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Innovations in census methodology and technology, and results of testing**Innovative approaches used in the 2016 Canadian Census****Note by the Statistics Canada¹***Summary*

The latest Canadian Census was conducted on May 10, 2016, with collection spreading from early May to July 2016. The model for this Census was very similar to the one used for the 2011 Census, with the exception that the mandatory nature of the long-form collected on a sample basis was re-introduced by the new government in November 2015. This paper will briefly describe the collection methodologies used, including the wave methodology promoting response via the internet option. It will also describe the new communication approach used to support collection, focussed on targeted messaging to different segments of the population using different media channels, including approaches for hard to reach populations. Preliminary response metrics will also be presented in support of the description of the different methodologies.

¹ Prepared by Marc Hamel.

I. The Canadian Census

1. Canada conducts a census of population and dwellings every 5 years. The most recent one took place in May 2016 and expanded on methodological changes introduced for the 2011 Census. The wave collection methodology encourages response via internet while ensuring a high level of self-response. The basic approach was extended to a larger portion of dwellings (82%) in 2016. New for 2016 was the use of Statistics Canada's common systems for the census program, such as the eQ internet application and the Collection Management Portal to support field collection operations. The communication strategy was also revamped. The census brand was modernized, and specific strategies were developed for different key populations, including difficult to reach groups, based on population profiles and response patterns derived from 2011 Census results. Finally, collection efforts were planned and coordinated based on response models, updated dynamically during collection.

II. The census collection methodologies

2. The Canadian census uses different methodologies in conducting its collection. They are briefly described in Rodrigue et al (2012). The main methodology consists of a mailout using the information available in an Address Register. This methodology was applied to approximately 82 per cent of all dwellings in 2016. For the others, a questionnaire was either delivered to the dwellings by a census enumerator as part of a list and leave operation (16 per cent), or the census was collected directly at the door by a census enumerator (2 per cent). Collection at the door is mostly used for First Nations communities, and those in remote and northern areas. Central mail out is not used for all dwellings because the national postal service cannot deliver unaddressed mail. Statistics Canada does not have names of residents associated with dwellings as part of the Address Register. Since the dwelling is the basic starting point for the census enumeration of the population in Canada, it is imperative to provide specific letters or questionnaires to specific dwellings to determine the response status of every dwelling and ensure complete enumeration. The list and leave approach is used mostly in rural areas where mail is generally not delivered at the door but to a shared post-office box and requires a name to be delivered to a specific dwelling.

3. Statistics Canada conducted a test during the 2016 collection operation of mailing in selected list and leave areas, with selective drop-off to dwellings where mail-out is not possible. The results of this test are not discussed in this paper, but we hope to be able to increase the mail-out portion above 90 per cent for the 2021 Census if test results are conclusive.

III. The wave collection methodology

4. The wave collection methodology used for the 2016 Canadian Census is largely based on the theory of Dilman (2007), and was first introduced for the 2011 Census (Hamel 2012). Based on the results of tests conducted during the 2011 Census, the method was applied more uniformly for 2016, with a single treatment for mailout areas as opposed to two different treatments in 2011. The treatment was left unchanged for list and leave areas. The testing conducted during the 2011 Census concluded that a single treatment in mail-out areas would increase response via internet without impacting the level of self-response as a paper questionnaire option is also offered on demand. The choice of treatments in mailout areas in 2011 (letter only or paper questionnaire delivered in wave 1) was determined based

on the propensity of the population to self-enumerate as demonstrated in the 2006 census and on the 2006 Census internet take-up rate by area.

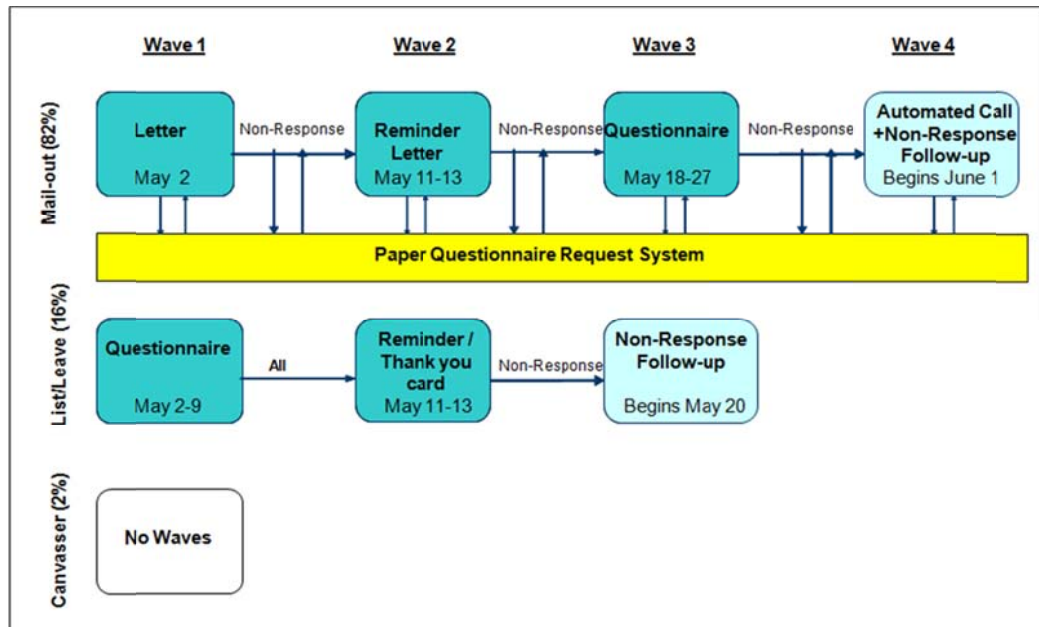
IV. Methodology in mailout areas

5. All dwellings in mailout areas were sent a letter only in wave 1 (Chart 1). The main message in the letter was changed from 2011 (please respond in the next 10 days), instructing respondents to complete their questionnaire by census day, which was May 10. Letters were all delivered on a single day on May 2 by the postal service. It invited respondent to respond online using the personal Secure Access Code printed on the letter, and also included a toll free telephone number to order a paper questionnaire if this was preferred. These calls were directed to the Questionnaire Request System. The toll free number of the Census Help Line was also included in the event that respondents had any questions or required assistance.

6. The initial mailout was followed with a Wave 2 reminder letter to all non-respondents from wave 1, starting on May 11. Wave 3 started on May 18, 8 days after census day. A questionnaire package was sent to all dwellings for which a response had not been received and a questionnaire had not been ordered via the Questionnaire Request System. This package contained a new access code for internet. The letter accompanying the package contained more direct wording concerning the mandatory requirement to complete the census.

7. Wave 4 started on June 1 and consisted of telephone or personal follow-ups of remaining non-respondents by enumerators. If personal contact was not established during initial follow-up, a message would be left on the answering machine or a ‘Notice of Visit’ card would be left at the door indicating the purpose of the follow-up and asking the householders to call the Census Help Line or the nearest Local Census Office for assistance in completing the census. Follow-ups continued until response rate objectives were met for all areas.

Chart 1 – Wave approach



V. Results from 2016

8. The various strategies and collection methodologies that were put in place ensured that the response objectives for the 2016 census were reached, and in most cases surpassed. The overall collection response rate was 98.4 per cent, with fairly low variance in rates at the Census sub-division level, a key geographic level for result dissemination for small areas. The objective for response had been set at 98 per cent. The internet collection response rate was 68.3 per cent, surpassing the objective of 65 per cent. The overall self-response was 88.8 per cent, a record level for the Canadian Census. We can then conclude that the methodology reached its objectives of increasing response by Internet without negatively impacting self-response.

9. The higher quality of responses received by internet has been demonstrated in previous censuses. The preliminary analysis of item non-response for 2016 shows lower rates of non-response compared to the last 2 censuses (2006 and 2011), pointing to an increase in overall quality for 2016. Additionally, income information will be obtained directly from income tax records for 2016, replacing the questions and the consent to use income tax record previously included in the long-form. This approach ensures that the 2016 Census will produce very high quality results for income information.

10. The table 1 shows the national and provincial global collection response rates, the internet collection response rates and the collection self-response rates.

Table 1 - Collection response rates

	Overall Response	Internet	Self-response
Canada	98.4%	68.3%	88.8%
Newfoundland and Labrador	98.6%	45.1%	88.0%
Prince-Edward-Island	98.2%	44.9%	89.6%
Nova Scotia	98.4%	55.8%	89.6%
New Brunswick	98.3%	65.4%	89.7%
Quebec	98.7%	70.5%	89.4%
Ontario	98.6%	70.9%	90.0%
Manitoba	98.2%	61.1%	88.9%
Saskatchewan	98.1%	54.2%	88.6%
Alberta *	97.9%	65.3%	83.3%
British Columbia	97.8%	71.2%	88.1%
Yukon	96.6%	56.8%	79.0%
Northwest Territories	96.6%	39.5%	87.2%
Nunavut	95.2%	0%	0%

Notes: These preliminary rates are obtained directly from collection results (as of August 4), i.e. before data processing and data quality verification. They are calculated as the number of private dwellings for which a questionnaire was returned, divided by the number of private dwellings classified as occupied by field staff. After processing and quality verification of the data, post-collection response rates will be produced. Among other improvements, these final response rates will include collective dwellings and adjustments to the number of occupied private dwellings based on a sample study of the quality of the dwelling occupancy status. * The rate Alberta exclude the municipality of Wood Buffalo that was evacuated for more than a month because of forest fires.

11. The collection response rate for the long form which was collected on a 1 in 4 sample basis was also the highest ever achieved on the census at 97.8% nationally. The long form, which adds approximately 50 questions to the 10 from the short form was reintroduced as a mandatory instrument in October 2015 by the newly elected government. It had been changed to a voluntary survey in 2011 by the previous government.

VI. Response management

12. Again in 2016, a strategy was put in place to manage the collection process to ensure that the target response rate for both the short and the long forms were going to be reached, but also to ensure as uniform response levels by region as possible. The dynamic predictive mathematical model was improved from 2011 to optimize the human and financial resources in the pursuit of response objectives.

13. The dynamic model projected the end of collection by region based on a number of parameters, such as self-response levels, productivity of enumerators, the projected attrition of enumerators, the remaining number of cases to be resolved, the hours worked per day by enumerator by area and by the collection support units (telephone follow-up capacity). This information was modeled every week during collection to determine if different tiers of the collection management strategy needed to be invoked. It was also used to estimate the number of work hours to be added in any given region/area to complete collection operations by the end of July at the targeted response level. The model was finally used to forecast collection costs until the end of collection and see if the available budget was going to be sufficient.

14. This analysis was shared with census managers every week to guide decisions about collection priorities and to make decisions on required actions and/or adjustments. Decisions were centered on the necessity to move regions to a different tier, and where the effort of the centralised telephone capacity was going to be focussed. The management strategy was comprised of four tiers (Hamel 2012).

15. Because of actual and predicted favorable conditions during the 10 weeks of non-response follow-up in 2016, most areas in the country never moved below tier 2. At tier 2, collection continued in any given geographic area until a response rate of 98.5% was reached for the short form and 96% for the long-form. The preliminary assessments show that the predictive power of the model was fairly accurate

VII. Adopting corporate systems for the Census

16. Because of the particularities of the Census Program, most required systems had traditionally been developed specifically and solely for the census. In recent years, Statistics Canada has adopted a Corporate Business Architecture which calls for IT solutions and business processes to be developed for corporate use rather than for individual program specific requirements. This allows for the development more robust solutions. This approach also deploys a rigorous risk mitigation strategy regarding the maintenance of corporate software applications.

17. The Census Program successfully adopted such solutions for 2016, allowing economies of scale for the department and the census program itself. The solutions adopted for the 2016 Census include the common internet application (eQ) to replace the census-specific application used since 2006. A new Collection Management Portal (CMP) was also deployed to replace the Field Management System used in 2011. This web base application is used by field personnel to retrieve work assignments, including timely updates on cases resolved from other sources, and enter productivity and pay information. This system also has a number of other key features, such as management information reports used by manager to monitor collection progress. The Census Program was the first user of CMP which will now be adopted by all other surveys conducted by the Agency. Corporate solutions were also successfully adopted by the Census Program to manage overnight travel, and other financial services.

18. Preliminary evaluations indicate that some adjustments to these solutions will be necessary for 2021. Overall, the adoption of corporate solutions for the Census was successful in 2016, and it is expected that their re-use in 2021 will allow important efficiencies.

VIII. Tailored communication strategy

19. The communication approach was redesigned for the 2016 Census. The Integrated Communications Strategy (ICS) was designed as a social marketing campaign. The emphasis was placed on research, segmentation, targeting, and positioning. The overall targeting strategy consisted of full market coverage, and the use of differentiated marketing to reach audiences that had proven more difficult to enumerate in the past.

20. Statistical analyses guided the design, implementation and monitoring of census communications activities. The ICS employed behavioral economics and sociodemographic segmentation to identify hard-to-enumerate audiences. The goal of the segmentation was to understand which areas are more or less predisposed to self-respond, and what key sociodemographic characteristics had to be considered in the execution of communication activities. These activities were tailored to specific populations to encourage early participation in the census. Throughout the collection period, the Census communications team relied heavily on both 2011 segmentation maps, as well as real-time response maps to identify specific areas/audiences where response was lagging.

21. Preliminary observations made in the field by outreach teams, supported by preliminary analysis of cumulative response rates, seem to indicate that the use of differentiated, segmented marketing activities played a role in both increasing self-response from hard-to-enumerate audiences, while reducing the need for non-response follow-up activities in the field. This success contributed to the overall increase in self-response compared to 2011.

IX. Lessons Learned

22. The approaches used to increase internet and self-response in the Canadian census have again proven to be a success in 2016, following the successful introduction of many of these in 2011. The refinements introduced following the lessons learned from 2011 made it possible to reach and surpass all collection objectives for 2016 while generating important efficiencies, especially in non-response follow-up. The focus of the evaluations from 2016 will be on the potential for expansion of the mailout universe which would increase the benefits of the methodology further for 2021. Particular attention will be dedicated to improving the methods of contact with dwellings, anticipating that the efficiency of using traditional mail as the primary mode of contact will diminish in the next 5 years as more and more people rely on other means of communication, such as Internet.

Biography

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