

Article

Household projections for England, comparisons with other sources: 2001 to 2018

Assessing the accuracy of household projections through comparisons with household estimates and other data sources.

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1. Main points

- Household estimates and household projections are produced differently for different purposes; figures from different sources and methods should not be expected to match exactly.
- Trends prior to 2011 are more similar because sources use census data to reweight past figures.
- Comparisons suggest that the number of households in England is not growing as quickly as it was previously; average household size is remaining the same or slightly increasing.
- Trends in the 2016-based household projections are more similar to those from household estimates than
 past sets of household projections.

2. Things you need to know about this analysis

What are household projections?

Household projections show the number of households there would be in England in the future if a set of assumptions about the size and structure of the population and that population's patterns of household formation were realised in practice. The assumptions used in household projections for England published by Office for National Statistics (ONS) and before it, the Ministry of Housing, Communities and Local Government (MHCLG), are based on past demographic trends in the population and rates of household formation. However, future demographic behaviour is inherently uncertain, meaning that any set of projections will almost inevitably be proved wrong to some extent, when treated as a forecast or prediction of future numbers of households ¹. Household projections are not forecasts, because they do not attempt to predict the impact of future public policy, changing economic circumstances or other factors that may influence household growth, such as the number of houses built.

At the same time, household projections form an important part of the evidence base for the assessment of future requirements (potential need and demand) for housing and associated services. They are used in making local authority plans, for example, in calculating objectively assessed housing need figures. Local authorities also use household projections to plan future service provision such as household waste and recycling, school places, adult and child social services and health and social care. More widely, household projections are used in macroeconomic forecasting, policy modelling and planning.

We recognise that for those using household projections in these contexts, an assessment of how well household projections have performed as forecasts or predictions of the future number of households may be useful, in giving an indication of the uncertainty associated with projecting demographic variables. For ourselves as projection makers, such comparisons are useful in identifying areas where improvements could be made. The need for such a comparison was also identified by the Office for Statistics Regulation in a Systematic review of public value of statistics on housing and planning in the UK, published in November 2017.

Scope of this analysis

This analysis compares household projections with household estimates and other housing data, explaining why these data sources may show different patterns and assessing what these differences can tell us about the accuracy of household projections. Housing and planning are devolved policy areas, with different policies applying to England, Wales, Scotland and Northern Ireland. Household projections for England, Wales, Scotland and Northern Ireland are also produced separately, using different methodologies. Therefore, this article focuses mainly on data for England; any UK-level data used are clearly identified.

Notes about Things you need to know about this analysis

1. This inherent uncertainty also applies to population projections that feed in to the household projections, as discussed in the <u>National Population Projections Accuracy Report</u>, published July 2015, and in <u>Fifty years of United Kingdom national population projections: how accurate have they been?</u>, published in 2007.

3. Comparing household projections and household estimates

What is a household?

From 2011 onwards, in both household estimates and household projections, a household is defined as one of the following:

- · one person living alone
- a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area

This includes:

- sheltered accommodation units in an establishment where 50% or more have their own kitchens (irrespective of whether there are other communal facilities)
- all people living in caravans on any type of site that is their usual residence; this will include anyone who
 has no other usual residence elsewhere in the UK

A household must contain at least one person whose place of usual residence ¹ is at the address. A group of short-term residents living together is not classified as a household, and neither is a group of people at an address where only visitors are staying.

A different definition of "household" was used prior to 2011 in the household estimates and household projections, based on the 2001 Census definition of a household. Analysis undertaken to assess the effects of this definitional change on household estimates found that it had very little impact.³

Although they share the same definition of a household, it should be noted that household estimates and projections are produced differently.

Household projections

Household projections show the number of households there would be in the future if a set of assumptions about the population and household formation were realised in practice. These are modelled data based on population estimates, population projections and census data and make an assumption to remove those living in communal establishments.

Household projections are designed to give a longer-term view of future household growth given the assumptions made and are not optimised to measure short-term changes between two points in time. To provide a consistent time series and show how past trends are projected forward, household projections are also produced for past years. It is these figures that can be compared with household estimates.

It should be noted that household projections for past years are modelled in the same way as data for future years; any changes to the household projections methodology or revisions to population estimates will cause changes to household projections for past years.

Household estimates

Household estimates show the number of households in England, using social survey data collected from the Labour Force Survey (LFS). These estimates are based on a sample of approximately 40,000 households and are subject to sampling error. The LFS sample includes those living in households, students in halls (via the home address) and NHS staff living in NHS accommodation.

Trends for numbers of households in England are similar between 2001 and 2011, but diverge slightly after 2011

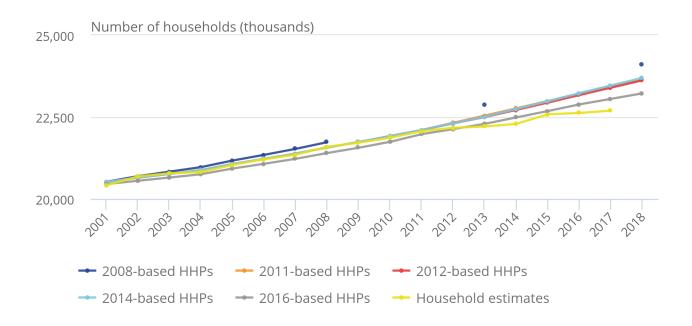
Figure 1 shows the number of households in England for 2001 to 2018 as shown by the latest set of household estimates (available for 2001 to 2017) and the last five sets of household projections (2008-based household projections are not available for all years of the time series).

Figure 1 shows that between 2001 and 2011, the trend in household estimates and household projections was broadly similar, with differences of between negative 0.2% and positive 0.5% between the 2014-based household projections and household estimates over this decade. The 2008-based household projections are consistently higher than the household estimates, with the 2016-based household projections an average of 0.5% lower than the household estimates between 2001 and 2011.

However, from 2011 onwards, the trends diverge slightly, with household estimates increasing more slowly between 2011 and 2017 than in the previous decade. In contrast, household projections (of all base years) continue to show increases, albeit with 2016-based household projections showing a slower rate of increase, more like the household estimates, than the previous sets.

Figure 1: Household estimates and household projections, England, 2001 to 2018

Figure 1: Household estimates and household projections, England, 2001 to 2018



Notes:

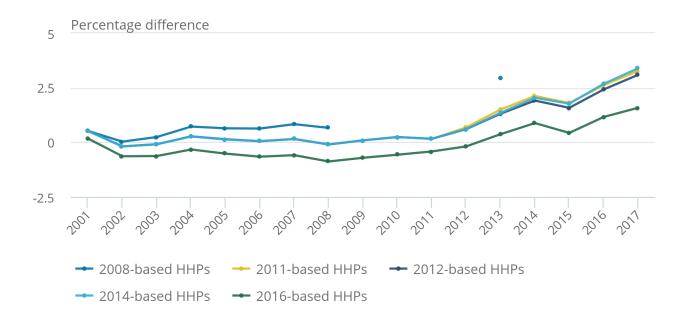
- 1. HHPs equals household projections.
- 2. 2008-based household projections are not available for all years between 2001 and 2018.
- 3. The latest household estimates available are for the year 2017.

Figure 2 shows the percentage differences between recent sets of household projections and household estimates. The results provide further evidence of the divergence in trend after 2011, with larger differences between the household estimates and household projections occurring for more recent years.

In contrast to previous sets, the 2016-based household projections are lower than the household estimates for 2002 to 2012, with smaller differences than previous sets in the later years of the time series, with a difference of 1.58% in 2017 compared with 3.39% for the 2014-based household projections. It should be noted, however, that the overall differences between the series remain relatively small.

Figure 2: Percentage differences between household estimates and different sets of household projections, England, 2001 to 2017

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Notes:

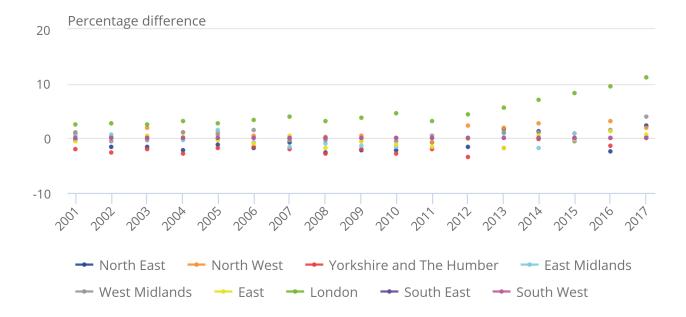
- 1. HHPs equals household projections.
- 2. 2008-based household projections are not available for all years between 2001 and 2017.

Regional data also show different trends – particularly for London

There are differences for all regions of England when comparing household projections with household estimates. Figure 3 shows that when comparing the 2014-based projections, the North East shows the least consistent variation across the years, with differences ranging from positive 2.4% to negative 2.6%. The 2014-based household projections for Yorkshire and The Humber are around 2% lower than the household estimates for 2001 to 2012 (equating to around 50,000 households each year), becoming more similar in the latter years. Household projections for London are consistently higher than the household estimates, with differences steadily increasing from 2011 onwards to a difference of 11.2% by 2017 (around 367,000 households).

Figure 3: Percentage differences between household estimates and 2014-based household projections, regions of England, 2001 to 2017

Figure 3: Percentage differences between household estimates and 2014-based household projections, regions of England, 2001 to 2017

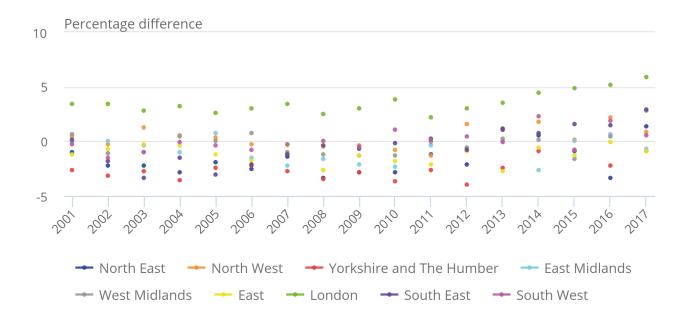


Source: Office for National Statistics

Figure 4 shows that the 2016-based household projections and household estimates are more similar; for example, 2016-based household projections for London are 5.9% higher than the household estimates in 2017, compared with the 11.2% difference observed in the 2014-based projections. However, there are more years and regions where the 2016-based household projections are lower than the household estimates than for the 2014-based projections. Of the 153 year-region combinations, 97 have a 2016-based projection lower than the estimate, compared with 68 when comparing the 2014-based projections.

Figure 4: Percentage differences between household estimates and 2016-based household projections, regions of England, 2001 to 2017

Figure 4: Percentage differences between household estimates and 2016-based household projections, regions of England, 2001 to 2017



Average annual changes also indicate a divergence after 2011

Changes in household estimates and household projections vary from year to year, but by looking at average annual change over time, we can observe whether trends are similar between datasets. Table 1 shows that average annual change figures between 2014-based and 2016-based household projections and household estimates are more similar for 2001 to 2011 than they are for 2011 to 2017, providing further evidence of the divergence in trends.

Table 1: Average annual change between sources of household data, England, selected years between 2001 and 2017

Source	Average annual change (%)		
	2001 to 2017	2001 to 2011	2011 to 2017
Household estimates	0.66	0.78	0.47
2014-based household projections	0.84	0.75	1.00
2016-based household projections	0.75	0.72	0.80

Source: 2014-based household projections for England – MHCLG, 2016-based household projections for England – ONS and household estimates – ONS.

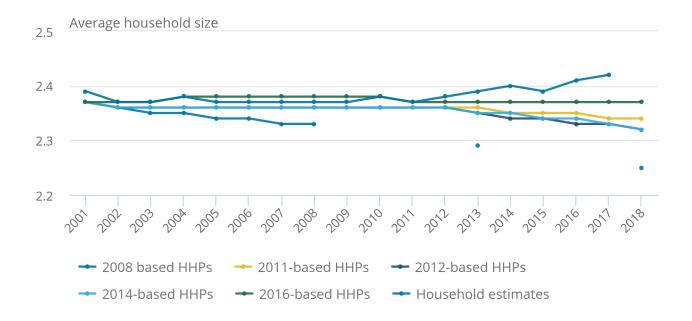
Average household sizes also vary between sources

Average household size can be calculated using household estimates and projections by dividing the number of people in the population living in households by the number of households for a given year. It is a useful measure because it shows to what extent changes in the population are being absorbed in to existing households, with more people living together in the same number of households, or resulting in the creation of more households.

There was a period of decreasing average household size from 1996 to 2002, after which it stabilised. Figure 5 shows that the 2008-based household projections projected average household size to continue to fall, to 2.25 people per household by 2018. Having included the results of the 2011 Census in modelling, subsequent sets of household projections projected average household size to remain level between 2001 and 2011, before continuing to fall after 2011, with the 2016-based projections showing a more gradual decrease than other sets. In contrast, the household estimates show an increase in average household size in recent years, from 2.37 persons per household in 2011 to 2.42 in 2017. This again suggests a divergence between the data sources after 2011.

Figure 5: Average household size from household projections and household estimates, England, 2001 to 2018

Figure 5: Average household size from household projections and household estimates, England, 2001 to 2018



Notes:

- 1. HHPs equals household projections.
- 2. Average household size figures for England from the household estimates are only available for 2001 to 2017.
- 3. 2008-based household projections are not available for all years between 2001 and 2018.
- 4. 2011-based household projections are available for 2001 and 2011 to 2018.

Notes about Comparing household projections and household estimates

- 1. A usual resident is someone who resides, or intends to reside, in the UK for at least 12 months.
- 2. In the 2001 Census, a <u>household was defined</u> as "one person living alone, or a group of people (not necessarily related) living at the same address with common housekeeping that is, sharing either a living room or sitting room or at least one meal a day."
- 3. From 1996 to 2010, in the household estimates, a household was defined as a person living alone, or a group of people living at the same address who have the address as their only or main residence and either share one main meal a day or share living accommodation (or both). As outlined in the <u>families and households quality and methodology information</u>, to measure the impact of the introduction of the new household definition in 2011 on the household estimates, a set of questions was asked by interviewers at each address they visited. Overall, only two addresses out of 2,188 productive cases (less than 0.1% of interviewed households) would change classification under the new household definition.

4. Why do the trends diverge?

There are three main reasons for the differences observed between household estimates and household projections:

- household projections are designed to show the number of households there would be in England if a set
 of assumptions about population change and household formation take place; however, actual changes in
 population and household formation, as observed in the household estimates, may differ, resulting in
 different trends in numbers of households between the household estimates and projections
- household estimates are based on social survey data from the Labour Force Survey (LFS), which is subject to sampling variation; there is also evidence that the LFS may under-represent one-person households
- household projections and household estimates are both affected when the results of a new census are incorporated in to the underlying data used in their methodologies; this is likely to explain why estimates and projections are more aligned for years up to 2011 and differences are larger after 2011

The following sections discuss each of these reasons in more detail.

5. Household projections assumptions may not play out in practice

Household projections show the number of households there would be in England in the future if a set of assumptions based on past demographic trends in the population and rates of household formation were realised in practice. They are designed to give a longer-term view of future household growth given the assumptions made, and are not optimised to measure short-term changes between two points in time. There are several assumptions made in the production of household projections. Some of the main assumptions include:

- how the size and structure of the population of different parts of England will change in the future
- how many people will live in communal establishments (such as halls of residence or nursing homes) rather than in private households
- how many people will want to form new households and have the opportunity to do so, for example, due to relationship formation or breakdown, moving out of the parental home, or moving in to or out of house shares with friends

There are many reasons why past trends in these and other assumptions made in the household projections may not be realised in practice. Some of the main factors include changes in:

- the number of births or deaths in a particular area
- how long people might be expected to live and for how long people are able to live in their homes, perhaps due to ill health or the availability of care in the community
- international and internal migration
- the availability, affordability and desirability of communal establishment accommodation, compared with living in a private household (which can vary by area and life stage)
- relationship and family formation and breakdown, for example, having children later in life, separation, divorce and remarriage
- the availability and affordability of suitable housing (for example, housing of the right size and type in the right location that is affordable to those wanting to live in it)

The state of the economy, government policies (national and local), public health and social and cultural trends can all influence these factors. The reason household projections are a projection and not a forecast is because the household projections do not attempt to predict how future demographic, economic, social or political changes might impact the household projections. The assumptions are based on the past and do not attempt to adjust for the future. The diverging trends observed between the household estimates and household projections therefore imply that some parts of the trends carried forward in the household projections (which differ between sets of household projections) have not continued beyond 2011 in the same way, resulting in a difference between the household projections and the household estimates.

6. Household estimates are subject to sampling variation

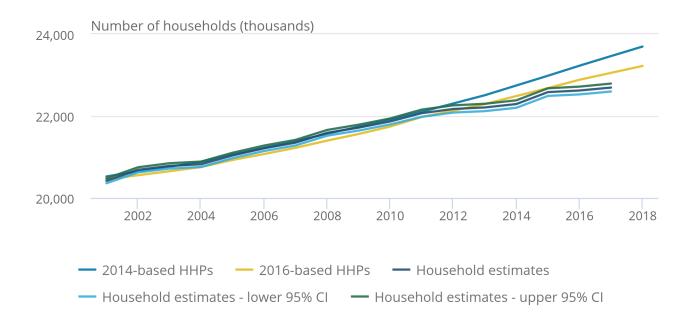
Household estimates are derived from the Labour Force Survey (LFS), based on a sample of approximately 40,000 households, produced from interviews in the April to June quarter. This quarter is thought to be representative of the rest of the year ¹. Being based on the LFS, all household estimates produced are subject to sampling variability. This is because the sample selected is only one of many possible samples that could have been drawn from the population.

Confidence intervals are commonly used as indicators of the extent to which the estimate based on a sample may differ from the true population value; the larger the confidence interval, the less precise the estimate is. Figure 6 shows that in 2017, the 95% confidence interval around the estimated number of households in England of 22,695,000 was plus or minus 97,000. This means that we are 95% confident that the true value of the 2017 estimate is within the range of 22,598,000 to 22,792,000.

Although household projections for England still project a larger number of households in 2017 than the upper bound of the 95% confidence interval of the household estimates, it is still important to recognise the margin of sampling error associated with the household estimates when considering the scale of the differences compared with household projections.

Figure 6: Number of households from household projections and household estimates with upper and lower confidence interval bounds, England, 2001 to 2017

Figure 6: Number of households from household projections and household estimates with upper and lower confidence interval bounds, England, 2001 to 2017



Notes:

- 1. HHPs equals household projections.
- 2. CI equals confidence interval.

Past analysis of the differences between household estimates and other household data sources has also identified that LFS estimates of one-person households may be lower than those from non-survey sources ². This is likely to be due to non-contact with one-person households in the LFS and other surveys.

Figure 7 shows that the estimated number of one-person households is consistently lower than the projected number of one-person households from the 2014-based household projections ³. The difference is quite consistent between 2001 and 2013, but has increased in more recent years, with a difference of 12.8% (806,000 households) for 2017.

Notes about Household estimates are subject to sampling variation

- 1. For more information, please see the Families and households quality and methodology information report.
- 2. For more information, please see Comparing data sources on families and households, published in 2012.
- 3. Household type breakdowns from the 2016-based household projections are not yet available.

7. Changes in census and underlying population data

Household projections and household estimates are both affected when the results of a new census are incorporated into the underlying data used in their methodologies.

Household estimates

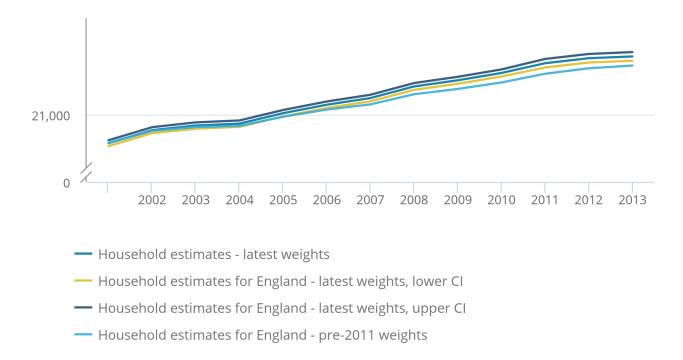
Household estimates are derived from the Labour Force Survey (LFS) household dataset. The LFS sample is weighted using mid-year population estimates data, which are used to provide an estimate of the total population living in households sampled by the LFS. LFS datasets are reweighted periodically to take account of the latest available population estimates.

In some years, population estimates are revised more extensively than in other years, to take account of newly-available data sources, which will provide more accurate information about the population. Some of the most extensive revisions to population estimates take place following a census. For example, in January 2015, we published revised household estimates for the years 2002 to 2013, following the incorporation of the results from the 2011 Census into the weighting for the LFS.

Figure 8 compares household estimates for England from before and after this reweighting took place. It shows a difference of 1% on average for the period 2001 to 2013 (119,000) in the estimated number of households in England as a result of the reweighting.

Figure 8: Household estimates, latest weights and weights prior to 2011 Census, England, 2001 to 2013

Figure 8: Household estimates, latest weights and weights prior to 2011 Census, England, 2001 to 2013



Source: Office for National Statistics

Household projections

Household projections are also affected by changes to mid-year population estimates, population projections and the availability of new census data. Each set of household projections is referred to as being "based" in a particular year; for example, the latest available set are the "2016-based". This means that the population data used in the production of this set of household projections are the 2016-based subnational population projections for the years 2017 to 2041 and the mid-year population estimates for the years up to and including 2016. Therefore, the input data about the size and structure of the population used in the 2016-based household projections is different to that used in previous sets of household projections.

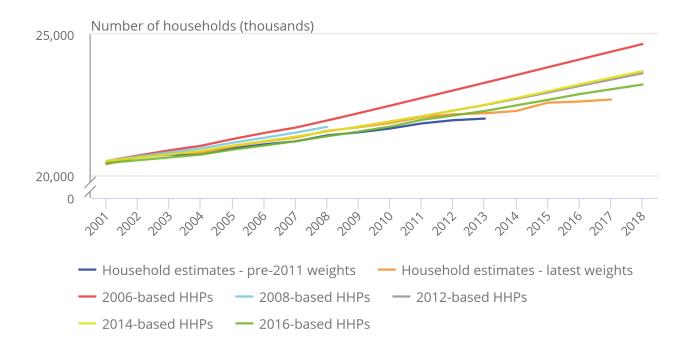
The other main input dataset used to produce household projections is a set of projected household representative rates (HRRs). The HRR is the chance of a person of a particular demographic group (for example, 20- to 24-year-old males) being the household representative person (HRP). The projected HRRs used in household projections are primarily modelled using census data, with different demographic breakdowns, numbers of years of census data and projection models used in different sets of household projections. When data from a new census become available, it can be incorporated into the model used for projecting HRRs, updating the trends being projected forward.

Figure 9 shows that the household estimates produced prior to the 2011 Census and the 2006-based and 2008-based household projections (also produced prior to the 2011 Census), show different trends in the number of households for 2001 to 2011 than the latest estimates and projections. Because the latest household estimates and projections both incorporate 2011 Census data, the 2001 to 2011 back series for both sources have been reweighted and reproduced respectively to align with the results of the 2011 Census, resulting in a more consistent and comparable time series across the estimates and projections.

As there has been no census since 2011, household projections will continue to reflect past trends observed prior to 2011. In contrast, household estimates will better reflect actual changes that have taken place since 2011, although these figures are subject to sampling error and may be reweighted following the results of future censuses.

Figure 9: Household estimates and household projections, England, 2001 to 2018

Figure 9: Household estimates and household projections, England, 2001 to 2018



Notes:

- 1. HHPs equals household projections.
- 2. 2008-based household projections are not available for all years between 2001 and 2018.
- 3. The latest household estimates available are for the year 2017.

In summary, we would expect household estimates and household projections for 2001 to 2011 to look more similar than figures for years after the most recent census has taken place, because the estimates and projections for before 2011 will have been reweighted and reproduced respectively to account for 2011 Census data.

8. Comparing household data with other sources of housing and planning data

Household projections form an important part of the evidence base for the assessment of future housing need. As a result, household projections are sometimes compared with other sources of data about households, housing and planning, as well as household estimates. Before comparing these data, it is important to understand some of the definitional differences between what they are trying to measure.

English Housing Survey

English Housing Survey (EHS) data provide estimates of the number of households in England. These estimates are based on a sample of approximately 13,000 households and are subject to sampling error.

Census

Census data provide estimates of the number of households in England for 2001 and 2011. <u>Approximately 95% of households in England responded to the Census in 2011 (xls, 2.71MB)</u>, with coverage estimation used to adjust census estimates to account for those who did not respond ¹.

Dwelling stock estimates

Dwelling stock estimates data show the number of dwellings in England as at 31 March each year. A dwelling is defined (in accordance with the census definition) as a self-contained unit of accommodation.

Self-containment is where all the rooms (including kitchen, bathroom and toilet) in a household's accommodation are behind a single door that only that household can use. Non-self-contained household spaces at the same address should be included together as a single dwelling. Therefore, a dwelling can consist of one self-contained household space or two or more non-self-contained household spaces ² at the same address. This means that there may be more than one household living in a single dwelling. Dwelling stock estimates include vacant dwellings.

Vacant dwellings

Vacant dwellings data for England are sourced from the Council Tax base of each local authority. The reference date of the data can vary slightly from year to year, but is generally a date in October or November.

Up until April 2013, dwellings undergoing major structural repairs for up to 12 months and those vacant for less than six months were eligible for a Council Tax exemption. In April 2013, these exemptions were replaced with a new flexible discount that applied to all empty properties. Local authorities are now entitled to apply any level of discount from 0% to 100% to all empty properties. Where local authorities award zero discounts for empty properties there is less incentive for owners to report their property as empty, which could have led to some under reporting of some empty properties³.

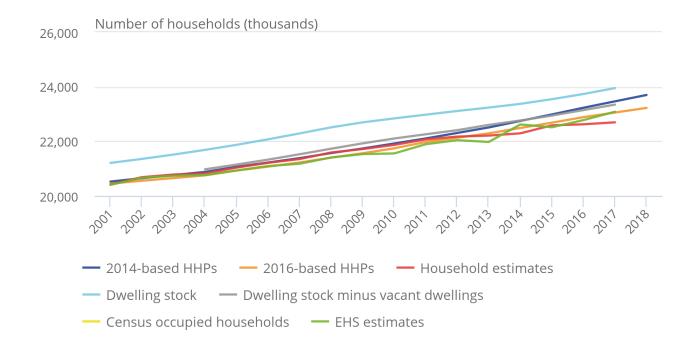
Data from the 2011 Census showed that <u>99.9% of all household spaces in England equate to an unshared dwelling</u> – that is, there is only one household space (and one household) in the dwelling. The 2011 Census also showed that 4.4% of all household spaces in England had no usual residents living there ⁴. Between the 2001 and 2011 Censuses, there was a 20.9% increase ⁵ in unoccupied households – that is, households with no usual residents.

Other sources of housing and planning data also show slight differences in trends

Figure 10 shows that dwelling stock estimates are consistently higher than other data about households, which is to be expected given that dwelling stock estimates include vacant dwellings. When vacant dwelling estimates are subtracted from dwelling stock estimates, the figures are more like other sources of household data, particularly the 2014-based household projections. It should be noted that even with vacant dwellings subtracted, dwelling stock estimates may include some dwellings that do not contain households. The 2014-based household projections diverge from the household estimates and EHS estimates after 2011, by up to 769,000 households in 2017, a difference of 3.4%.

Figure 10: Numbers of households and dwellings from various data sources, England, 2001 to 2017

Figure 10: Numbers of households and dwellings from various data sources, England, 2001 to 2017



Notes:

- 1. HHPs equals household projections.
- 2. EHS equals English Housing Survey.
- 3. Census occupied households data are available for 2001 and 2011 only.

These differences extend to average annual change and average household size

As with comparing figures from the household estimates and household projections, average annual change figures vary across sources of housing and planning data, with larger variations between sources occurring since 2011 than for the decade 2001 to 2011.

Table 2: Average annual change between sources of household and dwellings data, England, selected years between 2001 and 2017

Source	Average annual change (%)		
	2001 to 2017	2001 to 2011	2011 to 2017
2014-based household projections	0.84	0.75	1.00
2016-based household projections	0.75	0.72	0.80
Household estimates	0.66	0.78	0.47
English Housing Survey estimates	0.78	0.71	0.89
Dwelling stock	0.76	0.80	0.69
Dwelling stock minus vacant dwellings ¹	N/A	N/A	0.80

Source: 2014-based household projections for England – MHCLG, 2016-based household projections for England – ONS and household estimates – ONS

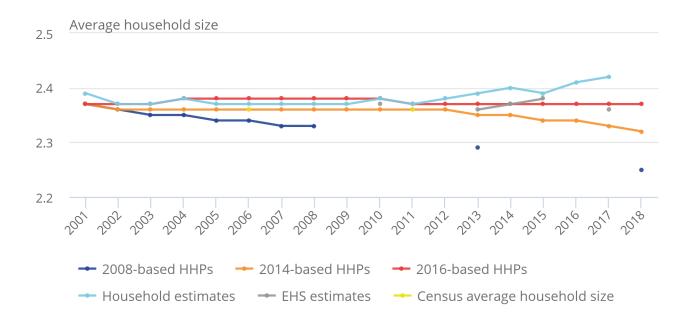
Notes:

1. Vacant dwellings data are available for the years 2004 onwards, so only average annual change figures for 2011 to 2017 have been provided.

Figure 11 shows that average household size was 2.36 people per household in both the 2001 and 2011 Censuses. This stability is not reflected in average household sizes from the 2008-based household projections, as these were produced before the 2011 Census results were available and so assumed that average household size would continue to fall. The other data sources reflect the stability as they were either produced or reweighted using 2011 Census data. After 2011, average household sizes from the EHS and 2016-based household projections remain broadly level, while household estimates show a slight increase, from 2.37 persons per household in 2011 to 2.42 in 2017.

Figure 11: Average household size from various data sources, England, 2001 to 2018

Figure 11: Average household size from various data sources, England, 2001 to 2018



Notes:

- 1. HHPs equals household projections.
- 2. 2008-based household projections are not available for all years between 2001 and 2018.
- 3. The latest household estimates available are for the year 2017.
- 4. EHS equals English Housing Survey.
- 5. Average household size estimates from the EHS are not available for all years between 2001 and 2018.
- 6. Census average household size data are available for 2001 and 2011 only.

Notes about Comparing household data with other sources of housing and planning data

- 1. For more information about how coverage estimation was applied to the 2011 Census, please refer to Trout, Catfish and Roach: The beginner's guide to census population estimates.
- 2. A household space is the accommodation used or available for use by an individual household.
- 3. For more information see <u>Table 615</u>: vacant dwellings by local authority district: <u>England</u>, from 2004, published by the Ministry for Housing, Communities and Local Government.
- 4. Household spaces are identified separately in census results as those with at least one usual resident and those that do not have any usual residents. A household space with no usual residents may still be used by short-term residents, visitors who were present on census night, or a combination of short-term residents and visitors. Vacant household spaces and household spaces that are used as second addresses are also classified in census results as household spaces with no usual residents.
- 5. For more information, please see <u>2001 Census table UV053</u>, published in 2003, and <u>2011 Census table QS417UK, published in 2013</u>.

9. Summary

Data about the number of households and dwellings in England show broadly similar trends between 2001 and 2011, after which trends diverge. The differences suggest that the number of households in England is not growing as quickly as it was previously and that average household size is remaining the same or slightly increasing. This trend differs from the assumptions made in previous sets of household projections, which may not play out in practice.

The changes to the methodology for the 2016-based household projections have resulted in trends more similar to household estimates. It should be noted that survey-based estimates of numbers of households are subject to sampling variation and are reweighted when new census data and population estimates are made available. Similarly, household projections are updated when new census data become available. These changes explain why the data sources are more similar for years prior to 2011, for which data have been reweighted and reproduced in light of the results of the 2011 Census.