Statistical Transformation of the population and social statistics system in England and Wales

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September 2023

Office for National Statistics
Agenda

• Vision for transforming population and migration statistics
• Dynamic population model (DPM)
• International Migration
• Questions and comments
Future Population & Migration Statistics System in England and Wales

Strategic vision: More frequent, timely and inclusive statistics about the population and its characteristics

A social statistics system that shapes our understanding of society and people.

A system to create and share statistics that is sustainable and future proof.

A broad, flexible range of outputs and products to respond to user needs and questions of the day.

Administrative data will be at the core of this system.
The transformed outputs will include:

- **National to local Population and Migration Statistics**
  - Understanding demographic change and respond to challenges

- **Population sub-groups and characteristics**
  - Reflecting the diversity of populations to local levels

- **Housing, accommodation and living arrangements**
  - Understanding who and how people live together in our society

- **Outcomes**
  - Data assets that allow us to understand population life journeys and outcomes
We have launched a consultation....

• In 2014, the UK Government set out it’s ambition that “censuses after 2021 will be conducted using other sources of data and providing more timely statistical information”

• The aim of the consultation is to understand how close our proposed system is to meeting user's needs

• The consultation closes on 26th October 2023

• Responses to this consultation will inform a recommendation on how the ONS should produce statistics about population in England and Wales in the future
Accessing the consultation

Welsh language questionnaire
English language questionnaire
Overview of the Dynamic Population Model (DPM)
Dynamic Population Model

• Aim: produce estimates (including uncertainty) of population stocks and flows for single year of age, sex, year (2011-current) at Local Authority level in England and Wales using
  • Multiple data sources on population stocks and flows
  • Models of measurement error, demographic processes and the demographic identity of population change
  • Particle filters for estimation (currently)
Hybrid statistics system

Demographic accounts - Our best, coherent estimate of population and change

- Population stock
- Births
- Deaths
- International migration
- Internal migration

Data and system models (pre-post-COVID)
- Census, SPD, syoa, sex
- Real-time data dashboard
- Rates by syoa. sex. LA: Births, Deaths, internal migration, emigration, and Immigration counts sex

Coverage

SATELLITE ACCOUNTS
- Life expectancy
- SATELLITE ACCOUNTS
- UK
- CE
- Mortality
- Fertility
- International migration
- Internal migration
- Projections
- SAE
- Ethnicity
- Ageing
- Households & families

SATELLITE COHORTS
- Refugees
- Migrants
- Covid & health
- Education
- Etc etc

Longitudinal cohorts
- 1% Longitudinal Study
- 100% Longitudinal Study (rolled forward population)

Cohort maintenance

Cross-sectional Multivariate characteristics

Survey
DPM overview

1 System models (for rates) Formal representation of what an experienced analyst knows about demographic trends
2 Data models Formal representation of what an experienced analyst knows about data quality
Input data in the DPM

- **Births and deaths** from registration data (assumed exact)
- **Population stocks** (point estimates, measures of uncertainty and coverage adjustment)
  - MYE 2011 (Census 2011-based)
  - PR 2012-2015
  - SPD 2011, 2016-2022
  - MYE 2021 (Census 2021-based)
- **Smoothed superpopulation rates;** births (by mother’s age), deaths, in-migration and out-migration
Figure 4.2: Combined in-migration for females in Cambridge ages 0-50 for the year ending 30 June 2021, observed counts (“unsmoothed”), estimates used in [ONS, 2022d] (“GAM”) estimates from equation 4.5 (“GAM-LASSO”)
Main steps for estimation

1. **Approximate components.** Build approximations of the series for births, deaths, migration, and population. Unlike in the final account, these series do not have to be mutually consistent.

2. **Fit system and data models.** Use the approximate series to fit models for births, deaths, and migration. The models all contain hyper-parameters, which are kept, and rates, which are discarded. Similar calculations, based on the approximate series for births, deaths, migration, and population, are also done for data models.

3. **Estimate individual accounts and rates.** Using the hyper-parameters and the raw data, (re-)estimate demographic accounts and rates. Each Local Authority is estimated independently (conditional on the hyper-parameters and data).

4. **Combine accounts, derive migration.** Combine the individual accounts into a unified account for all of England and Wales. As part of this process, derive values for all migration flows between Local Authorities, and between all Local Authorities and the outside world.
Data models: estimate coverage ratios

• **2011-based**
  • Ratio of MYE-2011 to admin source in 2011 by single year of age, sex, LA.
  • GAM used to smooth over age profile, independently for sex and LA

• **2021-based**
  • Ratio of MYE-2021 to admin source in 2021 by single year of age, sex, LA.
  • GAM used to smooth over age profile, independently for sex and LA

• **Interpolated (a proxy for a robust coverage adjustment)**
  • Linear interpolation between 2011 and 2021 by single year of age, sex, LA.
  • Plan to use 2022 and 2023 ratios equal to 2021 ratios for next publication (assumption under review)

• Future robust coverage adjustment being developed and is vital
Comparison of local authority estimates: 2021
What do ABPEs show about 2021/22 population change? As expected, largest growth is in London. Estimates produced 4 months ahead of planned official estimates.

Source: Office for National Statistics – ABPE best estimates
Overview of International Migration
Historic migration statistics not fit for purpose

- International Passenger Survey, intentions based
- No net migration by reason (inc. students)
- Disaggregation difficult due to already wide confidence intervals
Delivering transformed migration statistics

Non-EU = Home Office visa data

EU = RAPID (DWP taxes and benefits)

UK nationals = Previous (IPS-based) Modelled estimates

= Immigration Emigration Net Migration EU, Non-EU and GB
Reflections

- Stove-pipe versus Matrix model
- Designing in resilience
- Socialising Bayesian methods - use of narrative and metaphor
- Segmentation of audiences
- Capability- building
- Making flexibility the new Business As Usual
- Cultural shift
- Active user engagement
- Challenge linear thinking
Questions and comments welcome!