Reducing collection effort while maintaining data quality in business surveys
Outline

▪ The Integrated Business Statistics Program (IBSP)

▪ How the Quality Indicator/Measure of Impact (QIMI) tool works

▪ Impact on surveys

▪ Future steps
Integrated Business Statistics Program

- A recent platform intended to reduce costs and improve efficiency in processing business surveys at Statistics Canada

- Currently ~95 surveys are integrating into or produced using the IBSP

- QIMI (Quality Indicator/Measure of Impact) is a central part of the program and will be used for ~60 surveys in 2018 where the sample is large enough to warrant collection prioritization
IBSP Active Management Model

- Sampling
- Multi-Mode Collection
  - Active Management
    - Follow-Up
    - Manual Editing
  - Automated Processing
    - Editing
    - Imputation
    - Estimation
- Rolling Estimates
- QIMI
- Interpretation & Dissemination
QIMI: Ideas

- Focus on a limited number of key estimates and appropriate quality measures
- Evaluate the quality of these estimates at regular intervals throughout collection with quality indicators
- Identify estimates where quality is low
- Identify units with significant impact on the quality of key estimates which have not reached quality targets
- Feed this information to collection and to analysts
QIMI: Implementation

- Every survey selects key estimates, a combination of key variables and key domains
- Each survey has sufficient key variables to capture the complexity of the survey, but not so many as to force all units to be high priority
- Key variables have mandatory collection edits so that units which require failed edit follow-up can be prioritized
QIMI: Implementation

- Quality can be measured in multiple ways and more than one quality indicator can be used at the same time

- For collection year 2017, two quality indicators were used
  - Key Variable Weighted Response Rate (Non-response follow-up)
    - Each variable’s response rate is weighted by itself
  - Relative Deviation From Predicted Values (Failed edit follow-up)
    - Uses a predicted value that is compared to the reported/imputed value divided by the estimate total
QIMI: Implementation

- Before QIMI is run, factors of importance are set according to the relative importance of each key estimate.
- Quality targets are set for each quality indicator for each key estimate.
- Key estimates which are the most important to the survey will be given more stringent quality targets.
- Once a quality target is met during collection the key estimate will no longer have impact on collection priorities.
- This allows the QIMI prioritization lists to be very dynamic in prioritizing which domains to follow up and which variables in the survey.
QIMI: Implementation

- Every survey unit has its measure of impact calculated for every quality indicator for each key estimate where the quality target has not been achieved.
- The impact of a unit on key estimates is weighted with the factor of importance and distance from the respective quality targets for each key estimate to obtain a global measure of impact for the unit for each quality target.
QIMI: Implementation

- The follow up list is generated using a combination of the ordered lists of global measure of impact for the quality indicators in use.
- The priority list is broken down into 6 groups, with one group reserved for units no longer eligible for collection.
- Collection workloads are built so that non response follow up concentrates on the top 30% of the eligible units. Failed edit follow up concentrates on the top 15% of the eligible units.
QIMI: In practice

- An agriculture survey had one key estimate with much lower quality than any other estimate
  - It contains the units with the largest difference from predicted and Key variable weighted scores
  - One unit reported in the wrong units causing a huge difference from predicted values
  - One unit has too large an imputation due to this respondent
  - Outlier removal of the respondents misreport contributes to the low quality score
  - Collecting either unit will fix the problem with the imputed unit if no other intervention is made
  - If not fixed through collection analysts are alerted to the problem both with the imputation and the respondent unit
QIMI: Impact

- In collection year 2015 3 surveys piloted QIMI, in 2016 ~36 surveys used QIMI, in 2017 ~50 surveys with more joining each year

- Collection quality is now assessed over many key estimates rather than as a single weighted response rate, thus overall data quality has improved

- Improvement in the percentage of quality targets met both in time and in effort over the three year period, even though many quality targets have been increased since the first year
QIMI: Impact

- Many of the original group of surveys were able to shorten their collection period in 2017 without impact to the response rates
  - This is allowing more of our surveys to publish data within 12 months of the end of the reference year
  - A third of the first wave surveys published within 12 months for RY2016, as opposed to a single survey for RY2014
- In the future meeting QIMI collection targets will signal that collection will end early and bring cost reductions to surveys
QIMI: Impact

Surveying Mapping: Quality Targets Met and Response Rates vs. Days Elapsed since Mailout

- % Quality Targets Met (CY2015)
- Weighted Response Rate (CY2015)
- % Quality Targets Met (CY2016)
- Weighted Response Rate (CY2016)
- % Quality Targets Met (CY2017)
- % Weighted Response Rate (CY2017)
**QIMI: Impact**

Specialized Design Survey: % of Quality Targets Met vs. Effort (nrfu)

- % QT met (CY2015)
- % QT met (CY2016)
- QIMI_start CY2016
- %QT met(CY2017)
QIMI: Future Work

- New quality indicators will be added over the next year
  - Weighted and Unweighted: For surveys where data is required for modelling purposes or there is interest in small units
  - CV: directly linked to whether estimate is publishable
    - In 2018 the IBSP system will introduce the calculation the variance due to imputation.
    - QIMI will then be able to prioritise units based on the impact of switching a unit from imputed to reported on the CV of key estimates
    - Priority of units will be lowered that are easy to impute while those which are difficult to impute will increase their priority

- These indicators can be combined with those already in use depending on survey needs and aims
QIMI: Future work

- The use of paradata can further improve QIMI
- Two sources - Transaction history files and Eqlogs
  - Transaction history files
    - Contain information on all messages and phone calls made to respondents and the result of these calls
  - EQ logs
    - Contain information on respondents behaviour in the EQ in terms of movement between pages and time per page
    - Do not contain information on computer use outside EQ and do not contain respondents keystrokes.
QIMI: Future work

- Priority of units stuck in the survey or who have needed multiple calls to respond in the past can be increased.
- The priority of units which are likely to have completed the bulk of the survey can be decreased.
  - If respondents have spent a reasonable amount of time on important pages of the survey we can assess the probability that they have supplied the necessary information.
QIMI: Conclusion

- QIMI is already helping surveys to obtain better data for the complete survey, improve quality and publish earlier
- As changes continue to be made to the QIMI system we expect further improvements both in data quality and in reductions in effort and cost.
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