Reflections on the UK journey through the statistical transformation of population statistics

Dominic Webber, UK Office for National Statistics

Group of Experts on Population and Housing Censuses

Office for National Statistics

Agenda

- Overview of ABPEs
- How ABPEs are produced by the dynamic population model (DPM)
- Input data to the DPM
- Strengths and limitations
- Similarities and differences: ABPEs vs official mid-year population estimates
- Our latest release
- Key users and uses of the statistics
- Next steps

What are mid-year admin-based population estimates (ABPEs)?

- Official statistics in development
- Aiming for ABPEs to be the official estimate of the population in 2025
- Refer to mid-year reference point (30 June)
- Produced by the dynamic population model (DPM) at LA level by single year of age and sex
- Derived using a wide range of admin data
- Timely provisional ABPE around 6 months after the reference period
- Improved updated ABPEs around 12 months after the reference period when more data are available

How the DPM produces the ABPEs

The DPM is a statistical modelling approach that uses a wide range of data to measure the population and population change in a fully coherent way.

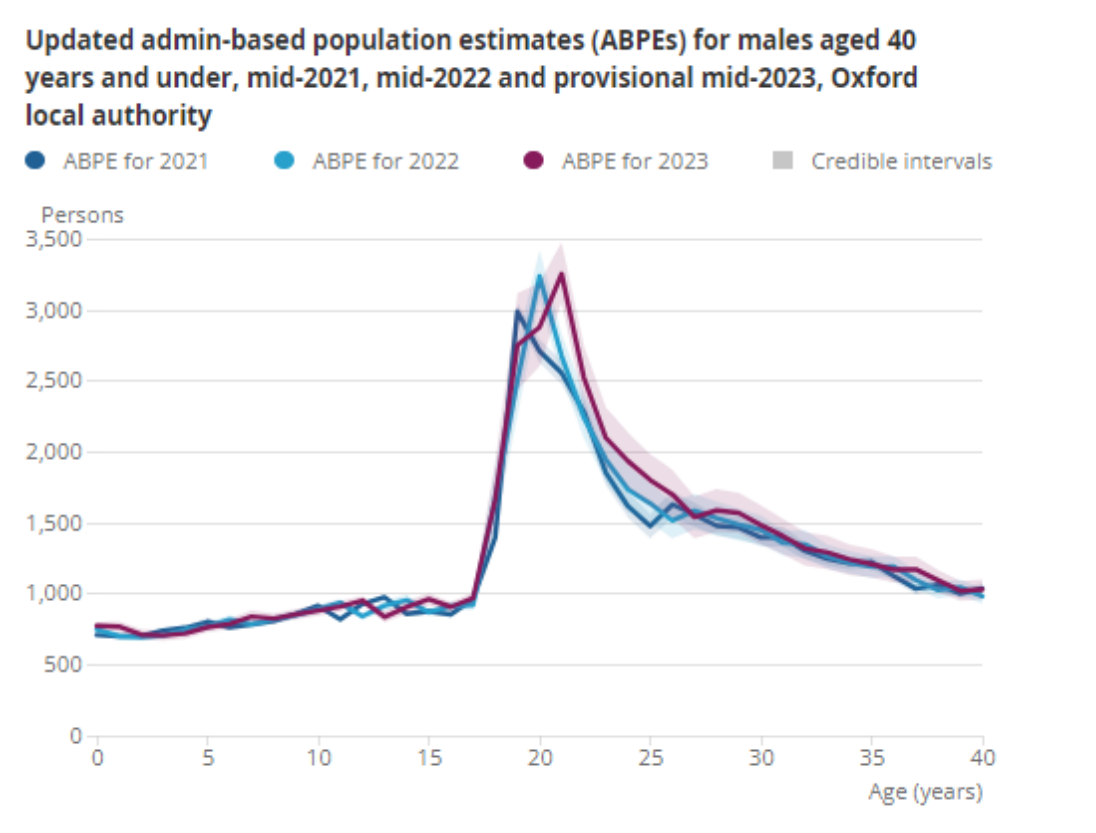
The count of a population in an area at a particular time point is calculated as:

The count of that population at a previous time point **+** the number of people born or who arrived because of migration **−** The number of people who died or who migrated out of that area in the intervening period **=** The count of the population in an area at a particular time

The DPM balances the inputs against each other, so if a large change in one component is not reflected in other components, then it will consider the relative strength of each and take this into account

How the DPM produces the ABPEs

- Creates a distribution of potential population and migration counts
- Our estimates of the population and components of population change are the **average (mean) value**
- **Credible intervals** illustrate the uncertainty around the estimates. The probability the true value lies in the credible interval is 95%
- Estimates by LA, single year of age and sex can be **summed to give higher level estimates**
- Credible intervals cannot be summed



ABMYE Dec 23 publication

DPM Input data: population stock

- Estimate of usual resident population on 30 June each year
- Local authority level by single year of age and sex
- Can use more than one stock in a single year
- Produced independently for each year
- Coverage adjustment accounts for under- or over-estimated population groups
- Estimates of uncertainty in the population stock are also provided to the DPM

Population stock: mid year

Such as:

- **Statistical population dataset (SPD)**
- **Personal demographics service (PDS)**

DPM Input data: flow estimates and counts

- Flow data estimates changes in the population stock over time
- Local authority level by single year of age and sex

Flow estimates and counts: 12 months to mid-year

- **International migration**
- **Internal migration and cross-border moves**
- **Births** (counts treated as exact)
- **Deaths** (counts treated as exact)

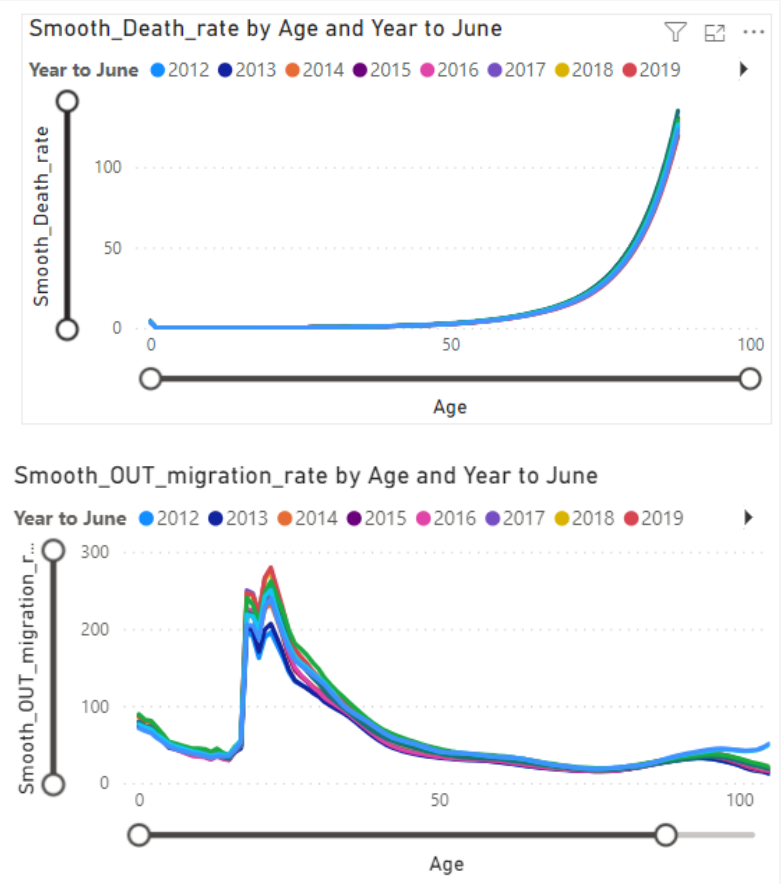
DPM Input data: demographic rates

Demographic rates

Calculated and smoothed over time
Provide information on underlying trends

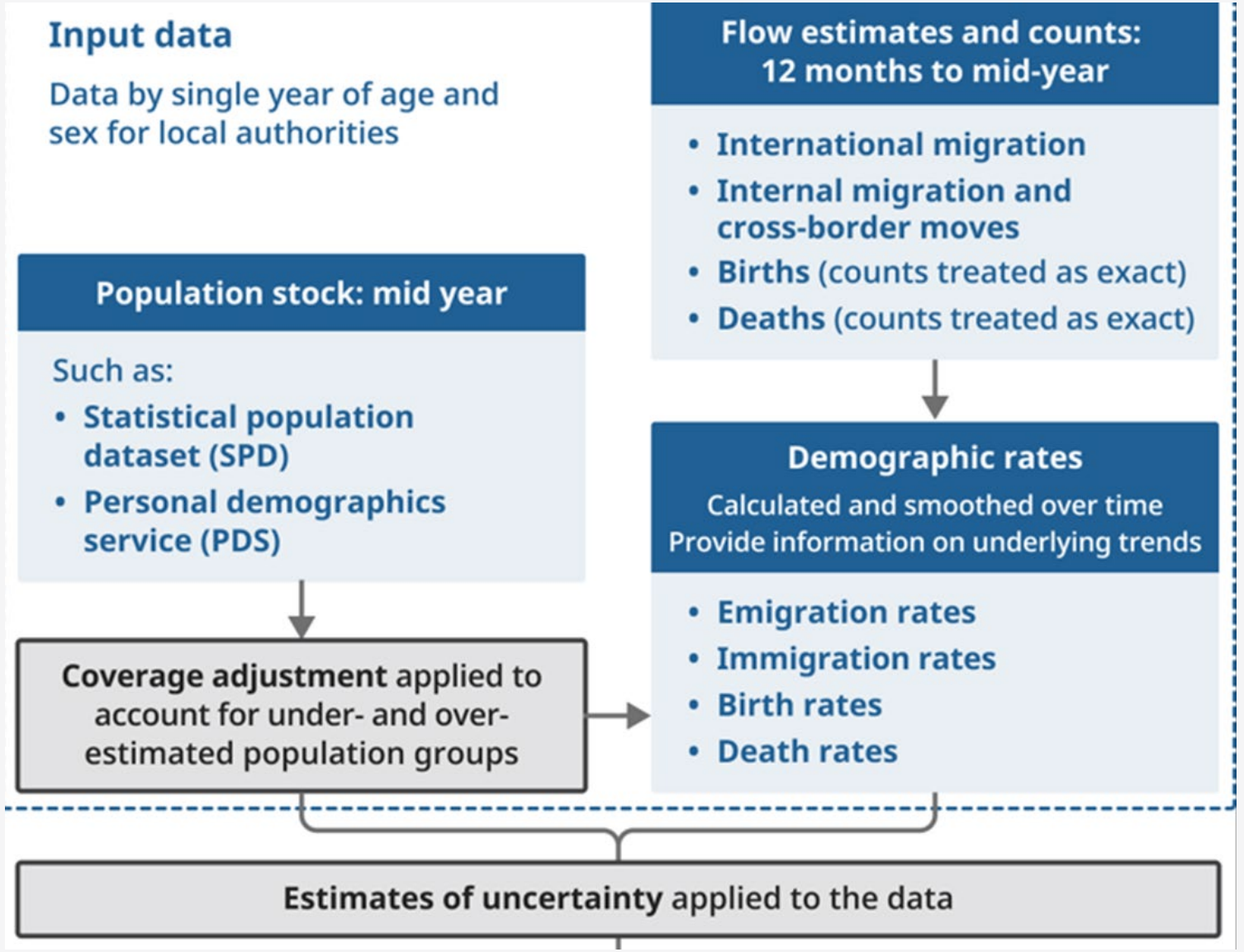
- **Emigration rates**
- **Immigration rates**
- **Birth rates**
- **Death rates**

Examples of smoothed rates per 1,000 population

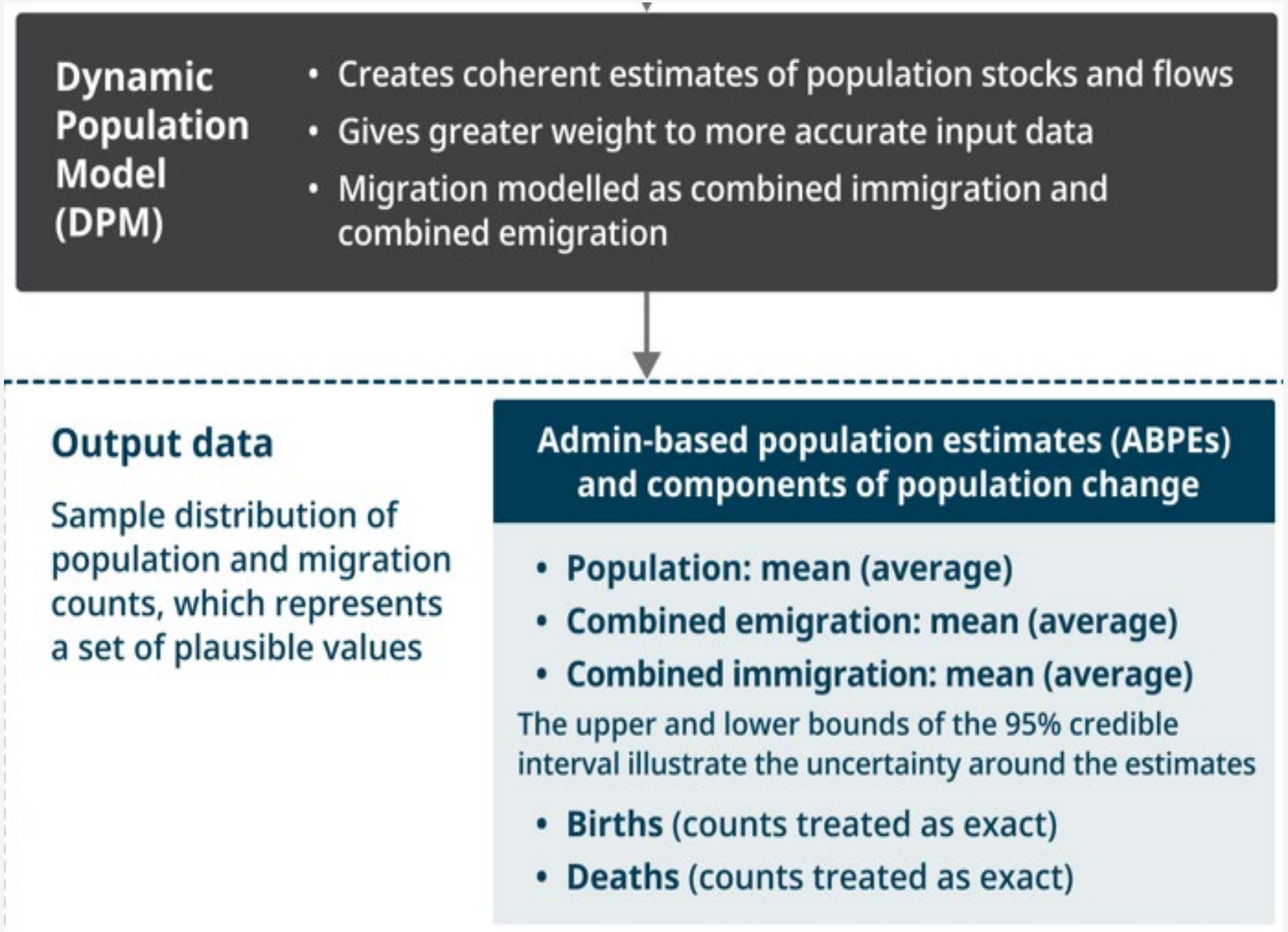


- No denominator for immigration (use expected number of moves into LA per year)
- Estimates of the uncertainty in the rates is provided to the DPM

DPM: Input data



DPM: estimation process and outputs



Strengths

1. **Timely** - provisional estimates produced around 6 months after the reference period.
2. **Incorporates a wide range of admin data**- including tax, benefits, education, health and local data
3. **Flexible and adaptive** - the DPM can take account of quality limitations in underlying data sources and can incorporate other data sources as they become available
4. **Resilient system** - accepts changes to input data, such as missing data
5. **Independent population stocks** are used for each year
6. **Demographic trends** are taken into account
7. **Modular design -** parts of the DPM can be updated when better data or methods become available enabling continuous improvement
8. **Less reliant on a future census**

Challenges

- **Coverage adjustment is needed**
- **Like any model the outputs are only as good as the inputs** but the balancing between sources based on their uncertainty accounts for some of the quality limitations
- **Complex approach** so we need to continue educating our users about it
- **Alternative methods needed for below local authority level**

Mid-year population estimates (MYEs) vs mid-year admin-based population estimates (ABPEs)

Our census-based mid-year population estimates (MYEs) have provided the best picture of population at a moment in time for many years.

Similarities:

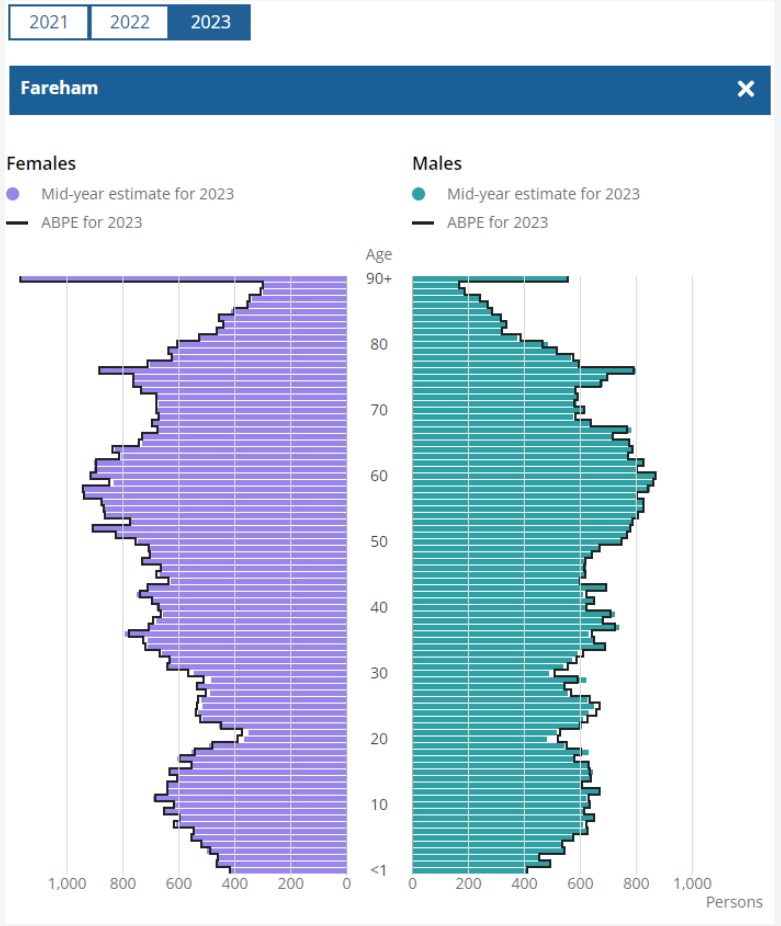
- Estimates refer to the usual resident population at mid-year (30 June) for the reference year
- Based on the cohort component method using births, deaths and migration each year
- Adhere to best practice

Differences:

- MYEs rely on a rolled forward census-based population stock, ABPEs use an independent population stock for each year which is based on a wide range of admin data.
- ABPE process balances input data and uncertainty to find coherent estimates
- Demographic rates are used in the ABPE process and ensure underlying trends in fertility, mortality and migration are automatically taken into account

Latest release: results

- Published 15 July 2024: ABPEs for 2011-2023
- Updated ABPEs are very similar to our accredited official population estimates
- For mid-2023:
  - total ABPE for England and Wales is 0.1% lower than provisional ABPE
  - total ABPE for England and Wales is 0.2% lower than the mid-year population estimate
  - ABPE credible intervals for the total local authority population contain the accredited official population estimates for all local authorities



Next Steps: dissemination and engagement

- Aim for APBEs to become official estimate of the population in 2025
- Working with the OSR to ensure we meet the standards of trustworthiness, quality and value
- Publish case studies to help users understand differences between MYEs and ABPEs and to build confidence in the new approach (planned for autumn 2024)
- Continue to engage with users
  - understanding user needs
  - address feedback
  - quality standards
- Considering the best way to meet user needs for customisable data and analysis
- Ensuring coherence across the population statistics system as we make the transition

Next Steps: data and methods

- Investigating new data sources
- Ensuring timely and reliable supplies of data
- UK estimates
- Estimates below LA level
- Better estimation of hard-to-count population groups (e.g. students)
- Coverage adjustment using administrative data
- Credible intervals at all levels of aggregation
- Disaggregate migration flows into international migration, internal migration and cross border moves
- Methods guide (planned for publication summer 2025)

Questions