

# Methodology used to produce household projections for England: 2022-based

Information on the methods used to produce the 2022-based household projections for England.

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## Notice

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We have edited text in paragraph three of Section 3: Communal establishments and household population of this release. This text was updated to explain that the method to adjust the communal establishment (CE) population from 2022 onwards now holds the number constant from 2021 and no longer uses a rate, as originally detailed.

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# 1 . Overview of household projections

This methodology provides a high-level overview of how we produce our [2022-based household projections for England](#). These projections use our [2022-based subnational population projections](#) published on 24 June 2025.

Household projections show the potential 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. These assumptions are based on past demographic trends in the population and rates of household formation.

Our household projections are based on the [Census 2021 definition of a household](#):

"One person living alone, or 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 all sheltered accommodation units (irrespective of whether there are other communal facilities) and all people living in caravans on any type of site that is their usual residence. This also includes anyone who has no other usual residence elsewhere in the UK. A household must contain at least one person whose place of usual residence 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. Using census data, we remove those living in communal establishments (CEs) from the input data for these projections.

Household projections are not forecasts and do not directly take into account policy or development aims that have not yet had an impact on observed trends. Future demographic behaviour is also inherently uncertain, meaning that any set of projections will almost inevitably be proven incorrect, to some extent, when treated as a forecast or prediction of future numbers of households. Household projections should be thought of as a trend-based starting point for analysis, providing data produced on a consistent basis for England, its regions and local authorities.

The inherent uncertainty in future demographic behaviour also applies to the population projections used in our household projections. A recent discussion of the accuracy of national population projections is available in our [Comparing national population projections to estimates report](#). For a discussion of the accuracy of subnational population projections, please refer to our [Comparing subnational population projections with estimates report](#).

The methodology for our household projections is split into two stages. Stage 1 provides a summary of the projected number of households, based on trends in population change and household formation. Stage 2 gives a more detailed breakdown of household type. This article summarises both stages of the methodology.

## Transfer to the Office for National Statistics

The Office for National Statistics (ONS) took responsibility for the household projections in January 2017. The aim of the transfer was to improve the consistency between the household projections and the subnational population projections (SNPPs) and allow us to produce them more efficiently. Previous household projections datasets, published before our 2016-based release, can be found on the [Ministry of Housing Communities and Local Government \(MHCLG\) household projections collection](#).

Household projections are normally published every two years, around three months after the publication of the SNPPs.

## 2 . Overview of 2022-based methodology

Our 2022-based household projections are compiled using a two-stage process.

Stage 1 begins by taking the latest sets of mid-year population estimates (MYEs) and subnational population projections (SNPPs), by age group and sex, and applies an adjustment to remove those living in communal establishments (CEs) using census data. This produces a projected household population for England and its regions and local authorities by age group and sex, for the years 2011 to 2047.

The full definition of a communal establishment can be found in the [2011 Census glossary](#). Household representative rates (HRRs) are derived by the age and sex of the Household Reference Person (HRP) from 2011 Census and Census 2021 data using a two-point exponential model. To produce a projected number of households by age and sex of HRP for England, regions and local authorities for 2022 to 2047, the projected household population is multiplied by HRRs. HRRs are held constant from 2022 to 2047.

Totals for the regions are then constrained to the England total, with figures for local authorities constrained to the relevant regional totals.

Stage 2 begins by calculating household headship rates. Household headship rates show the proportion of people in a demographic group based on geography, age group, sex and household type who were the household representative person (HRP). In our 2022-based household projections, the household reference person (HRP) is the eldest economically active person in the household.

These rates are calculated for 2011 and 2021 using census data. They are then projected forward to produce headship rates for the other years of the projection period. They are then applied to the projected household population to produce an initial projected number of households for 2022 to 2047, with headship rates held constant for 2022 to 2047. The projected number of households produced are then constrained to the overall totals by age and sex from Stage 1.

Finally, checks are carried out 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 for that geography and year. Where this is not the case, adjustments are made to the number of households allocated to each household type within that geographical area and year, so that the implied numbers of adults and children are coherent with the projected household population.

Therefore, although the initial HRRs and headship rates for 2022 to 2047 are held constant at rates calculated for 2022, the final HRRs and headship rates published in our [detailed data for modelling and analysis](#) may differ slightly across these years, because they account for the effect of these checks on the number of adults and children, as well as geographical constraining.

## 3 . Communal establishments and household population

The first step in our methodology requires the adjustment of:

- our 2011 to [2022 mid-year population estimates \(MYEs\)](#)
- our [2022-based subnational population projections \(SNPPs\)](#)

This adjustment ensures that the data only refer to usual residents living in private households. It is made by subtracting the population living in communal establishments (CEs) from the MYEs and SNPPs. More information is available in Section 4: Quality summary of our [Mid-year population estimates quality and methodology information \(QMI\)](#).

Estimates of the population living in CEs by age group and sex are obtained from the 2011 Census and Census 2021 for England and at local authority level. More information is available in:

- our [Sex by age - local authorities in England table from the 2011 Census](#)
- our [Sex by age - local authorities in England table from Census 2021](#)

To adjust the CE population in the non-census years, we use an interpolation between the 2011 Census and Census 2021 for all ages, with numbers held constant from 2021 onwards.

The CE population is then subtracted from the total usual resident population in the MYEs and SNPPs by age group and sex. This leaves the private household population, split by age and sex, in the years required for the household projections.

## Prison population adjustments

In our previous household projections releases, a specific, modest, adjustment was made to remove the prisoner population in non-census years using prison population data from the Ministry of Justice (MoJ). This was particularly helpful because our 2018-based household projections release was published some time after the 2011 Census, and new prisons have been opened since. There were limitations to this approach, and these were outlined in our [Methods used to produce household projections for England: 2018-based methodology](#). This method was used in non-census years to remove the prisoner population.

For this release, data from Census 2021 were used on the number of CE residents, including prisoners, by age and sex in each local authority in England, without use of any further MoJ data. The starting point of the projections was close to Census 2021, which also led to our decision not to include any MoJ data. We have also not applied the small adjustment that removes those in Immigration Removal Centres (IRCs) from the denominator after the first stage of calculation.

The definition of a prisoner changed for Census 2021. Prisoners sentenced for less than 12 months were counted as usually resident at their permanent or family home, as many do not serve the whole sentence and are generally released from prison halfway through their sentence. Those serving a sentence of 12 months or more were counted at their prison address. This differed from the 2011 Census where only prisoners sentenced to less than six months in prison were counted at their permanent or family home.

As a further step in our household projections, we make an adjustment for prisoners based on their sentence length. In 2011, we treated prisoners who are serving a sentence of less than six months as part of the household population. However, this was changed to 12 months in 2021. Research we completed showed a negligible difference between those serving less than 12 months and those serving less than six months. For this reason, we have resumed using a definition based on those serving less than six months. This means that in 2021 data only (not 2011 data), the CE dataset (including those we remove from the total population) still contains those who are serving between 6 and 12 months.

## 4 . Household representative rates

The next stage of our method is to produce household representative rates (HRRs), which can be multiplied by the household population figures to produce a projected number of households. The HRR is the proportion of people in a demographic group who were the household reference person (HRP). The value of the HRR will be between zero and one.

### Defining the HRP

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 2022-based household projections for England use the 2021 Census definition of the HRP for both Stage 1 and Stage 2 of the methodology; that is, the eldest economically active person in the household, then the eldest inactive person if there was no economically active person.

### Calculating base HRRs using 2011 Census and Census 2021 data

Our 2022-based household projections use base HRRs calculated using both the 2011 Census and Census 2021. The household population from these censuses are divided by the number of HRPs (by age group, sex, area and year), which are also taken from both censuses.

When producing the HRRs, we merged:

- City of London with Westminster
- Isles of Scilly with Cornwall

This was because these local authorities have small counts, and projecting them could result in unreliable trends.

## Smoothing and projecting base HRRs

To counteract a cohort effect on projected HRRs for older age groups, the base HRRs produced from 2011 Census and Census 2021 data were smoothed across age groups for males and females. This cohort effect relates to changes in retirement patterns and the impact of World War Two, which may have changed the relative size and structure of these cohorts and therefore their likelihood of being HRRs.

In our 2022-based projections, the HRRs for 2011 and for 2021 were smoothed using a three-point moving average. For example, the HRRs for 19- to 24-year-olds in the smoothed method are an average of the HRRs for 16- to 18-year-olds, 19- to 24-year-olds and 25- to 29-year-olds. All age groups were smoothed in this way except for the 16- to 18-year-olds and those aged 90 years and over. This was because they are the start and end of the age range, and their HRRs would be calculated as an average of two groups rather than three. For the 16- to 18-year-olds, smoothing resulted in an implausibly large number of HRRs at that age, so it was decided that retaining the unsmoothed HRRs would be preferable for this group. HRRs for those aged 90 years and over were not smoothed, to be consistent with the unsmoothed 16- to 18-year-old age-group.

Once smoothed, the base HRRs for 2011 and 2021 are projected forward to produce HRRs for the other years of the projection period.

The 2022-based household projections use a two-point exponential model to project forward HRRs calculated using 2011 Census and Census 2021 data for each demographic group. The formula for projecting forward base HRRs is:

$$y_i = k + ab^{xi}$$

Where:

- $i$  is the year, from 2011 to 2047
- $y_i$  is the headship rate in year  $i$
- $c$  is the most-recent census year (2021)
- $d$  is the least-recent census year (2011)
- $k$  is 1 if  $y_c \geq y_d$  and  $k$  is 0 if  $y_c < y_d$
- $a$  is  $y_d$  minus  $k$
- $b$  is  $(y_c - k)$  divided by  $(y_d - k)$
- $xi$  is  $(i - d)$  divided by  $(c - d)$

The values of  $c$  and  $d$  are constants; that is, for each year of the projection period,  $c$  will equal 2021 and  $d$  will equal 2011.

## 5 . Number of households and geographical constraining

Once projected numbers of households have been calculated for England, regions and local authorities, regional numbers of households are then constrained to the England total, and local-authority-level numbers of households are constrained to the regional totals. This constraining takes place on the assumption that England and regional-level projections will be less subject to variation than household projections for local authorities, because of smaller populations. This approach also provides consistency across geographies.

## 6 . Household type breakdowns

### Calculating household headship rates

In the second stage of our 2022-based household projections, also called the Stage 2 methodology, we calculate the projected number of households by household type and age.

This begins by calculating base household headship rates. These show the proportion of people in a demographic group (based on geography, age group, sex and household type) who were the household reference person (HRP). Headship rates use the same age groups as HRRs. More information is available in [Section 4: Household representative rates](#).

Headship rates are calculated using 2011 Census and Census 2021 data, based on the current definition of HRP (the oldest economically active person in the household). The base headship rates for 2011 and 2021 for each geography, sex and household type were smoothed over the age distribution, using the same three-point moving average as in Stage 1. HRRs for those aged 16 to 18 years and those aged 90 years and over were left unsmoothed.

Headship rates are calculated separately for males and females because they are smoothed across age groups (maintaining consistency with the Stage 1 HRRs) and males and females have different distributions of headship rates.

These smoothed headship rates are then projected forward using the same two-point exponential model as in Stage 1, to produce projected headship rates for the years 2011 to 2021. As in Stage 1, headship rates for 2022 to 2047 are held constant.

### Stage 2 household types

The Stage 2 2022-based household projections are divided into six household types:

- One-person households: male
- One-person households: female
- Other households with two or more adults
- Households with one dependent child
- Households with two dependent children
- Households with three or more dependent children

The category "Other households with two or more adults" also includes four more household types that have been combined:

- Single family households: no children or non-dependent children
- Other household types: all in full-time education
- Other household types: all aged 66 years and over
- Other household types: other family composition

## **Constraining to Stage 1 totals**

Once base headship rates have been produced, smoothed and projected forward, they are multiplied by the household population for each age, sex, geography and year grouping to produce initial projected numbers of households by type. These initial projected numbers of households are then constrained to the projected household totals produced in Stage 1.

Although headship rates are calculated separately for males and females, the final headship rates do not contain a sex breakdown (except for one-person households, for which the sex split is retained). This is because the sex breakdown for the household projections by household type is removed before the application of minimum adult and child checks (except for one-person households). Our research identified some implausible trends between males and females for some of the disaggregated household types that were merged. The final constrained headship rates are then produced by dividing the number of projected households, by household type with the projected household population.

## **Minimum adult and child checks**

The next part of the Stage 2 processing is 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 for that geography and year.

As household population data include an age breakdown for those aged 16 to 18 years, we are required to make an assumption about the future numbers of 16- to 18-year-olds who would be considered dependent children. A dependent child is defined as any person aged 0 to 15 years living in a household, or a person aged 16 to 18 years in full-time education and living in a family with their:

- parent or parents
- grandparent or grandparents

It does not include any people aged 16 to 18 years who have a spouse, partner or child living in the household. To make this assumption, we used census points and interpolated between them. Previously, a combination of data from the two censuses and from the Annual Population Survey (APS) was used. For each local authority, we calculate the estimated proportion of people aged 16 to 18 years who are dependent children using census data for the years 2011 and 2021.

The number of dependent children in each local authority and year in the household population is then compared with the minimum number of dependent children implied by the household type breakdown for that local authority and year. When the latter is greater than the former, the number of households with dependent children is reduced by the number of children in excess of the household population.

Once the projections have been adjusted for the number of children in the household population, the minimum number of adults implied by the household projections is compared with the number of adults in the household population. Adults are anyone aged 19 years and over, plus the proportion of 16- to 18-year-olds who were not considered to be dependent children. No adjustments were required in any years of the projection period to reduce the minimum number of adults implied by the household type breakdowns. However, adjustments were made as a result of the minimum number of children implied. A large number of local authorities had fewer children than required to fill households with dependent children, and so numbers of dependent children were reduced where this excess occurred.

## Limitations of minimum adult and child checks

We recognise that there are limitations to the way in which we have applied the minimum adult and child checks. Firstly, we remove the same number of households from household types with dependent children, as there are excess dependent children. This means that we remove more children than the excess implied, because in removing a household with two dependent children, we reduce the number of excess children by two, not one. On the other hand, removing more children than the minimum excess implied may account more effectively for households with three or more children, some of which will have four, five or more children.

Similarly, where the minimum number of children implied by the household type breakdown is equal to, or only slightly lower than, the household population of children, we make no adjustment. This means we may not be making enough of an allowance for those households with three or more dependent children who will have four, five or more children.

For the minimum number of adults, we have assumed that the minimum number of adults in households with dependent children is one and that the minimum number of adults in households with two or more adults and no dependent children is two. We recognise that this is likely to indicate a lower minimum number of adults than is reasonable for many local authorities.

Using alternative household type breakdowns in the future may allow us to explore using more granular data about the minimum numbers of adults in households and provide more detailed checks. We will continue to review the most effective ways of applying minimum adult and child checks to household projections as part of our future research.

## 7 . Methods used for household projections for other parts of the UK

The methods described in this publication relate to household projections for England only. Household projections are produced separately for England, Wales, Scotland and Northern Ireland. We published our [User guide to the household projections across the UK](#) on 29 June 2020 and last revised it on 10 March 2021. In the user guide, we compare the methods and data sources used for England, Wales, Scotland and Northern Ireland.

## 8 . Variant subnational household projections

We have produced six subnational variant household projections, in addition to the migration category variant, as part of this release. These are:

- a high international migration variant
- a low international migration variant
- a 10-year migration variant
- a zero net migration variant
- a five-year migration variant which aligns with the principal population projection in the 2022-based national population projections (NPPs)
- a continuous projection of the household representative rates (HRRs) which were held constant from 2022 onwards in the migration category variant

The 10-year migration variant is based on 10 years of data for all migration trends (internal, cross-border and international). The five-year migration variant aligns with the principal population projections in the 2022-based NPPs. The migration category variant takes the place of a principal projection and is consistent with the subnational population projections. This variant includes more up-to-date migration data and is a better reflection of short-term population change.

## 9 . Summary of assumptions made in the projections

1. The mid-year population estimates (MYEs) and subnational population projections (SNPPs) are an accurate reflection of the past and projected size and structure of the usual resident population of England by age and sex.
2. Household representative rates (HRRs) calculated by age, sex and geography will produce an accurate reflection of the numbers of households in future years.
3. HRRs from 2022 onwards are constant, reflecting the uncertainty of household formation patterns in future years.
4. Projected numbers of households for England are more accurate than those for regions, which in turn are more accurate than those for local authorities; therefore, geographical constraining is applied to figures for regions and local authorities.
5. Headship rates from 2022 (before the application of constraining and minimum adult and child checks) are constant, reflecting the uncertainty of household formation patterns in future years.
6. Projected numbers of households by age and geography from Stage 1 are more accurate than those from the aggregated Stage 2 figures; therefore, initial Stage 2 projections are constrained to Stage 1 totals.
7. The distribution of household types (with and without dependent children) remains the same after adjustments have been applied to account for minimum numbers of children.
8. Where there are more dependent children implied by the projected numbers of households than there are in the household population, the number of households removed should be equal to the excess number of dependent children.
9. Where the minimum number of dependent children implied by the household type breakdown is equal to, or only slightly lower than, the household population of dependent children, no adjustment is required.
10. The minimum number of adults implied by a household with dependent children is one.

## 10 . Cite this methodology

Office for National Statistics (ONS), released 28 October 2025, ONS website, article, [Methodology used to produce household projections for England: 2022-based](#)