Developments in official population statistics

Strand organiser: Philip Humby (Office for National Statistics)

4.45pm Monday 5 September: Developments in official statistics 1

The release of Census 2021 outputs: what comes next?
Michael Roskams (ONS)

In this presentation, we will outline the Census 2021 outputs release schedule, sharing what we have released so far and preview what's coming next. We will talk about our plans for starting with simple summaries of different topic areas, before moving to more complex cross-cutting data. We will also showcase the different products that we are developing to help users engage with the census data, including new and innovative tools for data visualisation. In this way, we aim to ensure that all users of census data will be able to gain rich and detailed insights into their communities.

Mortality in England and Wales: an overview of past and projected trends in longevity
Julian Buxton, Eva Tipping, Ed Morgan, Stephen Rozee (ONS)

How do we measure longevity? We will look at a range of approaches to examine how average lifespans have increased and the changing patterns of longevity over time. We will also look at changing patterns of death by age, using compression of mortality. We explore mortality trends in England and Wales since the 1840s, during which time life expectancy at birth has doubled approximately for both men and women from around 40 years to 80 years. Since the 1970s, life expectancy at birth has increased by around 10 years for men and around 7 years for women. What are the future prospects for longevity? Will we see a continuation of the slower improvements in life expectancy seen over the last decade, and what can we say about the impact of the Coronavirus (Covid-19) pandemic on these measures?

2020-based National Population Projections and future plans
Alan Evans, Eva Natamba, James Robards (ONS)

In January 2022 the ONS published 2020-based Interim National Population Projections (NPPs) for the UK and constituent countries. This consisted of a principal projection only, unlike previous years where a full suite of variants was also produced. This round of projections was produced at a time of heightened uncertainty. Key sources of uncertainty include the base year being at the furthest extent from the 2011 Census (our current mid-year population estimates are rolled forwards from 2011), disruption in data supply owing to the pandemic (including the pausing of the International Passenger Survey) and impacts from the coronavirus (COVID-19) pandemic. Using our most up-to-date population estimates and assumptions about future fertility, migration and mortality, the 2020-based NPPs give an indication of the possible future size and composition of the population. The 2020-based NPPs project slower UK population growth than that in the 2018-based projections. Results from 2020-based NPPs project that the UK population will increase by 3.2% over the next 10 years. Over this period there is projected to be 59,000 more deaths than births due to both lower fertility and higher mortality. Given a higher number of deaths and fewer births are projected, net international migration is expected to play an increasing role in population growth. This presentation will detail production of 2020-based NPPs, explain demographic assumptions developed, give an overview of the results and outline future plans for population and household projections including the use of Census 2021 data in 2021-based subnational population projections and 2021-based household projections. Email

Scottish Population Projection: Results
Piers Elias and Esther Roughsedge (National Records of Scotland)

The mid-2020 interim national population projections for Scotland were the first set to show a decline in the projected population; by 2029 the excess of deaths over births out-weighed net migration. This presentation

will outline the methodology, look at the trends that have led to this change and at the implications of a declining and ageing population in Scotland.

9.00am Tuesday 6 September: Developments in official statistics 2. Census Q&A

'Getting it right matters' – our approach to ensuring trusted and high-quality Census 2021
Jo Neagus, Pete Large, Jon Wroth-Smith (ONS)

The census is central to decisions in all areas of society, as the basis of population estimates, insight into the wellbeing and needs of communities and across a wide range of sectors. While ONS delivered a successful census operation, collection is only the first step in making sure we produce the best possible statistics for every area. ONS has undertaken the most comprehensive quality assurance of census data in England and Wales. A huge amount of work was undertaken to compile, clean, complete, cross-check, ensure confidentiality and continue consultations with users, to make sure that Census 2021 results will provide users confidence that they are fit for purpose, and a reliable basis for decision-making. In this session we will take you on a tour of the quality assurance processes that we have used to make sure that census processes have worked correctly, and to validate estimates to check that final results are credible and consistent with other evidence. We will demonstrate the tools and explore the checks and comparator data sources that we used, and how we approached further investigation/exploration of census data to maximise its quality. We will also explain the role of our quality assurance process in the wider context of our work in this area, and what we found along this journey.

Quality assuring Scotland's Census 2022 using administrative data
Bethanie Fenney, David Rowley and Caroline Ellis (national Records of Scotland)

For the first time Scotland's Census 2022 uses administrative data to quality assure individual records. This is done in close conjunction with the record-level quality assurance that does not involve administrative data. Most of these processes use the National Health Service Central Register (NHSCR), a dataset of individuals registered with a GP in Scotland. In the remove false persons step, records flagged for removal are linked to the NHSCR to check whether they do in fact represent a real individual. All remaining records are linked to the NHSCR. Any census records where age needs to be imputed (because it is missing or inconsistent) use the NHSCR age as an imputation variable to improve the quality of imputation. In resolve multiple returns, records that are indicated to be resolved are linked to the NHSCR. If as many NHSCR records are found as census records, then the census flagged for resolution into a single record will not be resolved together. The census is linked to itself to identify potential duplicates for over-coverage adjustment. This step then links potential duplicates to the NHSCR to determine the likelihood that they are genuine duplicates, rather than distinct individuals in different locations with similar name and date of birth. Electoral register data is used to indicate whether each address is occupied. These data will inform the alternative household count to help with estimating the total population. These administrative data processes should improve the quality of the results of Scotland's Census 2022.

Working in partnership with local organisations: a new approach to the quality assurance of local authority census estimates
Jon Wroth-Smith, Jo Neagus, Pete Large (ONS)

The ONS delivered a very successful census operation and from this we will be able to provide a fantastic picture of our population in March 2021. To ensure we can produce the best possible information for every local area, we have undertaken the most comprehensive quality assurance ever of census data in England and Wales. For the first time ever we're drawing on the unique insight and expertise of local authorities across England and Wales in our cross-checking. We offered the opportunity to work in partnership with all local authorities, combined authorities and county councils to help ensure that both ONS and our users are confident in the quality of our local estimates from Census 2021. This presentation will set out the role of this initiative in our wider quality assurance process, and our approach to working in partnership with these

organisations. This will include the information we shared and the processes we used to help identify evidence from local sources that we could use to further investigate the quality of local estimates. We will also share the lessons we have learnt in understanding quality from this approach and the opportunities to use this approach more widely within national statistical institutes.

Improving the statistical quality in census outputs by resolving multiple responses
Lawrence Dyer (ONS)

The aim of the 2021 Census is to provide accurate estimates of people and households in England and Wales. Census statistical outputs are used by Government, Local Authorities and researchers for critical planning, resource allocation, and funding purposes. While considerable effort is made to accurately capture data through a carefully designed collection strategy, unfortunately errors will always exist in the raw data. To ensure that outputs produced from the census are of the highest quality, the data is cleaned and adjusted through a sequence of deterministic and statistical processes. One of the biggest risks to accurate outputs are multiple and duplicate responses from the same residence or individual. This can occur, for example, when Internet and Paper responses are received for the same household, or an individual has responded for themself in addition to being included by a family member. Multiples and duplicates result in overcount and inaccurate estimates. The Resolve Multiple Response (RMR) process was designed as an automated quality assurance method. Through complex deterministic and statistical rules, RMR minimises the risk of overcount and inaccurate estimates. RMR uses all response information collected at an address to establish the residence structure, identifying duplicate individual responses and resolving them to one. This presentation will describe the types of multiple responses seen typically in census data, how RMR resolves them, and the diagnostics used to ensure quality.

9.00am Wednesday 7 September. Developments in official population statistics 3: Population statistics transformation

Administrative-Data based population estimates for Scotland
Tom MacIntyre, Damien Allen, David Rowley and Caroline Ellis (National Records of Scotland)

In December 2021, the National Records of Scotland (NRS) published statistical research on Administrative-Data Based Population Estimates (ABPEs) for Scotland's population in 2016, 2017 and 2018. This work will inform decisions on the future of Scottish demographic statistics. Following the governance process, administrative datasets were processed and de-identified, before being transferred to Scotland's National Safe Haven for linking and analysis. The datasets used include data from health, the electoral register, vital events registrations, and education. The methodology used several linking variables so data could be linked, even without exact agreement between records. Records from across the data sources were resolved into individuals using these links. Business rules then indicated which individuals to include in Scotland's Integrated Demographic Dataset (SIDD). The ABPEs were then produced from this and compared with the official mid-year population estimates (MYEs) to determine success. On aggregate, the population estimates from the ABPEs are very similar to the MYEs, differing by less than 0.5 per cent in each year. When broken down further, larger differences occur with ABPEs having more males and fewer people aged over 65 when compared with the official statistics. The ABPEs are higher than the MYEs in deprived areas, especially for males aged 30–65. The ABPEs tend to be higher than official estimates for urban areas, and lower for rural areas. It is therefore possible to produce Scottish population estimates purely from administrative sources that roughly agree with MYEs. Further investigation will help understand the differences for particular groups.

Working towards transformed integrated population and migration statistics, an update
Jake Argent, Justine McNally and Elizabeth Pereira (ONS)

ONS are working to transform population and migration statistics to make best use of new and existing data sources and meet the needs of our users for better evidence to support decision-making at both national and local levels. This session will provide an overview of the research to develop coherent admin-based population

and migration estimates. This will be followed by sessions showcasing the progress made in specific areas of interest. Over the past 12 months, we have continued work to;

- understand the quality of the Administrative-Based Population Estimates (ABPE) by analysing a 5-year time series using two alternative approaches. Refining our methods based on this understanding and the feasibility of incorporating new health and education data sources,
- develop our Administrative-Based Migration Estimates (ABMEs) supported by statistical modelling
- explore population groups who may not interact with administrative sources in the same way as the rest of the population such as students, and
- explore the viability of Demographic Accounting models to produce timely, coherent population and migration estimates.

Through our research, we have learnt a lot about the quality of the underlying data sources and how linking these sources together and applying different rules impacts on the quality of these outputs. The 2021 Census provides an exciting and rare opportunity to fully evaluate our methods and outputs. For the first time, we are linking Census estimates to our combined administrative data index and ABPEs to evaluate their quality. This session will outline the aims and analysis plans of this linkage exercise and if available, our early findings. Our users have told us about the importance of timely, coherent population and migration estimates. We also know that acquiring and using micro level data is challenging so we want to investigate how best to use all data available to us to produce the best possible population estimates. The Dynamic Population Model is our approach to addressing these challenges. The session will include an update on what this is, what we have learnt so far and our next steps. We will also share our reflections on how the pandemic is impacting our sources, methods and statistics

No turning back: Estimating international migration flows with administrative data
Laura Cheatham, Chris Stickney, Dom Webber, Brendan Georgeson (ONS)

What the migration statistics system may look like in the future, and how fits in with the Dynamic Population Model. Here, we will talk through how administrative data supported by statistical modelling can be used to estimate international migration flows. They will talk about the strengths and limitations of using a model during a time when the pandemic stopped traditional data collection methods and why there is no turning back to the former intentions-based survey method. The use of modelling techniques has helped borrow strength from multiple administrative data sources whilst producing a single coherent estimate. It supports our aspirations to produce monthly estimates during ebbs and flows of administrative data collections.

Demographic accounting: The statistical scaffolding for future population modelling
Louisa Blackwell, Beck Keane and Greg Payne (ONS)

ONS has been researching, since before the 2011 Census, methods for producing population estimates based on administrative data. Research is ongoing, on refining methods for selecting administrative records to include in population estimates. We see demographic accounts as the statistical scaffold around which other demographic assets in the transformed statistical system will be built. Our ambition is to produce timely population estimates that do not suffer from the drift inherent in the current Census-based approach. Monthly published population estimates are envisaged, to inform policy decision-making. In the interests of accuracy and coherence, it is essential that the components of population change, natural changes, and migration, align with the time series of population stock estimates. To deliver this, we are prototyping a Bayesian demographic accounting framework. At its heart is a dynamic population model, which will offer a standardized, transparent and flexible system within which to generate monthly population estimates, using models and forecasts that draw on administrative and survey data. In the existing population statistics system, estimates are informed by their plausibility. Demographers do this informally, making adjustments to the estimates based on expert judgement. In the proposed system, demographic insights and expertise is encoded in system models. In existing methods, estimates are informed by knowledge of the strengths and weaknesses of the input datasets. In the proposed framework, this knowledge is embedded in the data models. The

dynamic population model will allow us to integrate incomplete information and balance the errors in components for different elements of the population statistics system. This research involves knowledge and skills development to support implementation of the accounting framework in a sustainable way within ONS.