

# Methodological News

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ABS Methodology and Data Management Division

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## Modelling Household Energy Consumption and Energy Efficiency Behaviours

The Analytical Services Unit is currently undertaking an analysis of household level data from the ABS 2012 Household Energy Consumption Survey (HECS) to determine the factors that influence household energy consumption and examine the factors that influence household energy efficiency modification actions and intentions.

The analysis aims to contribute to a better understanding of the relationship between household energy use, their energy efficiency behaviours and other characteristics and factors.

HECS surveyed approximately 12,000 households between January and December 2012 and included an online component which allowed energy information to be collected up to the end of March 2013. The scope of the survey was usual residents of private dwellings in urban and rural areas of Australia (excluding very remote areas), covering about 97% of the people living in Australia. The sample was collected using a stratified, multistage clustered design.

HECS provided a large number of energy related items ranging from household energy sources, expenditure, consumption, behaviours, perceptions as well as dwelling characteristics and household heating and cooling practices. Energy efficient modifications such as installations of insulation or other energy efficient heating and cooling systems, window treatments, solar panels and replacements of household appliances were also collected by HECS.

The modelling of household energy consumption employs a log-linear model. The results show statistically significant effects from household income, energy price, family composition, dwelling characteristics and climatic conditions on total domestic energy consumption (made up of electricity, mains gas and bottled gas).

The analysis of the determinants of household energy efficiency improvement behaviours utilises logistic regression models. The results indicate that modification actions are impacted by socio-demographic factors. Household income, family composition, home ownership and dwelling characteristics (e.g. dwelling type and age) are important determinants of the adoptions of energy efficiency measures. Factors such as energy saving efforts and past modification actions play a significant role in motivating household energy efficiency behaviours.

### Further Information

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## Winsorisation of Rates for Average Weekly Earnings

In business surveys, it is possible for a sample to include a small number of units with highly unusual values. These units are referred to as outliers. Their selection in the sample, combined with the application of the specified weights for these units, can mean that survey estimates significantly over- or understate the true population value. In the ABS, the two main methods of addressing

outliers are surprise outliering and winsorisation.

Surprise outliering reduces the design weight of an outlier unit to one, while adjusting the weights of the other units in the stratum upwards to compensate. While surprise outliering is relatively simple to implement, there are some issues with this method.

These include:

- The identification of surprise outliers can be a subjective choice, and require a large amount of effort.
- Setting a unit as a surprise outlier can have unexpected effects for rate estimates.
- If surprise outliering efforts focus on the impacts to a rate estimate, there may be little control over the effects on the components of the rate.

Winsorisation outliering identifies extreme reported values and replaces these with more reasonable values, design weights are left unchanged. The identification of winsorised outliers depends on objective cut-offs calculated using historical survey data. Reported values that exceed a given cut-off will be modified to a more central value. The theory for winsorising level estimates is reasonably well established. However, the theory for directly winsorising rate estimates has not yet been developed.

Recently, Business Survey Methodology (BSM) undertook an investigation to assess whether winsorisation for rate estimates can be effectively accomplished by winsorising the components of the rate separately. Data from the Average Weekly Earnings (AWE) survey was used for this investigation. The AWE survey is a biannual collection that

obtains data on employment and earnings from businesses in order to produce estimates of average weekly earnings (total earnings divided by total employment). These estimates are produced for males, females and all persons, for particular breakdowns. AWE undertakes surprise outliering of units in the sample.

The approach taken for this investigation was to winsorise the main earnings and employment data items for AWE separately. Winsorisation was applied to historical AWE survey data (excluding the effect of surprise outliers), and the resulting estimates were compared with publication estimates.

Results from the investigation have been positive. In general, the impact on estimates when winsorisation was used instead of surprise outliering was non-significant, with most winsorised rate estimates lying well within the 95% confidence interval of the original published estimates.

One benefit we have seen with winsorisation of rate components has been that while we only target units with unusually large earnings or employment values, the winsorisation process will pick up units that have either an unusually high or unusually low earnings-to-employment ratio.

Winsorisation outliering is scheduled to be placed into production in the near future, and will be used in conjunction with a reduced effort on surprise outliering.

### Further Information

For more information, please contact Lyndon Ang (02 6252 5279, [lyndon.ang@abs.gov.au](mailto:lyndon.ang@abs.gov.au))

## Responsive Design in the Provider Contact Unit: a Quarterly Business Indicator Survey Case Study

In August 2013, an Economic and Environment Statistics Group workshop defined the priorities of a short term "sprint" project, of 3 months duration, to address current challenges and pressures facing business collection operations. One sprint project area was the Quarterly Business Indicator Survey (QBIS) case study of a responsive design approach to intensive follow-up (IFU).

QBIS has historically been a difficult survey for the Provider Contact Unit (PCU) to follow-up. In an attempt to meet specified live response rate targets, it requires repeated attempts to contact a large group of non-responding providers by phone. These follow-up processes are resource-intensive, and it is becoming increasingly important to fine tune current procedures such that follow-up is targeted to cases where it is likely to have the most benefit to the survey estimates through better sample representativeness.

Operations Research and Process Improvement section (ORPI) has developed a framework for applying a targeted follow-up approach to the problem of achieving a representative responding sample in a cost-efficient manner. The framework is designed to be applicable to both business and household collections, and to integrate with current processes, rather than requiring extensive changes to the collection process before it can be applied. Further information on the Responsive Design Framework will be available in a paper presented to the

Methodology Advisory Committee in June 2014. This paper is available from the authors by request, until formally published.

The responsive design QBIS case study working group was formed in August 2013, with members from PCU, Quarterly Economy Wide Survey Business Survey Centre, ORPI and Business Survey Methodology section. This group was focused on the application of the responsive design framework to identify immediate strategies to reduce QBIS IFU cost.

Effective collaboration between group members resulted in identification of several defined strategies for application to specific subsets of non-responding units. Each strategy was trialled by applying a 50% random sample of the full target group – enabling production of Management Information throughout the IFU period, measuring progress of the strategy in comparison to standard procedures. The following proposed new IFU strategies were proved effective from the trial:

- IFU beginning delayed by 15 days past QBIS due date for businesses responding without PCU contact in the previous quarter (labelled 'gold provider').
- IFU beginning delayed by 15 days for businesses responding within 15 days of the QBIS due date in the previous quarter (labelled 'silver provider').

In combination, it was measured that these changes, which resulted in minimal impact to the live response rate, significantly reduced IFU effort required for this subgroup from the previous quarter. These proposed strategies were formally implemented in December

quarter 2013, and compliment current procedures.

While the additional sprint strategies were successful, IFU is still an issue for QBIS. For this reason, the QBIS working group is continuing, investigating additional strategies aimed at cost reductions with minimal impact on response rates. In addition, the QBIS case study experience has highlighted potential for savings in IFU procedures across a range of other surveys, through application of the responsive design framework.

## Further Information

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## Methodology Design Committee

The committee had been established to better prepare the methodology area for contributing to the ABS transformation program. Its role is to guide methodological developments and approve methodological solutions, ensuring that they are consistent with the Methodology Architecture Design Principles. It will approve the Methodology Statement of Intent and the Methodology Development Plans described below. It is chaired by the Chief Methodologist, with the Senior Executive methodologists and some senior methodologists as members.

The Statement of Intent sets out what methods should support the transformation strategy of industrialised processes in a metadata driven, 'assemble to order'

environment for statistical processing systems. It will describe the methods of key processes, where and how they should be improved and standardised. The Methodology Development Plans extend and elaborate the Statement of Intent. They cover all processes and, based on available information:

- summarise methods and tools in current use, their performance and diversity
- identify any further development needed to achieve the statement of intent
- list tools available commercially or from other statistical agencies.

The Statement of Intent and the Methodology Development Plans will guide methodologists as they contribute to the transformation, typically as members of multi-disciplinary teams. The teams will gather and assess user requirements and develop and evaluate solutions for them. Any departures from the Statement of Intent will need approval from the Methodology Design Committee. The Statement of Intent will also serve as a high level view of methods for project leaders on the transformation. Plans are to complete the Statement of Intent in early July and for Methodology Development Plans to be completed progressively.

## Further Information

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## How to Contact Us and Email Subscriber List

Methodological News features articles and developments in relation to methodology work done within the ABS Methodology and Data Management Division. By its nature, the work of the Division brings it into contact with virtually every other area of the ABS.

Because of this, the newsletter is a way of letting all areas of the ABS know of some of the issues we are working on and help information flow. We hope the Methodological Newsletter is useful and we welcome comments.

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