projections, mid-2039

<b>Projected households mid-2039</b>					
<b>Local authority</b>	<b>Region</b>	<b>2014-based</b>	<b>2016-based</b>	<b>Difference</b>	<b>Percentage difference</b>
Isles of Scilly	South West	900	1,000	100	11.4%
North West Leicestershire	East Midlands	47,300	50,600	3,300	7.0%
Rutland	East Midlands	17,800	18,900	1,000	5.7%
Wychavon	West Midlands	59,400	62,500	3,100	5.2%
Blaby	East Midlands	46,200	48,300	2,200	4.7%
Hinckley and Bosworth	East Midlands	55,300	57,800	2,500	4.5%
Ryedale	Yorkshire and The Humber	26,300	27,200	900	3.4%
Tendring	East of England	78,900	81,400	2,600	3.3%
Colchester	East of England	94,900	97,700	2,900	3.0%
West Lindsey	East Midlands	46,500	47,900	1,400	3.0%

Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

#### Notes

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In nearly half of local authorities there was less than 2% difference between the results of sensitivity analysis 1 and 2o, indicating the updated SNPPs and changes to household formation made a similar contribution to the differences observed between the 2014-based and 2016-based household projections for these local authorities. For remaining local authorities, a larger percentage difference suggests that either the SNPPs or the methodological changes affecting the HRRs made a larger contribution to the observed differences between the 2014-based and 2016-based household projections than the other.

Table 5 shows the distribution of local authorities in which either the SNPPs or the HRRs made a larger contribution to the observed differences between the 2014-based and 2016-based household projections. The percentage point difference indicates how much the SNPPs or HRRs affected the 2016-based household projections. A lower percentage indicates a more similar contribution of both the SNPPs and HRRs, while a higher percentage indicates greater confidence in a larger contribution of either the SNPPs or HRRs.

It should also be noted the percentage difference between the 2014-based household projection and the sensitivity analysis does not provide a definitive indication of the relative contribution of the changes to HRRs and updated SNPPs to the observed difference between the 2014-based and 2016-based household projections. The updated input data and methodological changes interact and there may also be factors the sensitivity analyses were unable to account for.

Table 5: Distribution of local authorities by contribution of subnational population projections and household formation and percentage point difference between each sensitivity analysis and the 2014-based household projection

Percent point difference between 2014-based household projection and each sensitivity analysis	Number of local authorities	
	SNPPs made a larger contribution	HRRs made a larger contribution
0 to 4	178	110
5 to 9	24	11
10 to 14	2	0
15 to 19	0	1
20 to 24	0	0
25 to 29	1	0

Source: Office for National Statistics and Ministry of Housing, Communities and Local Government

## 6 . Conclusion

For each local authority the differences between the 2014-based and 2016-based household projections are because of a combination of the methodological improvements to the 2016-based household projections and the updated input data. While the sensitivity analyses cannot provide a complete account for the differences seen, they provide a useful means of understanding the complex interplay between the factors involved.

A summary of the results of the sensitivity analysis for each local authority in England is shown in Tables 429a and 429b in the [2016-based principal projection household projections for England dataset \(XLS, 803KB\)](#). The full results of the sensitivity analysis for each local authority in England are provided in the [2016-based principal projection detailed data for modelling and analysis dataset \(ZIP\)](#). The sensitivity analysis, principal and variant household projections can also be analysed in the household projections data explorer tool.