Methodological News

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ABS Methodology and Data Management Division

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Articles

Estimating the Aboriginal and Torres Strait Islander Resident Population

Each Population Census gives an opportunity to update ABS estimates of the Aboriginal and Torres Strait Islander population, both at a broad national level and for regions of Australia. This process involves not just the Census counts but also estimates from the Census Post Enumeration Survey (PES) of the number of persons that have been missed by the Census.

The population estimates are obtained by smoothing PES-based net undercount estimates with high standard errors towards a stable predicted value. This process has been extensively discussed with stakeholders, including at two meetings of the Aboriginal and Torres Strait Islander Demographic Statistics Expert Advisory Group; it was also considered by the Methodology Advisory Committee in November 2011. The Bayesian model underlying the smoothing has been developed as a result of these consultations.

The estimation proceeded as follows. A prediction of the proportion of persons missed in the 2011 Census was obtained for a set of 18 regions, based on a logistic regression model applied to items that are available on the Census. The Bayesian modelling approach was then applied to smooth the estimates from PES towards these predictions plus a common "intercept" value. This intercept was allowed to be somewhat different for the four approximate regions classified as in Northern Australia, to reflect the particular challenges of collecting data in these regions.

The amount of smoothing used was chosen to give good model fit, an approach known as "Empirical Bayes". Consideration was also given to smoothing over time, but this was not implemented as there appeared to be important changes in Indigenous identification between the 2006 and 2011 Censuses. The results of the smoothing and the preliminary population estimates for 30 June 2011 will be published in late September 2012 in Australian Demographic Statistics, March Quarter 2012 (cat. no. 3101.0). Final population estimates will be released in August 2013.

Further Information

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Upcoming Enhancements to the Retail Business Survey

The Retail Business Survey (RBS) records sales for all employing businesses in Australia whose principal activity is to sell goods and services to households.

There are two enhancements which are in the pipeline to be made to RBS in the next year or so.

The first of these will see the size measure used in stratifying the sample updated. The sample design of the RBS has in recent years relied upon a stratification based on a static version of the Business Activity Statement (BAS) turnover. The last time this 'stratification turnover' was updated was in 2009. As this 'stratification turnover' becomes outdated, the survey estimates becomes gradually more volatile.

In order to combat the aging of the stratification, it is proposed that RBS now stratify by the most recent value of the BAS turnover, which is always up-to-date. This will allow for sampled units to better represent other population units with similar Retail sales. This change has been investigated by Business Survey Methods Section in Statistical Services Branch, and it is recommended for implementation in RBS in the next 6-12 months.

The implementation will be accompanied by a sample re-allocation, to ensure the sample is spread better across the size strata to reflect the turnover distribution as indicated by the up-to-date BAS data.

The second change regards improving information collected about online sales from retailers in Australia. The RBS has successfully trialled a new online sales question which will be added to the RBS hopefully later this calendar year.

Finally, an aspirational goal for the RBS is the expansion of the scope of the survey to cover more service industries. Traditionally, the bulk of businesses who sell to households have been classified under ANZSIC to the Retail industry. However, with the increase in household expenditure to service industries (such as Sports & Recreation), consideration is now being given to increasing the scope of the RBS.

Further Information

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Simulation Cost Model for the Monthly Population Survey

Accurate modelling of the interviewer enumeration costs for collecting household survey data has been a significant challenge for many years. Traditionally a linear cost model has been used, consisting of costs proportional to the total number of clusters selected (groups of dwellings in the same general location) and costs proportional to the total number of dwellings selected. The main issue with this method is that costs associated with travel to clusters (time and kilometre allowance, which are major components of total costs) are essentially proportional to the number of visits made to a cluster, which is a complex function of the total number of dwellings or clusters selected and therefore cannot be accurately represented by the linear model for a wide range of cluster sizes.

In spite of this issue, the linear cost model method has been sufficient to estimate costs for the process of determining optimal cluster sizes and sampling fractions when no significant changes were occurring to the overall design. In the current redesign of the Monthly Population Survey (MPS) however, there were a few significant changes, including the upcoming introduction of web-based enumeration. Also, the linear cost model didn't translate easily to use for Special Social Surveys without recalculating all the parameters. Therefore an alternative more flexible cost modelling method was required.

It was decided to try using a simulation cost model, This is where all the activity of an interviewer required to complete a workload

(e.g. travelling from home to the first dwelling, approaching a dwelling, interviewing etc.) is simulated and the total travel distance and time is counted, all for a given design, To inform the choice of sample design parameters a range of variance equivalent designs are compared to determine which one is the cheapest. In order to do this the following parameters had to be estimated:

- The probability of making contact with a household (conditional on the number of approaches that had been made);
- The probability of getting an interview at a contact (conditional on the number of previous contacts that had been made);
- Factors to convert straight-line distance between clusters to kilometres travelled;
- Time taken to travel between clusters (consisting of a constant time plus a time proportional to the straight-line distance);
- Time and distance for travel between dwellings within a cluster (for a given area type);
- Time taken for an interview;
- The amount of time an interviewer had available for work in one block.

To develop the model, paradata on the MPS data collection was used, which consists of records of respondent call attempts made by interviewers and their travel. This paradata provides a reasonably rich data source that should allow for straightforward estimation of all the parameters listed above (apart from the last one). The primary purpose of the data is for administering interviewer pay, so some aspects of the quality requirements for the data are different between its primary purpose and constructing a simulation model. Therefore considerable work was required to amend the data to provide the consistency needed to undertake the required modelling.

The chosen method of validating the simulation model was to build the model using the listed parameters, then simulate the historical selections from which we had estimated the parameters, to see if the average number of visits to each cluster was the same in the simulation as it was in reality. This was a legitimate test as the number of block visits was not used in creating any of the parameters.

When the model was finally applied to the new design of the MPS, the optimal cluster sizes came out quite similar to those in past redesigns. It was also found that if a 20% take-up of web-based enumeration was assumed, there was no discernible change in optimal cluster size.

It is hoped that the model will be expanded to be able to inform decisions about the sample designs for a wider range of household surveys as well as inform costs of data collection operation for new collection scenarios.

Further Information

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New National Accounts Benchmarking Project

The National Accounts Branch (NAB) uses annual and quarterly data sources to compile quarterly GDP. Benchmarks (or annual data) are better quality because they come from more reliable sources (e.g. annual surveys with larger sample sizes). Indicators (or quarterly data) are often less reliable, less detailed and/or less appropriate in scope than those annual benchmarks. NAB uses a benchmarking procedure to combine indicators and benchmarks and align them to produce better quarterly economic indicators.

NAB uses the benchmarking method developed by Denton (1971)[1].The estimates of the benchmarked quarterly data are derived by minimising the sum of squares of the quarterly differences of the ratio of the benchmarked quarterly values and the quarterly indicators. This is to ensure that the benchmarked series are as proportional to the indicator as possible. This method is applied over a five year moving window and subject to the constraint that the sum of the benchmarked quarterly estimates for a given year equals the annual benchmark. (Note: This is the multiplicative version, there is also an additive version of the method.)

When the annual benchmark series ends the NAB applies a simple extrapolation method to the quarterly estimates beyond the annual benchmark. For these estimates the benchmarking procedure assumes that the quarterly growth rates of the benchmarked series are the same as those of the quarterly indicator (this is done by carrying forward the quarterly Benchmark-to-Indicator (BI) ratio for the last quarter of the most recent benchmark year). This method can cause large revisions if the annual benchmark and the quarterly indicators are not highly correlated.

Many experts have proposed an ABS project to investigate more advanced extrapolation methods that can minimise quarterly revisions due to benchmarking in the Annual National Accounts (ANA). The new National Accounts Benchmarking Project will consider a number of methods including: X-12 ARIMA, Exponential Smoothing and univariate regression models.

The main outcomes of the project include (i) assessing if alternative extrapolation methods can minimise revisions and (ii) investigating the possibility of automating new extrapolation methods using the current procedure.

[1] Denton, F.T. (1971) Adjustment of Monthly or Quarterly Series to Annual Totals: An Approach Based on Quadratic Minimisation. *Journal of the American Statistical Association* Vol 66, No. 333, 99-102

Further Information

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