

Statistical bulletin

Rebasing of mid-year population estimates following Census 2021, England and Wales

Rebased mid-year estimates for 2012 to 2021 to align with Census 2021 results. Includes a revised back series of components of population change.



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1 . Main points

- The rebased population estimates slightly increase the population of England for 2012 to 2017 and decrease it for 2018 to 2021 mainly because of revisions to international migration.
- The rebased estimates for England increase the female population and decrease the male population for all years.
- The rebased population estimates decrease the population for both males and females in Wales in all years between 2012 and 2021, with the largest decreases occurring later in the decade.
- In Wales, the decreases to the population estimates for males tend to be larger than those for estimates of females; the largest proportional decreases seen were for young adult males (the 17 to 34 years age group) in Wales.
- These data replace the previously published mid-year estimates and form the new official estimates for the population of England and Wales in 2012 to 2021.

2 . The need for rebasing

Background to this release

Between censuses, we produce annual mid-year population estimates that use the previous Census as a benchmark and roll forward each year. Over the ten-year period between censuses, these rolled-forward estimates can "drift" away from the next census results. This is expected and it is standard practice to investigate the size and causes of the drift, and to rebase our population estimates accordingly. In February 2023 we published our reconciliation reports for England and Wales and local authorities. These identified differences between the mid-year estimates based on Census 2021 and the 2021 rolled-forward mid-year estimates (based on the 2011 Census with a decade of births, deaths and migration incorporated).

The reconciliation report found that the rolled-forward estimates were 268,500 higher for the population of England and Wales in mid-2021. The report then looked at potential causes of these differences.

How we have revised components of population change

Table 1 shows how we have moved from [our initial reconciliation difference as published in our February 2023 article](#) (268,500) by attributing changes to different components, to the final estimates for 2012 to 2021. Table 1 also shows the remaining unattributable population change (UPC) (negative 40,400), which is spread backwards through the decade alongside revised components. This means that after applying new components of change we initially had 40,400 too many people in the rolled-forward estimates.

Throughout this report, when we look at estimates for years up to 2021 and compare changes, these are changes compared with the rolled-forward estimates from 2011 we had before the information from Census 2021 was used. For consistency, the figures for 2021 changes also use the same rolled-forward basis for the comparison. The actual change in the official estimate for mid-2021, based on Census 2021, is minimal, an increase of 18,700 because of updated migration data for the period between Census Day and mid-2021. More information about migration at the UK level can be found in our long-term international migration (LTIM) release. The updated methods and estimates of LTIM for the UK overall are used to inform the rebased population estimates for England and Wales.

Table 1: Factors impacting on reconciliation differences, England and Wales 2021 estimates

Factor	Impact this has on the MYE back series (2012-2021)
Initial difference as published in February reconciliation paper.	268,500
Revision to net international migration flows due to improved methods and data	-177,000
Revised deaths component to incorporate very late death registrations	-30,200
Adjustment to Census-based 2021 mid-year figures, due to improved estimates of Census to mid-year migration for 2021.	-18,700
Removal of a foreign armed forces adjustment previously made, which is superseded by improved international migration estimates.	-3,300
Revision to 2020 births due to COVID derived registration delays.	1,100
Other misc. adjustments	*
Other (assigned as Unattributable Population Change)	-40,400

Source: Office for National Statistics

Notes

1. *represents an adjustment of less than 50 based on rounding changes and Home Armed Forces adjustment.
2. Figures have been rounded to the nearest 100.
3. Totals may not sum due to rounding.

The impact of these components on England and Wales is examined in the following sections.

3 . Revisions to components of population change

How the international migration component of the mid-year estimates has changed

The population estimates in this release contain our latest estimate of migration over the period from 2012 to 2021. These use mainly administrative data, which align with our [Long-term international migration, provisional: year ending June 2023](#) release, including the Home Office Borders and Immigration data, Department for Work and Pensions benefits and earnings data and IPS (International Passenger Survey) data supplemented with the 2021 Census for British Nationals.

The migration data used in this series include adjusted figures for 2021, which affect the previously published Census 2021-based mid-year population estimate, as shown in Table 1.

Figure 1 shows that, for England, the revised international migration estimates for 2012, 2013 and 2019 show slightly higher net migration than the previously published estimates. Figure 1 also shows that all other years up to 2020 have a lower net immigration revised estimate, peaking in 2020 when the revised data are 137,600 lower. The 2021 estimate for net migration is higher than previously published in the rolled-forward 2021 mid-year estimates by 54,900.

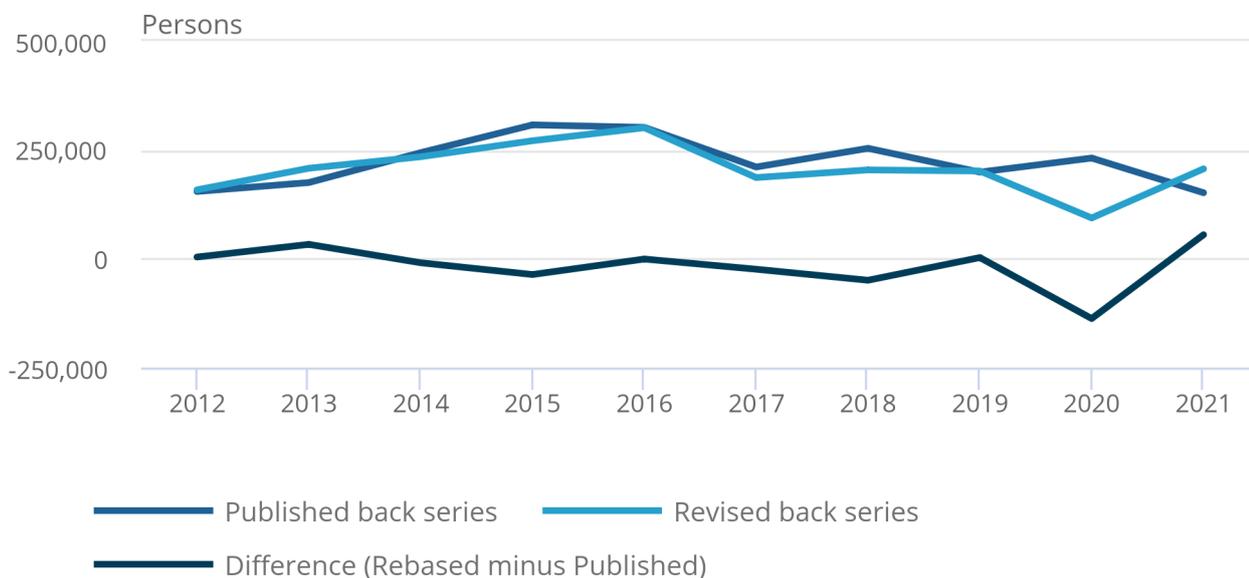
For more information on the methods used to produce the latest estimates of international migration and comparisons to our previously published IPS-based estimates, please see our [Long-term international migration estimates: quality assurance of administrative data methodology](#).

Figure 1: Revised estimates for England show a lower net international migration for most years.

Revised net international migration estimates compared with previously published mid-year estimates component, persons, England, 2012-2021

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Revised net international migration estimates compared with previously published mid-year estimates component, persons, England, 2012-2021



Source: Office for National Statistics

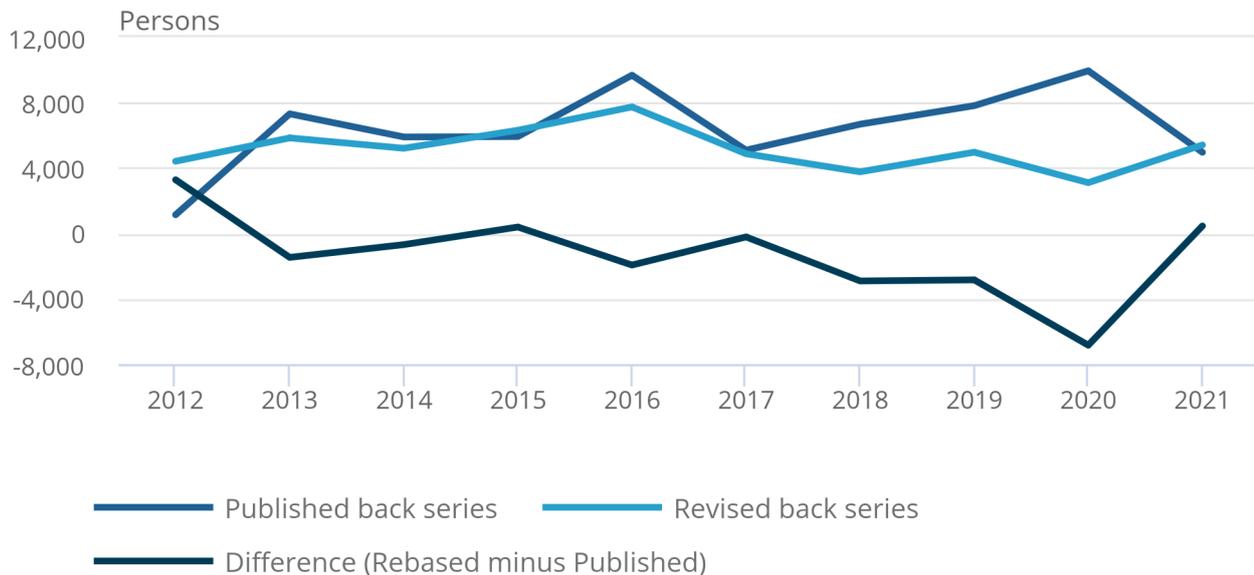
Figure 2 presents the same information for Wales, with higher net migration in 2012 and 2015, and lower net migration for other years leading up to a peak difference in 2020 where the revised data is 6,800 lower than the previously published estimate. Like for England the estimate for mid-2021 is slightly higher (by 400) than previously published.

Figure 2: The revised migration estimates for Wales show a small reduction for most years.

Revised net international migration estimates compared with previously published mid-year estimates component, persons, Wales, 2012-2021

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Revised net international migration estimates compared with previously published mid-year estimates component, persons, Wales, 2012-2021



Source: Office for National Statistics

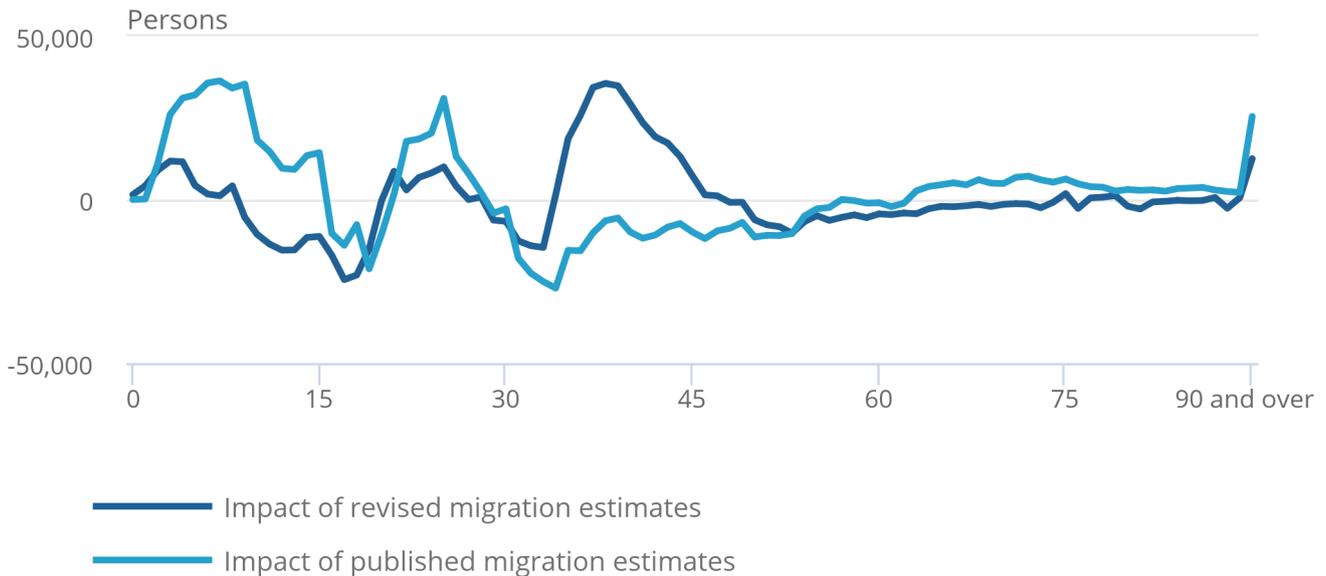
When comparing these migration data over time it is useful to examine the impact these changes have, as they accumulate, on the resulting populations. Impacts of the revised international migration trends are shown below, compared with the differences that our [Reconciliation of mid-year population estimates with Census 2021, England and Wales article](#) found between census-based and rolled-forward 2021 estimates. These charts show how much of the difference we found is accounted for by the revised international migration component.

Figure 3: Using new migration estimates for England decreases the overcount in the population of typical student ages, those aged 50 years and over, and young children.

Impact of using revised migration estimates on population estimates by age, England 2021

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Impact of using revised migration estimates on population estimates by age, England 2021



Source: Office for National Statistics

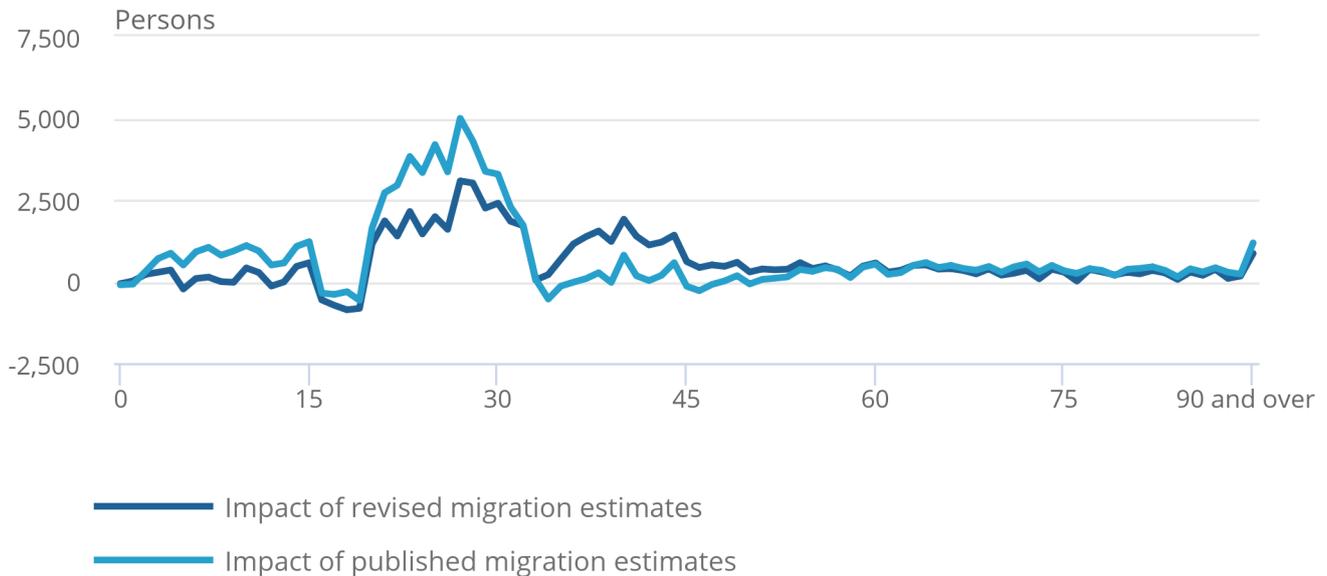
The original difference between census-based and rolled-forward estimates for England was an overcount of 201,700 in the rolled-forward estimates. The revised international migration data removed 164,100 people, reducing the overcount to 37,500. The main age groups affected by these changes were children aged between 3 and 12 years and those in their 20s, mid-30s and late 40s for whom differences were reduced, and adults in their late teens and late 30s to mid-40s for whom differences increased. There was a small reduction in differences for older adults over the age of 65 years.

Figure 4: Using new migration estimates for Wales eliminates most of the child overcount in previously published estimates and reduces overcounts for people in their 20s.

Impact of using revised migration estimates on population estimates by age, Wales 2021

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Impact of using revised migration estimates on population estimates by age, Wales 2021



Source: Office for National Statistics

The original estimate for Wales was an overcount of 66,800 in the rolled-forward mid-year estimates. The revised international migration data removed 12,800 people, reducing the overcount to 54,000. The main age groups impacted by these changes were children under 16 years of age and adults in their 20s and early-30s for whom differences were reduced, and adults in their late-30s, 40s and early-50s for whom differences increased.

This means that overall revised migration figures had a larger proportional impact for England (81.4% reduction in overcount) than for Wales (19.2% reduction in overcount), in terms of explaining the overcounts seen in the reconciliation paper.

The new international migration method allowed the removal of an adjustment previously made annually to prevent double counting moves made by dependents of Foreign armed forces. Over the decade this removal reduced the population estimate for England and Wales by 3,300.

Methods for calculating international migration have fundamentally changed over the decade and are still under development. The impact of these changes is explored in our [Estimating UK international migration: 2012 to 2021](#) article.

How the deaths component of the mid-year estimates series has changed

We have included a minimal adjustment for missed late registrations of deaths, because deaths referred to coroners can create a small series of very late registrations, which fall outside our normal late registration calculation. More details of this adjustment can be found in our [Population estimates for the UK, mid-2021: methods guide](#).

Tables 2 and 3 show the impact of these deaths at the England and Wales levels. The impact is minor and relatively evenly distributed across the years, with the number of male deaths being adjusted more than female deaths for all years. The age distributions of these deaths are spread across the whole age range with the largest numerical impacts for those aged under 1 year and those aged over 90 years as would be expected given these age groups' relatively higher mortality rates.

Table 2: Differences between new deaths component and previously published deaths component, England and Wales, by sex, 2012-2021

Year	Females total	Males total	Total
2012	1,160	2,130	3,290
2013	1,570	2,780	4,360
2014	400	780	1,180
2015	1,060	1,880	2,940
2016	1,020	1,920	2,940
2017	1,370	2,500	3,870
2018	1,250	2,240	3,490
2019	-380	-890	-1,270
2020	1,540	2,970	4,520
2021	1,720	3,170	4,880
Total	10,700	19,490	30,190

Source: Office for National Statistics

Notes

1. The negative value for 2019 reflects the nature of the late registration adjustment where the previous year informs the next year. These negative figures represent an adjustment that was too high for 2019, which has now been adjusted given more complete time series data.
2. Figures have been rounded to the nearest 10.
3. Totals may not sum due to rounding.

Table 3: Differences between new deaths component and previously published deaths component, England and Wales, by country, 2012-2021

Year	England deaths adjustment	Wales deaths adjustment
2012	3,180	110
2013	4,170	180
2014	1,000	180
2015	2,760	180
2016	2,760	180
2017	3,750	120
2018	3,320	180
2019	-1,260	0
2020	3,980	540
2021	4,300	580
Total	27,960	2,250

Source: Office for National Statistics

Notes

1. The negative value for 2019 reflects the nature of the late registration adjustment where the previous year informs the next year. These negative figures represent an adjustment that was too high for 2019, which has now been adjusted given more complete time series data.
2. Figures have been rounded to the nearest 10.
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These extra deaths have been incorporated into the revised population estimates back series published alongside this bulletin and are included in our [published deaths releases](#).

How the births component of the mid-year estimates has changed

Birth registrations were suspended during the early part of the coronavirus (COVID-19) pandemic, which affected our data collation. Data in our [Population estimates for the UK, England and Wales, Scotland and Northern Ireland: mid-2020 bulletin](#) included 99.8% of births in the reference period but omitted approximately 1,120 births in 2020. These births have now been correctly included in the rebased back series and have negligible effect on the population time series (an additional 1,090 births in England and an additional 30 births in Wales in 2020, with no local authority having a difference of greater than 2%).

How the internal migration component of the mid-year estimates has changed

Changes made to the internal migration components of the rebased estimates as a result of improvements to our distributional methods have affected the flow between England and Wales nationally, and for English and Welsh local authorities. The changes to internal migration increase the outflow from England (around 7,100 over the decade) and increase the inflow to Wales (around 7,100 over the decade).

The total flows to and from constituent countries of the UK are agreed between the Office for National Statistics (ONS), National Records of Scotland (NRS) and Northern Ireland Statistics and Research Agency (NISRA), based on records of in-migration to the relevant country. This rebased series does not make any changes to the agreed flows between England or Wales to and from Scotland or Northern Ireland.

How we dealt with residual differences

After we have made revisions caused by the known components of change (the births, deaths, international and internal migration changes, and changes to special populations) there remains some unattributed change in population (UPC) in the 2021 estimates that needs to be allocated back across the decade.

Our research into this and its distribution helped inform decisions and assumptions involved in the construction and distribution of our revised migration estimates. The initial gaps after the incorporation of new admin-based international migration estimates helped to advance further research, which resulted in the adjustment made to increase net emigration flows of British nationals.

The final UPC amounted to negative 40,400 (negative 297,000 males and positive 256,600 females) who needed to be incorporated into the rebased back series after all other revised components had been applied, to ensure that a plausible year-on-year population change converged with the known Census-based mid-2021 population estimate. Tables showing the breakdown of this UPC over time by sex for each local authority and for England and Wales is included in the supporting data download for this bulletin.

We researched different options for spreading this UPC backwards, which would have affected various ages and years differently. We decided to apportion UPC as follows:

- total UPC by local authority, age and sex was calculated (the unexplained population difference in 2021)
- this was then split back over time in proportion to the total international and internal migration churn for an area, ageing back cohorts

A simple fictional example for a hypothetical local authority (Borsetshire) is presented here:

- the total UPC for 21-year-olds in local authority Borsetshire in 2021 was 100
- we looked at the total inflow plus outflow international and internal migration of those aged 12 to 21 years in 2021 (using 2021 data only) and found that 80% of the migration activity (irrespective of in or outflow) occurs at the age of 18 years
- we assigned 80% of this UPC to 2018 when these people would have been aged 18 years
- this means that if this were the only UPC affecting this area, there would be a small UPC adjustment for 2012 to 2017 and 2019 to 2021, at a range of ages (12 years in 2012, 13 years in 2013, and so on). The largest adjustment (UPC of 80) would be to 18-year-olds in 2018, followed by a small adjustment for 19-year-olds in 2019, and 20-year-olds in 2020.

This was compared with the approach used for the post-Census 2011 rebasing, which spread the UPC backwards by cohort evenly, and the new method was judged to be an improvement.

While the 2011 approach would have been simpler to implement, it treats every age as equivalent.

We believe the UPC is most likely to be associated with migration (whether internal or international, and without judging whether it is inflow or outflow), and so we apportion it proportionally to the migration churn over the age profile (so ages more strongly associated with migration had more UPC assigned to them). In practice this increases the amount of UPC assigned to typical student ages and young working ages but does not tend to have a particularly different effect over time. The migration patterns of different age groups tend to be stable over the decade, except for the effects of the coronavirus (COVID-19) pandemic, which have already influenced the migration levels seen.

4 . The impact of changes on the rebased mid-year estimates series

Impact on the population of England, 2012 to 2021

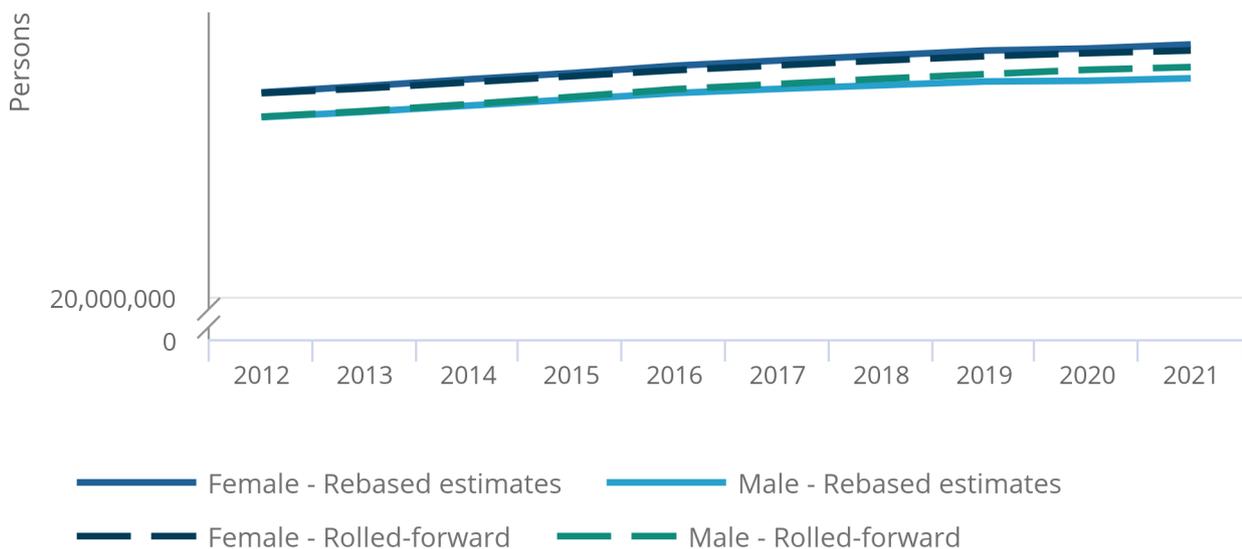
The mid-year estimates published for England have been adjusted to the greatest extent in 2020 (when compared with the rolled-forward figures from the 2011 Census) when they were reduced by 223,800, from 56.55 million to 56.33 million, a percentage change of negative 0.40%. Rebased slightly increased estimates for the years 2012 to 2017. This increase is the result of higher net immigration figures for non-UK nationals than previously estimated. These are only partially counteracted by the increases in UK-born emigration that have resulted from our adjustments, based on analysis of the 2011 and 2021 Census. For 2018 onwards, the rebasing slightly decreases the estimates, again influenced by changes in net migration estimates.

Figure 5: Rebased estimates decreased the number of males and increased the number of females compared to the rolled-forward estimates.

Comparison between rolled-forward mid-year population estimates and rebased back series by sex, England, 2012-2021

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Comparison between rolled-forward mid-year population estimates and rebased back series by sex, England, 2012-2021



Source: Office for National Statistics

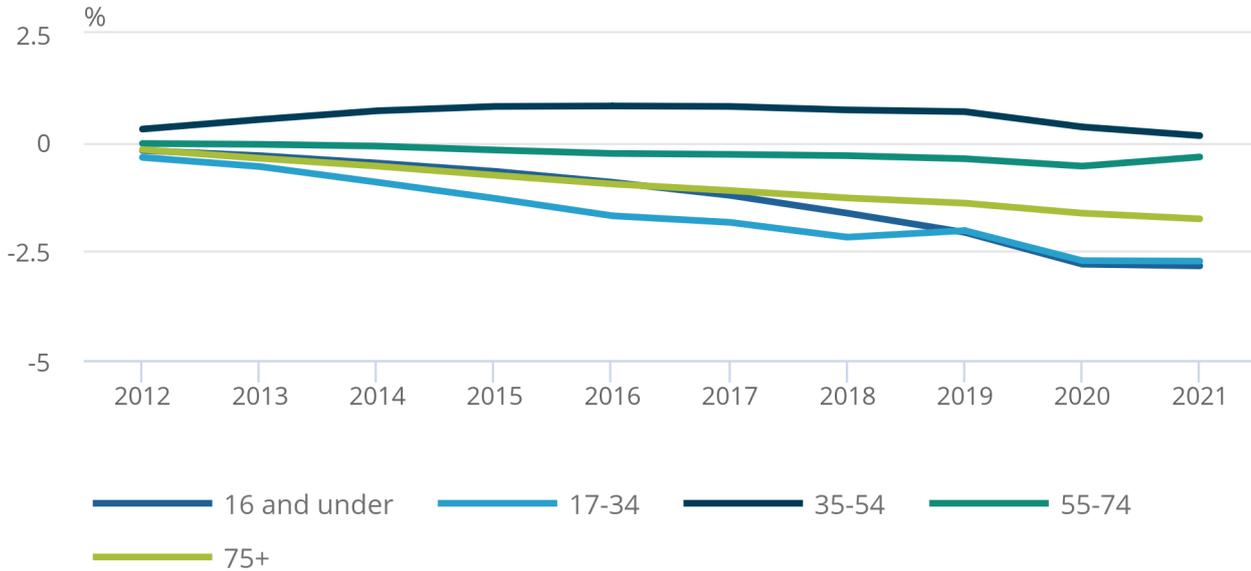
Population estimates were reduced for males in every year. The magnitude of these reductions increased across the decade and peaked in 2021 when the mid-year estimate was reduced by 394,300, from 28.08 million to 27.68 million, in 2021, a percentage change of negative 1.40%. The largest population decreases because of rebasing were seen for male children aged 16 years and under and for working-age males aged 17 to 34 years.

Figure 6: Male children aged 16 years and under saw the largest percentage decrease of all age groups in 2021 as a result of the rebased estimates

Impact of rebased estimates on males, percentage change by age group, England, 2012-2021

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Source: Office for National Statistics

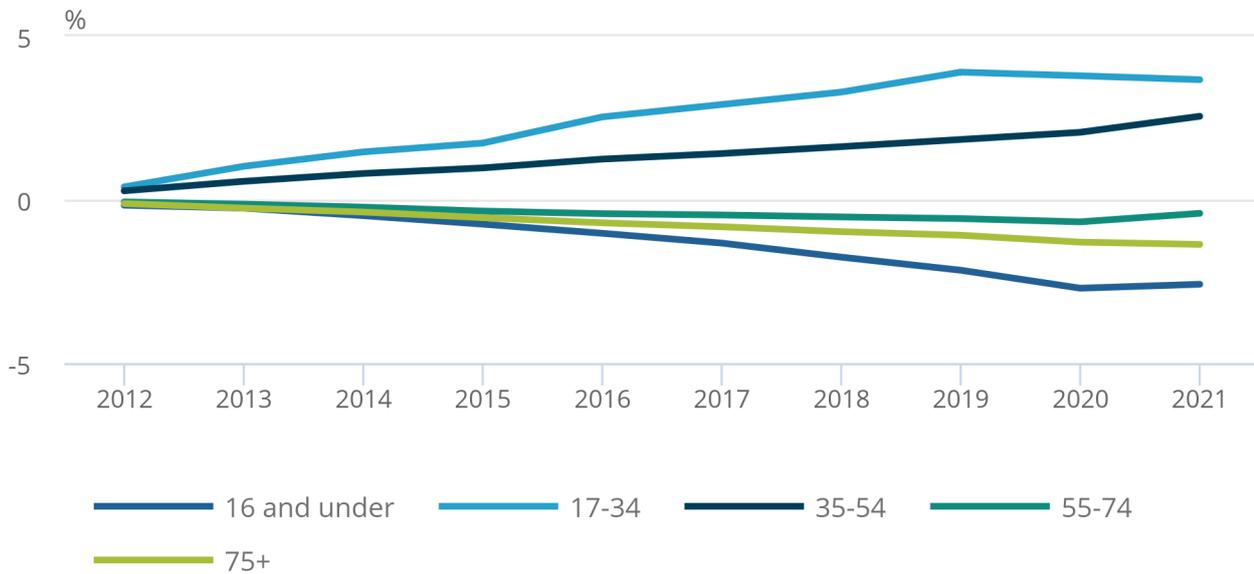
Rebasing increased population estimates for females in England in every year, with the largest change in 2021 when the mid-year estimate increased by 211,100, from 28.66 million to 28.87 million, a percentage increase of 0.74%. Working-age females aged 17 to 34 years saw the largest percentage change across the decade, peaking in 2019 and then steadily declining until 2021. Rebasing decreased population estimates for female children aged 16 years and under, with larger impacts later in the decade.

Figure 7: Female children aged 16 and under saw the largest percentage decrease compared to all age groups while females ages 17-34 years saw the largest percentage increase.

Impact of rebased estimates on females, percentage change by age group, England, 2012-2021

Figure 7: Female children aged 16 and under saw the largest percentage decrease compared to all age groups while females ages 17-34 years saw the largest percentage increase.

Impact of rebased estimates on females, percentage change by age group, England, 2012-2021



Source: Office for National Statistics

Impact on the population of Wales, 2012 to 2021

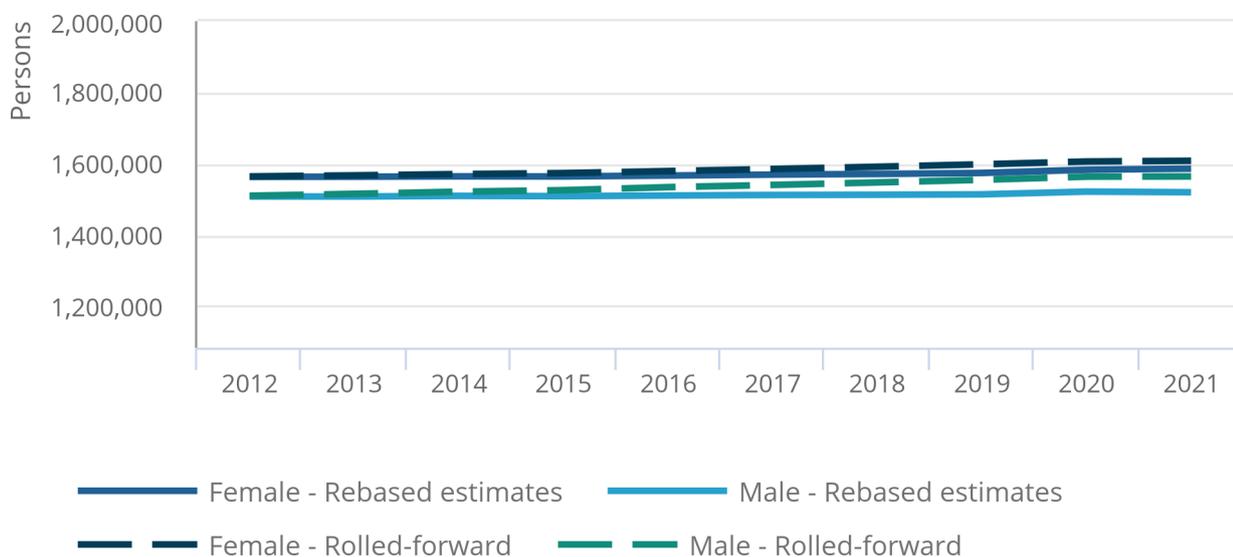
Rebasing reduced the total population estimates published for Wales in every year. The magnitude of this reduction increased from 2012 to 2019 and remained at similar levels from 2019 to 2021, when the mid-year estimate was reduced by 66,600, from 3.17 million to 3.11 million (when compared with the rolled-forward figures from the 2011 Census), a percentage change of negative 2.10%. This was a proportionally larger reduction than that seen for England.

Figure 8: Rebased estimates for Wales decreased the number of both males and females compared to the rolled-forward estimates.

Comparison between rolled-forward mid-year population estimates and rebased back series by sex, Wales, 2012-2021

Figure 8: Rebased estimates for Wales decreased the number of both males and females compared to the rolled-forward estimates.

Comparison between rolled-forward mid-year population estimates and rebased back series by sex, Wales, 2012-2021



Source: Office for National Statistics

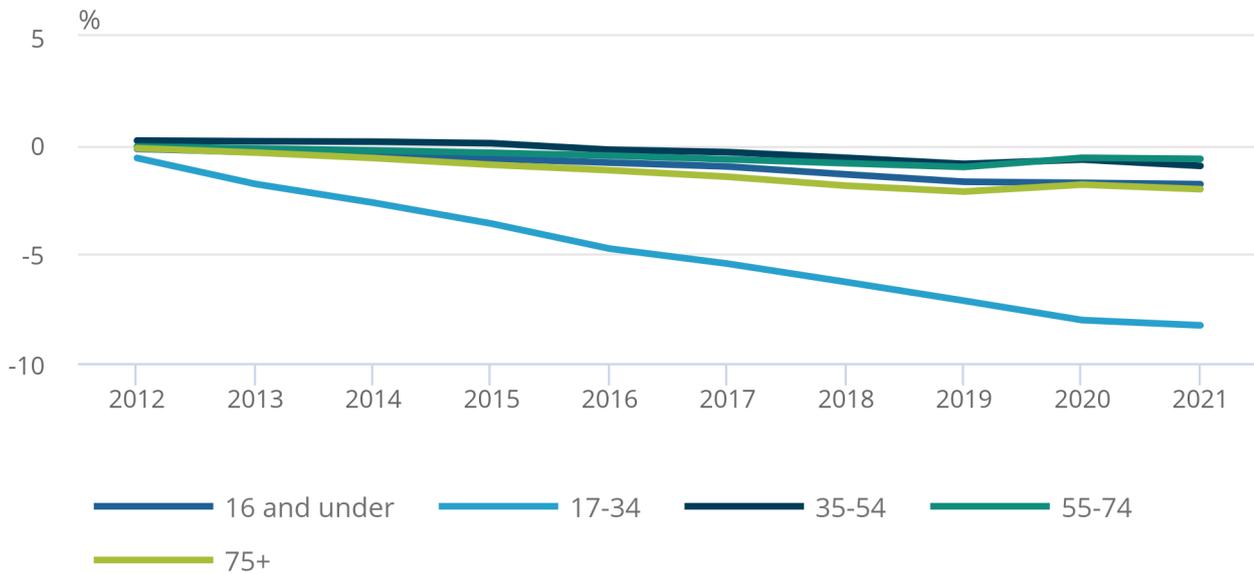
Population estimates for males were reduced in every year. This reduction increased in magnitude across the decade, peaking in 2021 when the mid-year estimate was reduced by 44,400, from 1.56 million to 1.52 million, in 2021, a percentage change of negative 2.84%. The largest population decreases because of rebasing were seen for males aged 17 to 34 years.

Figure 9: Males aged 17-34 saw the largest percentage decrease compared to other age groups as a result of the rebased estimates.

Impact of rebased estimates on males, percentage change by age group, Wales, 2012-2021

Figure 9: Males aged 17-34 saw the largest percentage decrease compared to other age groups as a result of the rebased estimates.

Impact of rebased estimates on males, percentage change by age group, Wales, 2012-2021



Source: Office for National Statistics

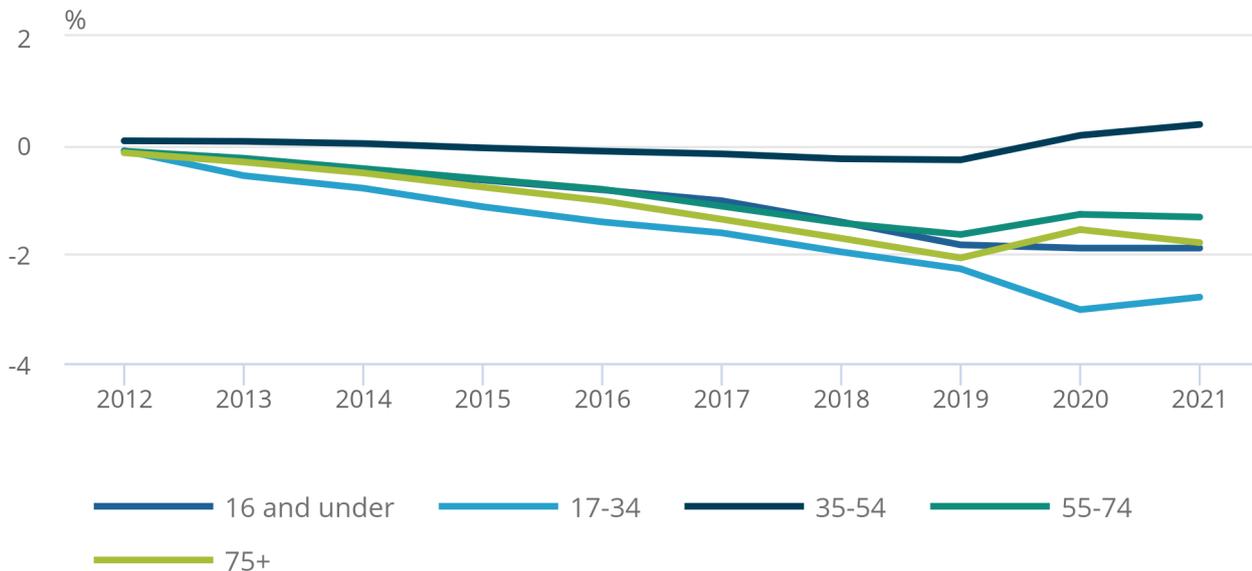
Rebasing decreased mid-year estimates for females in Wales in every year, peaking in 2019 when the estimate decreased by 24,300, from 1.60 million to 1.57 million, a percentage change of negative 1.52%. This decrease was largest for working-age females aged 17 to 34 years, but most age groups were affected.

Figure 10: Working age females aged 17 to 34 years decreased more than other age groups as a result of the rebased estimates.

Impact of rebased estimates on females, percentage change by age group, Wales, 2012-2021

Figure 10: Working age females aged 17 to 34 years decreased more than other age groups as a result of the rebased estimates.

Impact of rebased estimates on females, percentage change by age group, Wales, 2012-2021



Source: Office for National Statistics

Future publications of population data

Following this publication of the rebased back series for England and Wales, we will be revising a range of other statistics that use these estimates, and they will feed into our next round of national and subnational projections.

Analysis of the impact of rebasing on local authorities is planned for publication in early 2024, to assist users in exploring the local impacts of this rebased back series.

Our [Population estimates for England and Wales: mid-2022](#) bulletin presents data that build on these rebased figures for 2021.

In the coming months we will publish the latest admin-based population estimates (ABPE) from our dynamic population model (DPM), which will use these revised components to inform its modelling and provide additional insight into patterns of population change over time.

5 . Population Estimates data

[Estimates of the population for England and Wales](#)

Dataset | Released 23 November 2023

National and subnational mid-year population estimates for England and Wales by administrative area, age and sex, 2012 to 2022.

[Population estimates: quality information](#)

Dataset | Released 21 December 2022

Quality information on the mid-year population estimates at local authority and region level for England and Wales, by age and sex.

6 . Glossary

Components of change

Components of change are the factors that contribute to population change. This includes births and deaths (referred to as natural change) and net migration. Migration includes movements of people between the UK and the various countries of the world (international migration) and between local authority areas within the UK (internal migration).

Internal migration

Internal migration describes moves made between local authorities, regions or countries within the UK. Unlike international migration, there is no internationally agreed definition.

Net flow

The net flow is the inflow minus the outflow. Positive net flows (greater than zero) indicate the inflow is larger than the outflow, that is, a net inflow. Negative net flows (less than zero) indicate the outflow is bigger than the inflow, that is, a net outflow.

Usually resident population

These data estimate the usually resident population. The standard United Nations definition is used, including only people who reside in a country for 12 months or more, making them usually resident in that country. As such, visitors and short-term migrants are excluded.

Unattributable population change (UPC)

UPC is the remaining population change that can be seen between census-based and rolled-forward population estimates, which are not explained by any of the components of change we measure. This is a natural feature of rebasing the estimates and represents uncertainty around the components and the base populations. This is allocated across the decade to create a plausible distribution of change.

Census-based estimates

The method used in years in which a census take place. The mid-year estimates (MYEs) are based on the census estimates rolled forward only by the time between Census Day and 30 June.

Rolled-forward estimates

The practice of using the population estimate from the previous reference date as the starting point for estimating the population at the current reference date. The previous population estimate is aged on, and data on births, deaths and migration are used to reflect population change during the reference period.

7 . Measuring the data

The mid-year estimates for England and Wales are produced by the Office for National Statistics (ONS).

Estimates are produced by updating a census base using a standard demographic method: the cohort component method. These estimates cover the usually resident population. The mid-2021 population estimates are primarily based on Census 2021 (for England and Wales). The resident population, as at Census Day (21 March 2021), by single year of age, is aged on to 30 June, and then flows are applied to cover births, deaths and net migration. Censuses provide the most accurate estimate of the population and therefore the reliability of these mid-year estimates is very high immediately following a census.

Detailed information on the methods and data sources used can be found in our [Population estimates for England and Wales, mid-2022: methods guide](#).

Quality

More quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in our [Mid-year population estimates Quality and Methodology Information \(QMI\) report](#).

For local authority population estimates in England and Wales, confidence intervals from Census 2021, which compare age-sex estimates in Census 2021, are available in our [Local authority comparisons tool \(XLS, 2.39MB\)](#). These confidence intervals reflect most of the uncertainty in the 2021 mid-year estimates.

If you would like to provide feedback on local level population estimates, with the aim of adding commentary to such statistics and informing future research, use our [Population estimates: contextual information feedback form](#).

8 . Strengths and limitations

Strengths

- These are the official population estimates of England and Wales and incorporate estimates derived from Census 2021.
- Mid-year population estimates for reference periods immediately following a census are considered to be highly reliable.
- Information from administrative registers, such as the numbers of births and deaths, is considered to be very reliable.
- Estimates include data on moves between local authorities and between countries of the UK (internal migration).
- These estimates include our very latest international migration methods and data.

Limitations

- The data are not counts, rather they are estimates created by combining many different data sources.
- The data sources used are the best available on a nationally consistent basis down to local authority level, but the estimates are subject to the coverage and error associated with these sources.
- Our international migration methods are still under development and may see further revisions as they mature.

9 . Related links

[Estimating UK international migration: 2012 to 2021](#)

Article| Released 23 November 2023

How migration has changed over the decade, the methods used to produce the updated series and the evidence used to demonstrate confidence that the new methods are robust.

10 . Cite this statistical bulletin

Office for National Statistics (ONS), released 23 November 2023, ONS website, statistical bulletin, [Rebasing of mid-year population estimates following Census 2021, England and Wales](#)