Office for National Statistics

Statistical bulletin

Revised population estimates for England and Wales: mid-2012 to mid-2016

Revised estimates of the usually resident population for mid-2012 to mid-2016 (as at 30 June). Methodological improvements have been implemented allowing the creation of a new series of estimates that roll forward the 2011 Census. These revisions cover subnational population estimates for England and Wales only. Data are available by administrative area, single year of age, sex and component of population change.

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1 . Main points

- We have made improvements to population estimates for England and Wales from mid-2012 to mid-2016; these revised figures include new estimates of local authority international emigration and foreign armed forces dependants.

- While regional, county and local authority-level estimates have changed, national-level estimates for both England and Wales have been held constant and so related national-level releases such as the 2016-based national population projections are unaffected.

- The distribution of people aged in their 20s and 30s has changed more than for other age groups, resulting from the use of an updated emigration model and more timely data becoming available to distribute immigration for mid-2015 and mid-2016.

- Of all local authorities, 96% have revised mid-2016 estimates that are less than 1% different to the original estimates; 212 local authorities experienced upward revisions and 136 experienced downward revisions.

- The population in one local authority has been revised upwards by more than 5,000 people (Wandsworth), while four have been revised downwards by more than 5,000 people (Cambridge, Haringey, Oxford and Westminster).

2 . Statistician's comment

"These revised population estimates, incorporating methodological improvements and previously unavailable data, only affect the distribution of the population across England and Wales. Of the 348 local authorities only 28 see their population estimate for mid-2016 revised by 1% or more. Downward revisions have mostly resulted from higher emigration estimates for areas containing international students and lower immigration for Inner London."

Neil Park, Head of Population Estimates Unit, Office for National Statistics

3 . Things you need to know about this release

The data published in this release replace the previous series of population estimates for mid-2012 through to mid-2016. The Quality and Methodology Information (QMI) report and the Methodology guide accompanying this release set out the changes that have occurred in more detail and explain why these changes have been made now.

What's changed:

- local authority emigration estimates for mid-2012 to mid-2016 have been recalculated using an improved distribution model that includes a wider range of administrative and survey data than before

- local authority-level immigration estimates for mid-2015 and mid-2016 have been recompiled using previously unavailable data and using improved matching methods to better distinguish students, workers and other international in-migrants

- an improved method for accounting for the migration of dependants of foreign armed forces personnel has been incorporated; this results in improvements to the population estimates of Forest Heath and other local authorities containing, or neighbouring, US Air Force bases

Minor changes have also been made to ensure methods have been implemented consistently across years – specifically for mid-2012 and mid-2013 age distributions of asylum seekers and emigrants, and to the adjustment made between Coventry and Warwick student locations in mid-2014 and mid-2015.

What's not changed:

- Scottish and Northern Irish estimates are unchanged, but are available in the datasets accompanying this report, to provide an up-to-date UK picture

- population totals for each single year of age and sex are unchanged for both England and Wales, only subnational estimates have changed

- definitions, such as these estimates covering the usually resident population at 30 June each year, are unchanged and can be found in the QMI

- many population components, such as births, deaths and special populations, are unchanged; internal migration changes are planned for mid-2017 estimates, as set out in Population estimates for local authorities in England and Wales, new methods: February 2018

Data available

A revised set of population estimates tables are available from our website and via Nomis. To assist you in understanding the impact of revisions for individual areas we have also released the following:

- interactive population pyramids and maps in this bulletin, with the option of downloading the data behind them

- a new Population Estimates Revisions Tool allowing you to explore the impact by area, age group and component of population change

- a set of quality tools that compare the level and patterns of change seen in the revised population estimates against administrative data

Section 11 provides a list of related statistics, showing, for example, that revised small area population estimates consistent with these local authority population estimates will be released later this year.

4 . Which areas have the biggest revisions to population estimates?

It is helpful to compare the original and revised estimates at mid-2016 in order to get a picture of the impact of the changes in these revisions. Main findings include:

- there were 212 England and Wales local authority areas that had their populations revised upwards, 136 downwards

- the population in one local authority has been revised upwards by more than 5,000 people (Wandsworth), while four have been revised downwards by more than 5,000 people (Cambridge, Haringey, Oxford and Westminster)

- no areas were revised upwards by more than 5%, while two areas (Cambridge and City of London) were revised downwards by more than 5%

- there were 320 areas (92%) revised by less than 1%

Tables 1 and 2 show all local authority areas whose populations have been revised upwards or downwards by more than 1%.

Table 1: Local authorities with upwards population revisions of 1% or more, UK

Local authority name	Original population, mid-2016	Revised population, mid-2016	Difference	Percentage difference
Elmbridge	132,800	136,100	3,300	2.5%
Harrogate	156,300	159,800	3,500	2.2%
Ipswich	135,900	138,500	2,600	1.9%
Woking	99,700	101,400	1,700	1.7%
Wandsworth	316,100	321,500	5,400	1.7%
Suffolk Coastal	126,000	127,800	1,900	1.5%
Rugby	103,800	105,300	1,500	1.4%
Camden	246,200	249,200	3,000	1.2%
Mole Valley	86,200	87,300	1,000	1.2%
Hammersmith and Fulham	179,700	181,800	2,100	1.2%
West Berkshire	156,800	158,600	1,700	1.1%
Newham	341,000	344,500	3,600	1.0%
Isles of Scilly	2,300	2,300	less than 100	1.0%

Source: Office for National Statistics

Notes:

1. Figures are rounded to the nearest 100.

Table 2: Local authorities with downwards population revisions of 1% or more, UK

Local authority name	Original population, mid-2016	Revised population, mid-2016	Difference	Percentage difference
City of London	9,400	7,200	-2,200	-22.9%
Cambridge	131,800	124,600	-7,200	-5.4%
Oxford	161,300	155,300	-6,000	-3.7%
Haringey	278,500	272,100	-6,400	-2.3%
Westminster	247,600	242,000	-5,600	-2.3%
Bournemouth	197,700	193,700	-4,000	-2.0%
Forest Heath	64,400	63,300	-1,100	-1.8%
Exeter	129,800	127,500	-2,300	-1.8%
Southampton	254,300	250,400	-3,900	-1.5%
Lambeth	327,900	323,100	-4,800	-1.5%
Kingston upon Thames	176,100	173,700	-2,400	-1.4%
Tower Hamlets	304,900	300,900	-3,900	-1.3%
Lancaster	143,500	141,700	-1,800	-1.3%
Charnwood	179,400	177,400	-2,000	-1.1%
Hounslow	271,100	268,300	-2,900	-1.1%

Source: Office for National Statistics

Notes:

1. Figures are rounded to the nearest 100.

City of London and the Isles of Scilly often appear amongst the largest-changing areas where revisions are made, because of their small size. City of London was the fastest-growing area in the original series, growing by 23.6% over five years (with the next-highest level of growth being 15.9%, in Tower Hamlets). In the revised series the City of London grew by 9.6%, the fourth-highest rate of growth.

Local authority areas can be aggregated up to other geographies (regions, counties and Police Force Areas), typically the level of revisions seen for these geographies is lower than for individual local authorities. For example:

- seven of the English regions had their populations revised by less than 0.1%; London's decreased by 0.2% and the West Midlands' increased by 0.2%

- two county populations were revised downwards by more than 0.5% (Cambridgeshire and Oxfordshire) and two were revised upwards by more than 0.5% (Suffolk and North Yorkshire); all four counties contain local authorities indicated in Tables 1 and 2, there is no clear separate pattern for counties

It is possible to aggregate local authorities up to other geographies at which population estimates can be used to allocate funding – for example, Police Force Areas (which typically correspond to counties or pairs of counties) and Local Enterprise Partnerships. However, it is not possible to produce estimates for national parks or a complete set of clinical commissioning groups (CCGs). Revised estimates for CCGs will be available later in the year as part of the revised small area population estimates.

5 . Revisions to population estimates driven predominantly by improved emigration methods

Interactive population maps are available in Figure 1 showing the impact of revisions on the mid-2016 population estimates overall and attributable to each revised component. To use this interactive tool select a local authority to highlight it on each map.

Figure 1: Impact of revisions on mid-2016 estimates by components of population change, England and Wales

Comparing different components of population change between the two series shows only modest changes in the relative importance of each component to local areas. In the original estimates series for mid-2012 to mid-2016, there were 311 out of 348 local authorities in England and Wales that had higher levels of immigration than emigration. In the revised series this has increased to 342 areas.

6 . Revisions to emigration result in lower population estimates in areas with large numbers of international students

The main change to the revised estimates comes from use of an updated emigration model. While this uses an unchanged national estimate of the number of emigrants, drawn from the International Passenger Survey (IPS), the changes (listed in the Methodology guide) improve the way this is distributed amongst local authority areas. The improvements include:

- a greater range of explanatory variables (6 variables to 16) accounting for a wider range of drivers of emigration

- use of additional administrative sources, reducing reliance on less timely 2011 Census data and sample surveys, which are volatile at the local level

- future-proofing of the model through updated research to reflect current trends and patterns

A useful approach to understanding the impact of the updated model on local authority estimates is to group similar areas together. One of the most relevant groupings with these data is the 2011 Census area classification. This takes a wide range of census variables and groups local authority areas according to how similar they are. This shows that:

- changes are concentrated predominantly in young-adult ages, specifically those aged between 20 to 29 years and 30 to 39 years, reflecting the fact that emigration is the main source of these revisions and people of those ages form the majority of emigrants

- the changes have resulted in a loss of population aged 20 to 29 years of 2.0% from many student-dominated areas and 2.1% of those aged 30 to 39 years ("2b1, university towns and cities")

- there have been increases of 2.2% in those aged 20 to 29 years in "older farming communities" and 1.6% in "affluent rural" areas

There is no systematic change in all rural areas, however. Rural-urban classifications can be applied to geographical data, allowing policies to be examined for the effects they have on all rural or urban areas. The preferred classification can only be used with small-area data, however, it is possible to use the 2011 Census rural-urban classification of local authority districts in England to summarise the differences. Predominantly urban areas were revised downwards by some 31,000 people, or 0.08% of their population. Rural areas, taken together, were revised upwards by 0.21%.

Changes in student areas

The reason behind this can be illustrated by Table 2 in Annex A of Population estimates for local authorities in England and Wales, new methods. The explanatory variables used by the model that calculated each area's share of emigration previously included no variables directly related to students. The updated model better captures outflow from student areas by including variables that increase an area's share of emigration with higher levels of immigration in the mid-year estimates and of EU students in their final year of higher education aged 20 to 25 years. This has the result of increasing the emigration in areas that are dominated by students and, in particular, EU students.

This change has driven increases in emigration in the revised estimates for areas such as Cambridge, Oxford, Bournemouth, Exeter, Southampton and Lancaster, leading to their populations decreasing by 1% or more. Figure 2 is an interactive population pyramid, showing the age and sex distribution of the original and revised estimates for each local authority, county and region in England and Wales. Cambridge Local Authority shows one of the most pronounced patterns of change, with large differences between the revised estimates (bars, one set for males one for females) and the original ones (lines).

Figure 2: Interactive population pyramids, original and revised estimates, mid-2016

The inclusion of the student and immigration explanatory variables has also played a role in the decreases in population in several local authorities from different parts of London – Haringey, Westminster, and Kingston upon Thames.

The Population Estimates Revision Tool (PERT) allows these trends to be examined in more detail. For example, it shows that estimates of immigration for mid-2012 and mid-2016 for Oxford changed little,123 people over five years, while emigration increased by 5,886 people over the five years.

7 . Wider impact of revisions to emigration on population estimates

As set out in the Methodology guide accompanying this release, there were additional changes to the explanatory variables in the updated model and two further methodology changes. The following illustrate the kinds of resultant changes that have arisen in the revised population estimates.

Some areas may have their emigration estimates revised upwards where they have relatively high values on one or more of the new explanatory variables. This is particularly clear in areas with large student populations (as discussed in Section 6) but can also be seen in parts of London such as Hounslow and Haringey, which have relatively high numbers of south Asian residents, and births with country of birth of mother in either Romania or Bulgaria, respectively.

Conversely, areas may have had a relatively high value in one of the old explanatory variables, which is either no longer used or is diluted by the wider range of variables. This is most likely to have occurred in areas with high numbers of North American residents in the 2011 Census. These areas include Elmbridge, Harrogate, Woking, Mole Valley and West Berkshire, which all show decreases in emigration, increases in population, alongside relatively high populations of North Americans in the 2011 Census.

The downward revision of emigration in Wandsworth demonstrates the same effect where the population of Oceanians in the 2011 Census is diluted. The same effect with other variables may have been a driver for decreases of population in Rugby.

For Hammersmith and Fulham the difference between the original and revised emigration estimates is much larger for 2012 (negative 2,200) than for subsequent years (around negative 440 per year, as can be seen in the Population Estimates Revisions Tool). Part of the explanation for this difference is the use of employment estimates from the Annual Population Survey in the emigration model. In the original estimates for mid-2012, these were weighted to the pre-2011 Census population estimates, which were around 11,000 lower (6%) than the Census-based population estimate for Hammersmith and Fulham.

The Methodology guide explains that unlike the previous method, the distribution of emigrants is no longer restricted within a region. In the previous model each area's share was linked to that of typically five other neighbours via an intermediate new migration geography for outflows (NMGo). The clearest example of the impact can be seen in the East of England, with one former group of authorities including Cambridge now receiving a larger share of the region's emigration and another former group containing Suffolk Coastal and Ipswich receiving a smaller share.

8 . Revisions to immigration result in a lower population estimate for Inner London

The map in Figure 1 highlights the geography of immigration revisions. One of the strongest patterns is the change occurring within London. It is useful to look at immigration and emigration together, in part because the emigration model now uses immigration as an explanatory variable.

For Outer London local authorities, immigration barely changed at all over the two years of revisions (totalling an increase of 100 people); for Inner London the change was much more pronounced, with 20,700 fewer immigrants in the revised series. Emigration was revised downwards for Inner London as well, with 6,000 fewer emigrants; while it was revised upwards for Outer London, by 4,300 people. Figure 3 shows how both components have changed for each local authority within London.

Figure 3: Revisions in immigration and emigration for London's local authorities, mid-2012 to mid-2016

Figure 3 shows that there is a wide variety of changes in London, suggesting a mix of patterns, which is more likely to reflect reality than a simple trend affecting all areas equally. Outer London areas showed all combinations of increases and decreases in these two components, with a slight tendency towards decreased emigration. Inner London areas, however, showed a much bigger spread of revisions, with a tendency to downward revisions in both.

Figure 3 shows that Camden is the only Inner London local authority to have had its estimates of emigration revised downwards and its immigration revised upwards. Table 1 shows that its population has been revised upwards by 1.2%, the second-largest proportion for a London authority. Only Wandsworth changed by a higher proportion and Figure 3 shows that it has the highest decrease in emigration (7,600 people), modified by a smaller decrease in immigration (2,200).

Tower Hamlets and Lambeth appeared in the tables of areas changing by more than 1% because their estimates of immigration were revised downwards (by 3,500 and 3,800 people respectively), but showed relatively small changes in emigration.

The [Methodology guide](#) sets out that the process of matching between data sources to correctly identify people as a worker, student or other international in-migrant has been optimised in these revised estimates, taking on board techniques learnt through administrative data census research. However, the main change is simply that the revised distributions for mid-2015 and mid-2016 are based on more up-to-date data than was previously available.

9 . Improved population estimates for areas home to foreign armed forces personnel

The Methodology guide sets out how and why the revised series now accounts for not just foreign armed forces personnel (FAF, that is, members of the US Air Force based in England and Wales), but also their dependent children and partners.

As the mid-year estimates were rolled further on from the 2011 Census, it became increasingly apparent that the dependants found in the census were simply being "aged on" in the estimates rather than updated on an annual basis in line with changes to FAF personnel. By using additional administrative data, areas such as Forest Heath now have more plausible increased numbers of women aged in their 20s, and fewer aged in their late 30s and 40s. Figure 4 shows this as a sex ratio – the number of males per female by single year of age in the mid-2016 estimates.

Figure 4: Sex ratio by single year of age, mid-2016, Forest Heath, original and revised estimates

Figure 4: Sex ratio by single year of age, mid-2016, Forest Heath, original and revised estimates
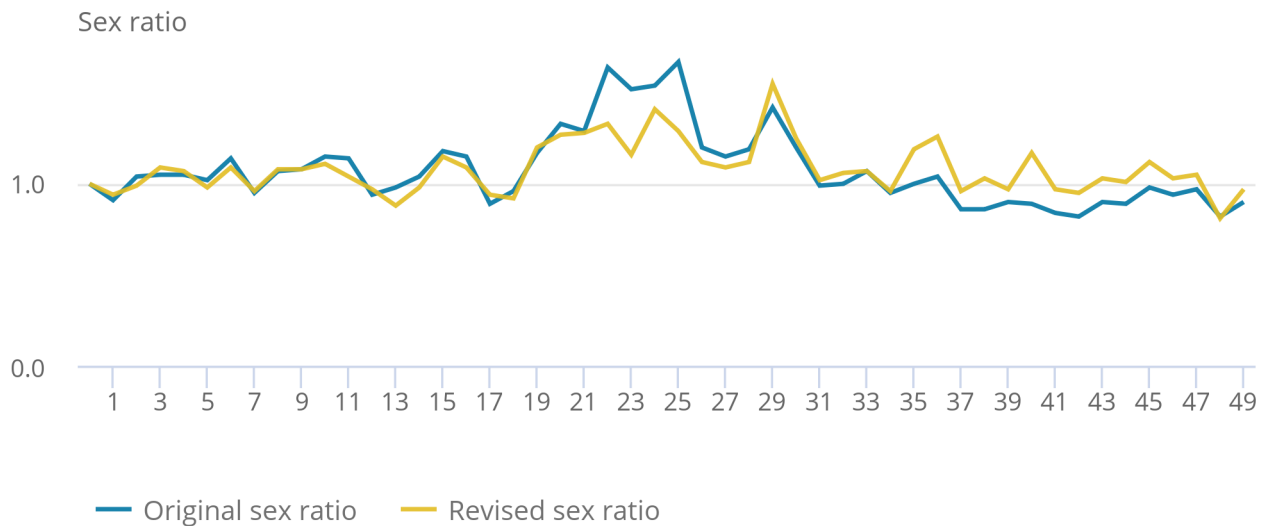
Source: Office for National Statistics

Notes:

1. The sex ratio is the number of males per female by single year of age.

These changes had much smaller impacts in a number of other areas, including Fenland, East Cambridgeshire, St Edmundsbury and Breckland.

10 . Assessing the credibility of revised estimates

As previously discussed, for the majority of local authorities the impact of the revisions is relatively small. This is particularly the case when considered along with the uncertainty associated with the 2011 Census estimates (on which the population estimates for mid-2012 to mid-2016 have been built) and the uncertainty associated with the mid-year population estimates.

One way to examine the plausibility of these revisions is to look at demographic measures that can be created from the estimates. Typically as we move away from a census base year these measures become more spread (reflecting the accumulation of statistical error). A reduction in the spread or distribution across local authorities is an indication that the revisions have resulted in more plausible population estimates. For example:

- the total fertility rates at local authority level show a lower interquartile range and a reduced standard deviation in the revised estimates; this shows that the number of females of fertile age in the revised estimates is more aligned with the numbers of births registered

- the median ages presented in Table MYE6 and old age dependency ratios (the number of people aged over 65 years compared with those aged 16 to 64 years) both show a reduced interquartile range and standard deviation, suggesting that age structures of areas have become more similar

11 . Implications for related statistics

A comprehensive guide to sources of mid-year population estimates, information on specific areas or components and related statistics appears in the mid-2016 population estimates bulletin. For this bulletin, it is useful to explain what is and isn't affected by the changes described:

- births and deaths registrations data, internal migration and national-level long-term international migration estimates and remain unchanged, as do the 2016-based national population projections

- some non-demographic Office for National Statistics (ONS) releases will begin to use the new estimates straightaway

- the revised local authority estimates will feed into the 2016-based subnational population projections, which will be released in May or June 2018

- the methods applied to these revisions will be applied to the mid-2017 population estimates to be released on 21 June 2018

- the revised estimates will underpin ONS's first release of household projections for England, in September 2018

- later in 2018 the small area population estimates back-series release will produce revised mid-2012 to mid-2016 estimates for Output and Super Output Areas, clinical commissioning group areas, national parks and Parliamentary constituencies

- the Labour Force Survey will be reweighted to take account of the new estimates in late 2018; other ONS social surveys will also begin to use the new estimates

Is your statistical product or analysis affected? We're keen to hear from users with feedback about the changes, positive or negative, or simply with information as to how they are used. Please contact us through pop.info@ons.gsi.gov.uk.

12 . Upcoming changes to this bulletin

The Population estimates for local authorities in England and Wales, new methods: February 2018 report discusses three planned changes to internal migration estimates, which will be incorporated in the population estimates from mid-2017 onwards. These are:

- an improved method to estimate the moves of graduates

- use of a new data source to measure cross-border flows

- a change of concept to allow the inclusion of within-year moves for the first time

These changes reflect Office for National Statistics's (ONS's) commitment to improving our methods, as well as changes in sources upon which the methods are based.

We welcome user feedback on the range of tables and tools that are made available alongside this bulletin, especially the new Population Estimates Revisions Tool. Feedback helps us develop future changes and can be sent at any time to pop.info@ons.gsi.gov.uk.

13 . Quality and methodology

The Population estimates Quality and Methodology Information report and Internal migration Quality and Methodology Information report contain important information on:

- the strengths and limitations of the data and how it compares with related data

- uses and users of the data

- how the output was created

- the quality of the output including the accuracy of the data

Concepts

Mid-year population estimates relate to the usually resident population. They account for long-term international migrants but not for short-term. This approach is consistent with the standard UN definition for population estimates, which is based upon the concept of usual residence and includes people who reside, or intend to reside, in the country for at least 12 months, whatever their nationality.

Mid-year population estimates are compiled to provide information about the size of the population and how it changes over time. This information is used for planning services, managing the economy and in the calculation of rates where a population denominator is required, such as social and economic indicators.

Net international migration estimates quoted in this report include net flows of asylum seekers and refugees where applicable. Other changes include moves of armed forces personnel at home and overseas.

Additional publications available

Measures of statistical uncertainty are available for the years mid-2012 to mid-2015, using the original series of estimates.

Methods guides, which detail the data sources and methodology used to produce the mid-year population estimates are available for the UK countries:

- England and Wales Methodology guide for mid-2016 UK population estimates (England and Wales)

- Internal migration methodology

- Northern Ireland Methodology Report (PDF, 128KB)

- Scotland Mid-year population estimates for Scotland: Methodology Guide 2016

Research and development

Further information and research is published on the population statistics research page.

Revisions policies for population statistics include the mid-year estimates. It explains how revisions to statistics are categorised and implemented by Office for National Statistics (ONS), including revisions following a census. The proposed changes to the methods that lead to this revision were first described alongside the mid-2016 release in Appendix 2 of the population estimates methodology guide, and then updated in population estimates for local authorities in England and Wales, new methods: February 2018.

Developments are taking place in population statistics across ONS. One of the main developments is the production of research outputs, which estimate local authority and small area population based on record-level data linking. These are known as statistical population datasets (SPDs). Releases each autumn compare the latest research outputs with the official mid-year population estimates.