Article

Admin-based population estimates: updated estimates for local authorities in England and Wales, 2021 to 2022

Updated admin-based population estimates for all local authorities in England and Wales, 2021 to 2022.

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1 . Main points

- We are continuing to develop our research into the new dynamic population model (DPM), which aims to estimate population and population change in a timely way, to better respond to user needs.
- We have used the DPM to produce updated admin-based population estimates (ABPEs) for mid-year 2021 and 2022 for all 331 local authorities in England and Wales.
- Updated ABPEs are defined as experimental statistics.
- Updated ABPE best estimates for mid-year 2022 give a total England and Wales population of 60,236,396 people: a 1.0% increase on the mid-year 2021 ABPE, with the largest increases occurring in London local authorities, in line with our expectations.
- For England, the total population estimate for mid-year 2022 is 57,108,862 people (1.1% year-on-year increase); for Wales, it is 3,127,535 people (0.7% year-on-year increase).
- We have further developed our methods and updated our input data since publishing our provisional estimates in February 2023; this work is ongoing, and we welcome feedback from users about these experimental statistics and our methods.

These are experimental statistics from research into a methodology that is different to what is currently used in the production of population and migration statistics. This article should be read alongside the estimates to avoid misinterpretation. These outputs must not be reproduced without this warning.

2 . Overview of the admin-based population estimates using the dynamic population model

Transforming population statistics

The census has evolved over time, providing a snapshot every 10 years into who we are and how we live. The census and our census-based mid-year estimates currently provide the best picture of the population at a moment in time. However, the coronavirus (COVID-19) pandemic underlined the need for more timely population estimates and we are committed to maximising the use of administrative data to increase efficiency by making the best use of data already available. We are researching new ways to produce population and social statistics.

In July 2022 we introduced the dynamic population model (DPM) as our future proposal for producing timely, coherent population statistics. The previously published admin-based population estimates (ABPEs) were re-branded as Statistical Population Datasets (SPD). This reflects that they are not a finalised estimate, but feed into the DPM where the strengths of the SPD are used alongside other data sources to produce coherent and timely estimates from admin data.

In February 2023 we provided our first provisional estimates for all 331 local authorities in England and Wales from mid-year 2011 to mid-year 2022. We showed results from our best estimate that incorporates Census 2021 data, and an estimate that approximates what users might expect to get in the future as we move beyond the census year. In this article we provide an update to those provisional best estimates for mid-year 2021 and 2022, incorporating further development of our methods and updates to the input data.

In this article the updated ABPEs are defined as experimental statistics because we continue to refine our methods for producing the ABPEs and these are still subject to further evaluation. Therefore, these statistics have limited use for decision-making. However, the ABPEs demonstrate the potential to produce more timely and coherent estimates of the population compared with our current approaches. We set out the details of the developments in data sources and methodology in our Dynamic population model, improvements to data sources and methodology for local authorities, England and Wales: 2021 to 2022 methodology.

The Office for National Statistics (ONS) will seek National Statistics status once we have developed the methods for producing the ABPEs to an appropriate standard, and after further consultation with users.

We have updated our assessment of the ONS's progress towards a transformed population and migration statistics system. For more information, please see our Population and migration statistics transformation in England and Wales, research overview: 2023 article. This summarises our research underpinning the consultation on the future of population and migration statistics in England and Wales, launching on 29 June 2023. The consultation will feed into the National Statistician’s upcoming recommendation on the future of population and migration statistics in England and Wales

Ourpopulation statistics sources guidehelps users find the right population statistics for them.

The dynamic population model

The dynamic population model (DPM) uses a range of sources to estimate population counts and the components of population change. As with the current mid-year estimation (MYE) process, the cohort component method structures our population modelling.

The DPM balances the available information on population stock at specific points in time with the flow components over time to produce a coherent set of estimates. DPM estimates and the data sources used as population stock inputs in the framework refer to the population at mid-year on 30 June for the reference year.

A significant advantage of the DPM is its flexibility. While it uses administrative data sources as stock datasets each year, it can incorporate other data sources when they become available. This could include sources relating to local areas or particular population groups, or sources that represent the total population. The model can also adapt to quality issues in our underlying data sources, drawing strength across data sources and balancing information available from population stocks and flows based on their respective measures of uncertainty.

Our updated ABPEs have therefore been produced despite there being quality issues in some of the data used for the internal migration component of the estimates. This is a significant benefit compared with our current official mid-year estimates, which have been delayed in 2023 because of a data issue. For more information, please see our Provisional plans for publishing the latest population and migration estimates statement.

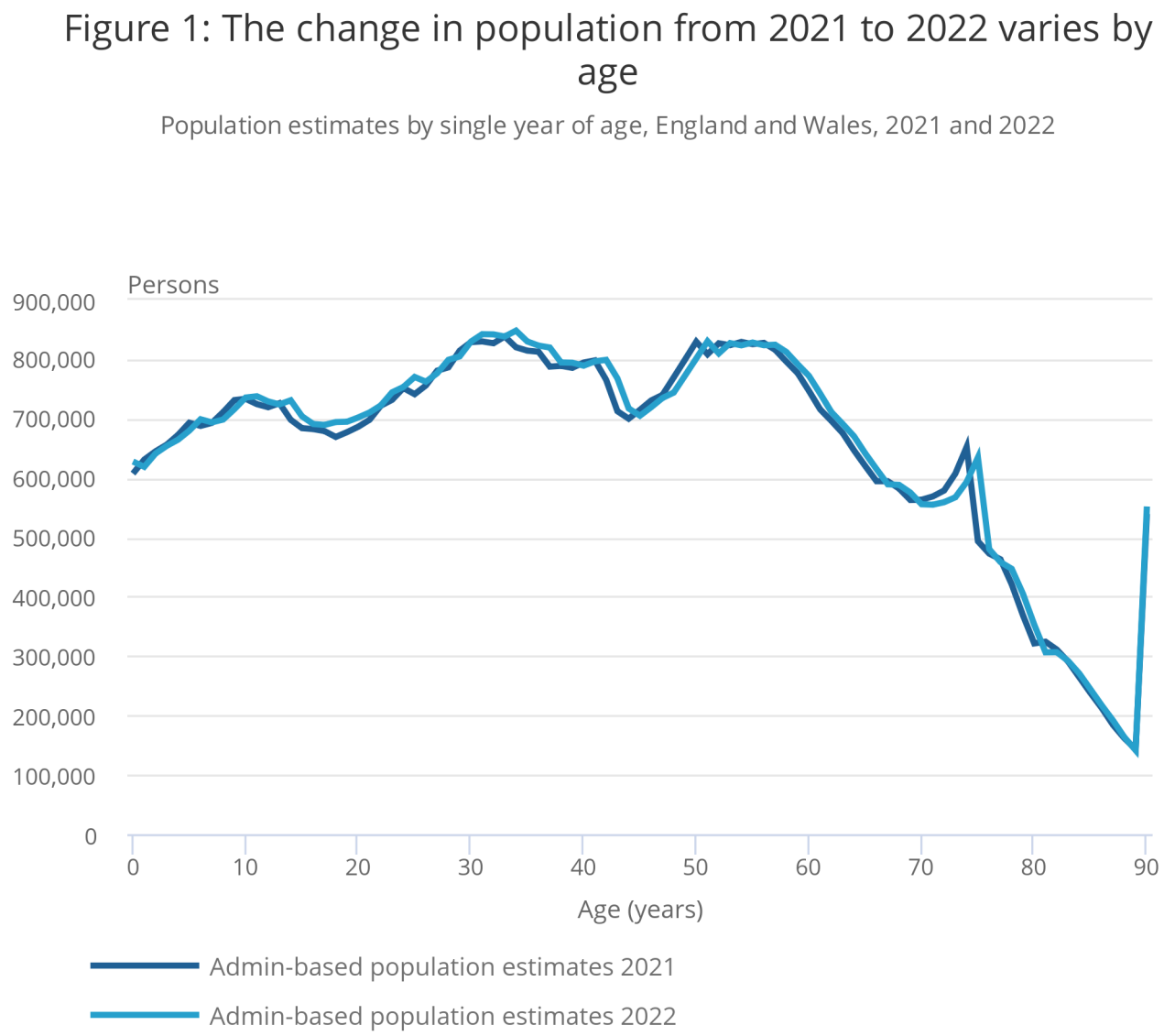
3 . Admin-based population estimates for mid-year 2022

Our best possible population estimates from the dynamic population model (DPM) incorporate Census 2021-based mid-year estimates (MYE) as our best picture of the population in June 2021. These also take into account uncertainty measures derived from Census 2021. The DPM uses this information along with birth and death counts, as well as statistical models for birth, death, and migration rates, to produce estimates for mid-year 2022.

Our updated experimental estimate for the mid-year 2022 population of England and Wales is 60,236,396, a 1.0% increase on the mid-year 2021 estimate. For England, the population estimate for mid-year 2022 is 57,108,862 (1.1% increase) and for Wales the population estimate is 3,127,535 (0.7% increase).

Figure 1: The change in population from 2021 to 2022 varies by age

Population estimates by single year of age, England and Wales, 2021 and 2022



Source: ABPE updated estimates from the Office for National Statistics

Notes:

1. Population at aged 90 years refers to all those aged 90 years and over.

The change in population between two years for a given age is determined by ageing of the relevant birth cohorts and by components of change (births, deaths and migration). The population of children aged under 10 years is estimated to have decreased, while there are increases in the young adult population because of migration. There are also increases for the oldest age groups as the population ages. Changes for those aged from 70 to 76 years reflect rapid changes in birth cohort sizes immediately after World War II.

Figure 2: The largest changes in population between 2021 and 2022 are in London local authorities

Percentage change in total local authority population from mid-year 2021 to 2022

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Two local authorities with very small population sizes have outlying results (City of London (24.3%) and Isles of Scilly (9.6%)) and are excluded from the chart in Figure 2. Estimates for these populations are included in totals for England and Wales and are shown in the population pyramids in Figure 3.

Excluding these outliers, the largest percentage increases in population are in London local authorities: Tower Hamlets (4.8%), Westminster (3.5%) and Newham (3.0%).

Outside London, the largest increases are in South Derbyshire (2.8%), Exeter (2.6%) and Manchester (2.6%).

Out of the 331 local authorities, 15 show a decrease in population between June 2021 and June 2022, with the largest decrease in South Staffordshire (negative 0.9%) in the West Midlands. There are 12 local authorities where our provisional admin-based population estimates (ABPEs) published in February 2023 suggest a small decrease in population in the year to June 2022, but updated ABPEs show small increases. The provisional estimates for one local authority, South Kesteven, show a small increase (0.1%), but now updates show the population is unchanged. More details on the differences between our provisional and updated estimates are discussed in Section 4: Developments to the dynamic population model.

England and Wales local authority estimates for 2021 and 2022

Figure 3 presents population pyramids for mid-year 2021 and 2022 for all local authorities, comparing the updated ABPE best estimate with the official MYE for 2021.

Figure 3: Local authority population pyramids

Admin-based population estimates (ABPE) and mid-year estimate (MYE) population estimates by local authority, sex and age, England and Wales

Notes

1. Mid-year estimate not available for 2022.

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4 . Developments to the dynamic population model

The dynamic population model (DPM) and resulting admin-based population estimates (ABPEs) show potential for producing timely, coherent population statistics.

With the results published in February 2023, we demonstrated our ability to produce early provisional estimates for mid-year 2022 for all 331 local authorities in England and Wales. We also showed the need for a coverage adjustment method for administrative population data sources.

We have made improvements since our February 2023 publication, which included:

- replacing the Statistical Population Dataset (SPD) version 3.0 with version 4.0
- updating our approach to create coverage adjusted population stocks
- updating internal and international migration data
- adding migration flow counts to account for some special populations
- adjusting migration rates to use age at time of event, rather than age at mid-year

We will further update these APBEs as we continue to develop the methodology and as further input data sources become available.

These improvements and plans for further development are described in more detail in our Dynamic population model, improvements to data sources and methodology for local authorities, England and Wales: 2021 to 2022 methodology.

Comparison of updated ABPEs with provisional estimates

Table 1: The updated ABPEs for England and Wales are very similar to provisional ABPEs
First provisional and updated ABPEs for mid-year 2021 and 2022, England and Wales

Mid-year	Provisional ABPE	Updated ABPE	% difference
2021	59,648,423	59,620,119	-0.05%
2022	60,134,268	60,236,396	0.17%

Source: ABPE provisional and updated estimates from the Office for National Statistics

2021

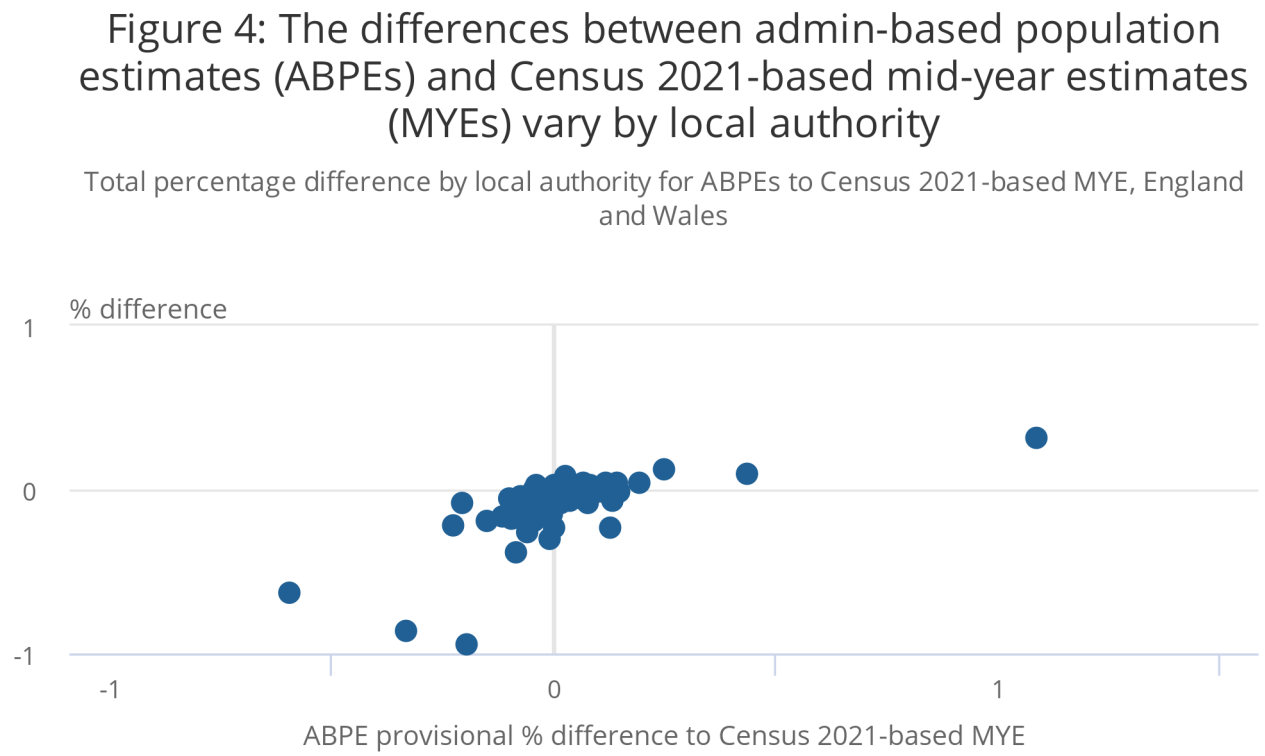
As Census 2021-based mid-year estimates (MYE) are used as an input to the model, outputs are very similar to Census 2021-based MYE. There are small differences as the DPM balances the information available from population stocks and flows based on their respective measures of uncertainty.

In the provisional ABPE best estimates, the largest difference to Census 2021-based MYE for total population by local authority is a 1.1% overestimate in Eden. Eden also shows the largest overestimate in the updated ABPE, at 0.3%. The largest underestimate in the provisional results is 0.6% in Cambridge and this difference is similar in the updated ABPE. Kensington and Chelsea, and Westminster have larger underestimates (0.9%) in the updated ABPE.

Differences in 2021 provisional and updated ABPE are mainly caused by updates to the migration data and updates to the coverage adjusted stock data (particularly for 2020). In addition, the uncertainty of the Census 2021-based MYE assumed in the model determines the extent to which the ABPE can deviate from Census 2021-based MYE.

Figure 4: The differences between admin-based population estimates (ABPEs) and Census 2021-based mid-year estimates (MYEs) vary by local authority

Total percentage difference by local authority for ABPEs to Census 2021-based MYE, England and Wales



Source: Mid-year estimates, admin-based population estimates from the Office for National Statistics

2022

We do not yet have a reliable administrative data source for the population stock in June 2022 because of delays in data delivery and quality concerns. DPM uses Census 2021-based MYE data along with birth and death counts and statistical models for birth, death, and migration rates to produce estimates for mid-year 2022. We are working on developing the DPM system to enable production of regular estimates and to ensure that data are received to meet our production cycle. In future iterations, we hope to publish estimates that include a stock for all years in our updated estimates.

The changes to ABPE from the provisional estimates to updated estimates at a local authority level are generally small. Excluding the City of London as an outlier (6.8% increase), the changes range from a 1.3% increase (Hounslow) to a 1.7% decrease (Oxford) from provisional ABPE.

The largest increases are in urban areas outside of central London and the largest decreases are in some university cities and London boroughs. The differences are strongly related to the updates to international migration estimates used as inputs to the DPM.

While some London boroughs and university cities have slightly lower population estimates for mid-year 2022 than in the provisional ABPE, they are still showing population growth from mid-year 2021 (as shown in Figure 2)

Figure 5: The differences between provisional and updated admin-based population estimates (ABPEs) vary by local authority

Total percentage difference by local authority for updated ABPEs to provisional ABPEs, England and Wales, 2022

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Oxford provisional and updated estimates for mid-year 2022

Our February 2023 publication showed a shift in age peak in the Oxford male population estimates, with a very sharp population peak for those aged 20 years for mid-year 2022. Figure 6 compares the provisional and updated ABPEs for males in Oxford in 2022; credible intervals show the levels of uncertainty in the estimates. The age profile in the updated ABPE peaks at those aged 20 years, but is lower and wider than in the provisional ABPE and is more in line with the long-term trend.

The net migration suggested by the updated input data is lower overall than that used in the provisional estimates, but quite similar at the peak for those aged 19 years (age at end June 2022). Our improved method of calculating migration rates to reflect age at the time of move redistributes the population in the student age group. We expect these estimates to be further improved with a population stock dataset for June 2022.

Figure 6: Oxford male population age profile is improved in updated ABPEs

Oxford male population estimates by age, 0 to 40 years, 2022

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Harrogate provisional and updated estimates for mid-year 2022

For our updated ABPEs, we use data from the MYE components of change series to include an adjustment to migration rates to improve how we account for special populations. In Harrogate, this change has a significant impact on the 2022 ABPE and improves the robustness of the estimates through the timeseries. This small local authority includes the Army Foundation College, a military training centre for people aged 16 and 17 years. The resulting migration flows of (mainly) young males into and out of the local authority were not captured in the migration rates used for our provisional ABPE.

The provisional and updated ABPE mid-year 2021 population estimates are essentially identical and show a peak at those aged 17 years, in close agreement with Census 2021-based MYE. The provisional ABPE mid-year 2022 population estimates (with unadjusted migration flows and no population stock dataset for June 2022) aged on the population present in 2021 to give a peak at those aged 18 years, rather than the expected 17 years.

The updated ABPEs show a smaller, wider peak at those aged 17 and 18 years for mid-year 2022. Model diagnostics are improved in the updated version but still indicate problems with the estimation process for some cohorts. We expect these estimates to improve further with a population stock dataset for June 2022, and with more research into how best to adjust modelled migration rates to account for moves that occur for specific cohorts at specific times of the year.

Figure 7: Harrogate male population age profile is improved in updated ABPEs for mid-year 2022

Harrogate male population estimates by age, 0 to 30 years, 2021 and 2022

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5 . Admin-based population estimates for local authorities in England and Wales: 2021 to 2022 data

Admin-based population estimates for local authorities in England and Wales
Dataset | Released 27 June 2023
Admin-based population estimates for all local authorities in England and Wales from the dynamic population model.

6 . Glossary

Administrative data

Collections of data maintained for administrative reasons, for example, registrations, transactions, or record-keeping. They are used for operational purposes and their statistical use is secondary. These sources are typically managed by other government bodies.

Dynamic population model

A dynamic population model (DPM) is a statistical modelling approach that uses a range of data to measure the population and population changes in a fully coherent way.

Credible intervals

The range in which the true value of the quantity being estimated is likely to be contained. This is a similar concept to the confidence intervals published for the current mid-year estimates (MYE) and Census 2021 estimates. We use 95% credible intervals in this article by taking 2.5th and 97.5th percentiles from the distributions of counts produced by our estimation process as the lower and upper bounds of our intervals respectively. In this case, we can say that the probability that the true value lies in the credible interval is 95%.

Model diagnostics

Statistical measures of model performance that are used to assess the robustness of the estimates produced by a statistical modelling approach

Experimental statistics

Official statistics that are in the testing phase and not yet fully developed

7 . Future developments

The dynamic population model (DPM), and resulting admin-based population estimates (ABPE), show potential for producing timely, coherent population statistics.

With these results, we have updated our provisional estimates for mid-2022 for all 331 local authorities in England and Wales. These updated ABPEs are now defined as experimental statistics. We will compare these experimental statistics with the official mid-year estimates for 2022 in autumn 2023.

In December 2023 we will provide further updated estimates for all local authorities from 2011 to 2022 alongside provisional estimates for mid-year 2023.

Planned improvements are outlined in our Dynamic population model, improvements to data sources and methodology for local authorities, England and Wales: 2021 to 2022 methodology.

8 . Provide feedback

We welcome your feedback on the dynamic population model (DPM), our transformation journey, and our latest progress and plans. If you would like to contact us, please email us at2023Consultation@ons.gov.uk.

We have launched our Local population statistics insight feedback framework, which enables users of population statistics to provide feedback at local authority level and suggest data sources for us to better understand the quality of our estimates.

You can also sign up toemail alerts from the Office for National Statistics Population teamfor updates on our progress, and to hear about upcoming events and opportunities to share your views.

9 . Collaboration

The Office for National Statistics (ONS) has been supported in this research by the University of Southampton. Specifically, we would like to thank John Bryant, Peter Smith, Paul Smith, Jakub Bijak, Jason Hilton, Andrew Hind, Erengul Dodd and Joanne Ellison for their guidance and support.

10 . Related links

Admin-based population estimates: provisional estimates for local authorities in England and Wales, 2011 to 2022
Article | Released 28 February 2023
Provisional admin-based population estimates for all local authorities in England and Wales from the dynamic population model.

Population and migration statistics transformation in England and Wales, research overview: 2023
Article | Released 26 June 2023
A summary of our research on the future of population and migration statistics in England and Wales, underpinning our consultation on the proposed new system.

Dynamic population model, improvements to data sources and methodology for local authorities, England and Wales: 2021 to 2022
Methodology | Released 27 June 2023
Developments of methods and data used in the dynamic population model.

Case studies for the population and migration statistics transformation in England and Wales: 2023
Article | Released 27 June 2023
Case studies for Manchester, Blackpool, Ceredigion, Cambridge and Newham showcasing our admin-based research outputs.

11 . Cite this article

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