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Transitions in census methodology; plans, experiences and innovations

Canada's Census Journey to Electronic Data Collection

Note by Statistics Canada*

Summary

This document discusses the history and contributing elements of Statistics Canada's transition from paper to electronic data collection and the plans for 2026 and beyond. The latest Canadian Census conducted in 2021 successfully implemented modifications to further encourage self response via the internet and to reduce the use of paper questionnaires by respondents. In the early development of the 2026 cycle design, strategies were explored to further reduce the use of paper in favour of electronic data collection for both self-response and during the resource intensive, Non-response Follow-up (NRFU) operations. Extensive testing is planned to validate proposed changes and to provide evidence-based analysis supported by quantitative and qualitative testing.

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I. Introduction

1. The purpose of the Canadian census programme is to ensure that once every five years all dwellings in Canada are enumerated and that for each occupied dwelling a census questionnaire is completed. The collection methods to undertake this task have evolved, and continue to do so with the introduction of new technologies and techniques that aim to provide timely, high quality data products for data users.

2. As with all statistical programmes, there comes a point at which traditional census collection methods are challenged by social changes, influencing how the general public interacts with and views government operations. From a census programme point of view, a few key indicators that highlight these changes are: demand for more timely statistical outputs; ongoing pressure to manage costs; and changes in response burden tolerance and data users' interests.

3. The objective of this paper is to provide an overview of Statistics Canada's journey to the implementation of electronic data collection, focusing particularly on the steps taken to eliminate its reliance on paper questionnaires (PQs) as it progresses towards 100 per cent electronic data collection. The future of census-taking in Canada will leverage previous investments in technology and opportunities to make the programme more user centric while reducing its environmental footprint.

II. Background

4. Canada conducts a census of population once every five years, with the most recent cycle having just finished the data collection phase in the summer of 2021. The 2021 cycle continued to expand on the approaches introduced in previous cycles to encourage self-response via the internet. This was accomplished through the utilization of a technique referred to in Canada as the "wave methodology". The wave methodology consists of a predetermined and specific timeline that uses various communication products and mediums to remind and encourage respondents to complete their questionnaire online, while mitigating the risk of a decline in overall response by also offering other response options such as ordering a paper questionnaire.

5. The wave methodology was introduced a number of cycles ago, and has been adapted in those that have followed. Each cycle has resulted in improvements to the method, with changes driven by institutional, environmental, socio-cultural and economic factors. As the method has progressed and as society and technology have evolved, progressively fewer paper questionnaires have been used, despite a growing population and the resulting expansion of census field operations in Canada.

A. Step by step transition to electronic data collection

6. In this section, the transition from paper to electronic data collection in the Canadian census will be examined, showing the progression of how multi-mode data collection¹ was implemented over the last 20 years. Multi-mode data collection was founded on the principle that, with the introduction of a response mode, there should be a measurable improvement to the cost effectiveness of collection activities while minimizing any impact or improving response rates and the quality of the data collected.

7. For one hundred years following the first post-Confederation census in Canada in 1871, the census in Canada was conducted in very traditional ways, using census representatives who canvassed dwellings and filled out a form. Then, self-enumeration was introduced with the 1971 Census. Self-enumeration reduced errors due to interpretation by census representatives and improved the accuracy of answers to sensitive questions. Further,

¹ Multi-mode data collection methods: paper questionnaire self-administered (PASI), paper questionnaire administered by an interviewer (PAPI), computer-assisted self-interview (CASI) and computer-assisted personal interviewing (CAPI).

this new response mode provided a sustainable and long-term approach to reducing collection costs as the population continued to increase.

1. Delivery Methods

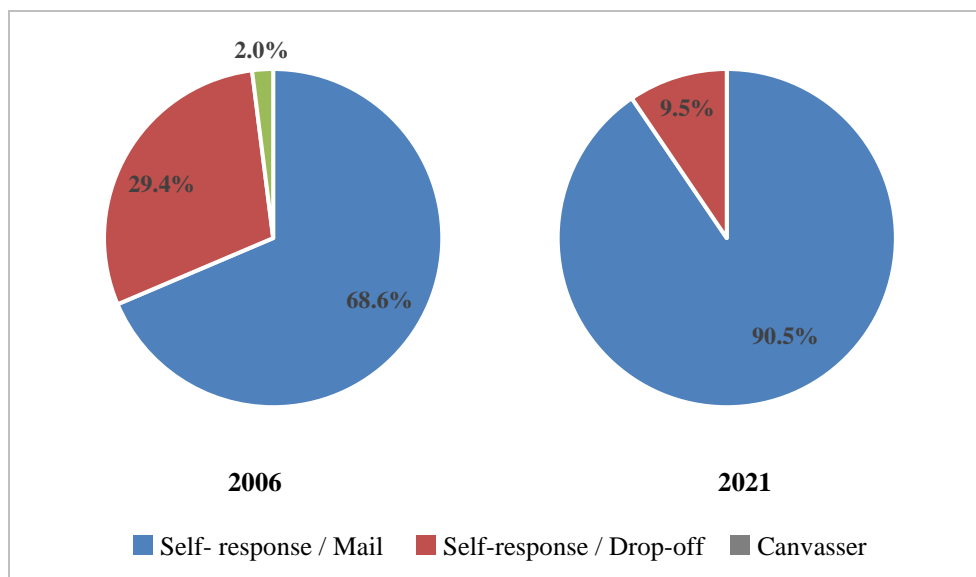
8. In the 1971 cycle, about 98 per cent² of dwellings were delivered a paper questionnaire. The self-enumeration approach was implemented in response to growing concerns around privacy of personal information (the ‘local enumerator’ issue) and the physical security of completed questionnaires. For the other 2 per cent of dwellings, predominantly on reserves and in the northern and remote areas of Canada, the canvasser collection mode was used.

9. The development of a high-quality census frame, the Address Register (AR), allowed the 2006 Census to introduce an important methodological change, the use of the “mail-out method” to replace the need for census representatives to list dwellings and to deliver questionnaires.

10. The mail-out operation is supported by the Canada Post Corporation (CPC), the national postal operator in Canada. In 2006, CPC delivered paper questionnaires to 70 per cent of the self-enumerated dwellings³. Self-enumeration comprised two delivery methods, the mail-out (MO) and the drop-off of the questionnaire by census representatives. The mail-out portion continued to grow every census cycle as the quality of the AR increased, thus reducing the need for the listing of dwellings and dropping off of questionnaires.

Figure 1

Proportion of private dwellings by delivery method



11. In 2021, 90.5 per cent of dwellings received the census invitation letter by mail. This level was reached by increasing the use of the addresses available on the AR in some areas where previously census representatives traditionally listed and delivered census material. Census representatives delivered invitation letters to addresses available on the AR that were identified as “un-mailable” by CPC. This method is expected to be further maximized in 2026.

12. The 2026 Census will also include additional improvements to the census frame. The Address Register (AR) will be replaced by the Statistical Building Register (SBgR), an evergreen register that will integrate new administrative data files. One of the main improvements of the SBgR is the capacity to support all dwellings across Canada, including those without a civic-style address. This is possible by allowing new types of addressing such as GPS coordinates, building numbers used in some northern region communities and

² Refer to [2001 Census Handbook](#), page 13.

³ Refer to reference material, “[About the Census](#)”, section “delivery of questionnaires”.

Dominion Land Surveys, a method used to divide most of western regions into one-square-mile sections. The SBgR also covers non-residential buildings, which is helpful to accurately delineate collective dwellings from the private dwelling universe. The full coverage of Canadian buildings will ensure persistence of units, reduce duplicates and provide unambiguous collection information to the census.

2. Electronic Response Modes

13. In 2005, with self-enumeration by paper questionnaire well established, the fact that more than half of all dwellings had access to the internet (approximately 61 per cent⁴) opened the door for the introduction of the internet response mode to Canadian households that had an internet connection.

14. In the 2006 Census, each paper questionnaire delivered (whether by Canada Post or by a census representative) included the Uniform Resource Locator (URL) of the census website and a unique Secure Access Code (SAC). About 18.5 per cent of households used this response mode, an important milestone for the transition from paper to electronic data collection. This number exceeded expectations at the time and had an important effect on all surveying of households at Statistics Canada. Immediately following this success, for example, the Labour Force Survey began looking at ways of introducing internet self-response. Online responses increased the quality and timeliness of the collection of data compared to paper questionnaire responses.

15. An important initial indicator of data quality is the completeness of the questionnaires. In 2006, the edit failure rate by questionnaire type⁵ was clearly higher for paper questionnaires than for internet (Table 1).

Table 1
2006 Edit failure (per cent)

<i>Response mode</i>	<i>Short Form %</i>	<i>Long Form %</i>
Internet	2.5	5.7
Paper	5.6	39.1

16. Electronic response also simplifies processing. With no need to ship, store, scan and retain paper, processes with internet/electronic response can be faster and more efficient, allowing for the census outputs to be produced in shorter periods of time and with lower cost.

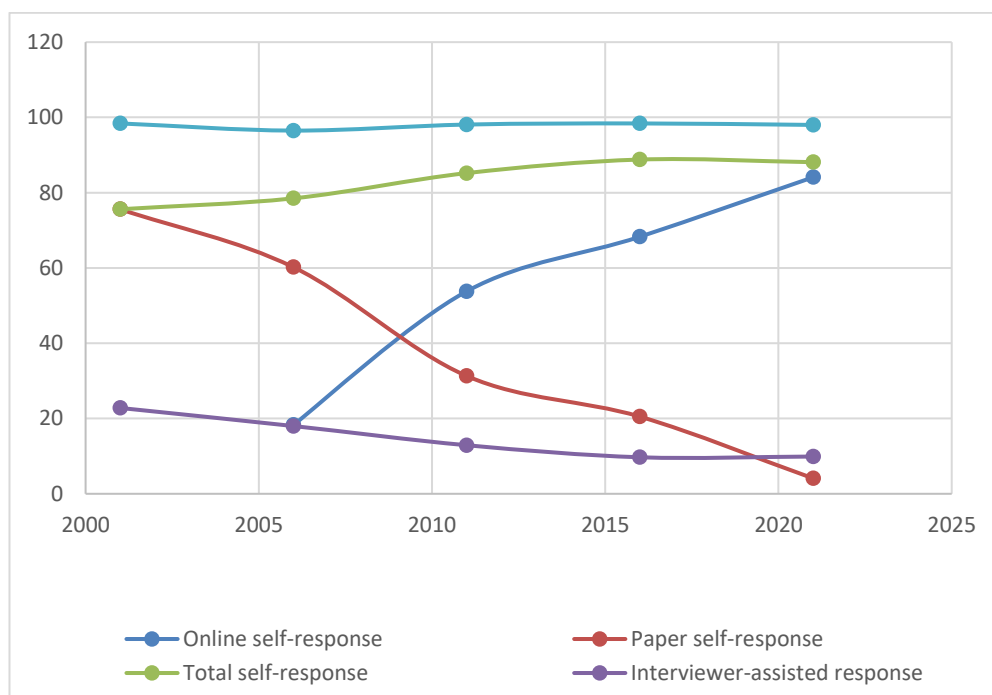
17. Building on the successful introduction of the internet response mode and looking to reduce the number of paper questionnaires used, the 2011 Census no longer included a paper questionnaire for 75 per cent of dwellings of the initial mail-out – instead sending out invitation letters with only a SAC to respond by internet. The results clearly demonstrated that providing an invitation letter led to more internet responses (or, conversely, that providing a paper questionnaire discouraged internet response). The internet response rate was 71.6 per cent for households that received an invitation letter, compared with 25.8 per cent for households that received a paper questionnaire.

18. The use of invitation letters without questionnaires was subsequently extended to all households in the mail-out (MO) areas, (approximately 82 per cent of private dwellings) in 2016, and to all Canadian households by 2021. As a result, the self-response rate increased over time and reached 88.1 per cent in 2021.

⁴ [The Daily, Tuesday, August 15, 2006. Canadian Internet Use Survey \(statcan.gc.ca\).](#)

⁵ [The Internet: A new collection method for the Census - ARCHIVED \(statcan.gc.ca\).](#)

Figure 2
Canadian Census collection response rates 2001–2021⁶



3. Paper Response Mode

19. As explained in the previous section, the offer of a paper questionnaire was deliberately reduced over the years to encourage respondents to use the electronic response mode, and each step was tested carefully before implementation to reduce the impact on the overall response rate. In 2016 (following the live experiment in 2011) paper questionnaires were only provided as a second reminder for non-respondents, and could be ordered at any time using the on-demand Questionnaire Request System (QRS) for respondents in MO areas. The QRS option was offered in the invitation letter. The paper questionnaire continued to be used in areas where census representatives delivered census material.

20. In 2021, the offer was further reduced, replacing the paper questionnaire with an invitation letter in areas where census material was delivered. In MO areas, the second reminder was replaced with a letter and the on-demand QRS option was moved to the end of the invitation letter, resulting in the associated self-response rates portrayed in figure 2. By the end of the 2021 field operations, paper self-response was only 4.1 per cent, well below the 20.5 per cent of 2016.

21. The census interviewer-assisted response (CATI/PAPI) has up to now been supported mainly by the use of paper questionnaire (PAPI). In fact, the responses received by the Census Helpline (CHL) and the Census Support Unit (CSU) telephone operators, which use electronic questionnaires (CATI), account for only a small portion of the enumerator-assisted response rate. In 2021, 1.3 per cent of the response rate was provided by the CHL and CSU services and 8.6 per cent was provided by the field Non-Response Follow-Up (NRFU), although NRFU visits to homes frequently prompt respondents to complete their questionnaire online or on paper.

22. The reduction in interviewer-assisted response has also contributed to a reduction in the paper response mode. The proportion is about half of the level seen 20 years ago; the response rate for this mode was less than 10 per cent in 2016 and in 2021, compared with about 23 per cent in 2001.

23. Combined, paper self-response and paper use by census representatives at the doorstep during NRFU has fallen dramatically over the years, accounting for only 12.7 per

⁶ Sources: 2001, 2006, 2011, 2016 and 2021 Census.

cent of all responses in 2021. This puts the Canadian census programme in range of a full elimination of paper, perhaps in time for the 2031 round. To do so, further encouragement of internet self-response is required, as is a major change to field operations during NRFU. Replacing paper with electronic devices for all interviewer-assisted work is the most important and immediate next step to ensure that the programme continues to lower its carbon footprint and build a climate resilient operation.

III. 2026 and beyond

24. The 2021 Census cycle had many challenges above what is normally expected, due to the pandemic and the resulting necessity to adapt the collection plans to correspond to many new public health measures. While extremely challenging, this provided a unique opportunity to test and implement a number of operational changes that will advance our technical and operational capabilities within much shorter timeframes. For example, the transition from traditional brick and mortar offices to a virtual workplace model and the reduction of domestic travel and higher emphasis on local hiring of census representatives, particularly in the northern and remote areas of Canada. These are significant innovations because they demonstrate that the programme is now prepared to introduce a more dynamic, fluid and technologically responsive posture without compromising data quality.

25. The two main areas of focus for the 2026 cycle are reduction of PQs used for self-response and the implementation of a handheld device for electronic questionnaire collection during Non-response Follow-up (NRFU) operations. The objective is to improve efficiencies in data collection and processing, reduce respondent burden while strengthening public trust in the agency to protect respondent privacy, and safeguard the confidentiality of the data entrusted to us. It is important to emphasize that public trust is a cornerstone of the research and analysis of possible technological or operational advances to the census programme.

26. In early 2022, working groups were formed to investigate 1) the possibility of eliminating paper self-response and 2) the introduction of field devices. The following is a summary of the initial findings and current planning assumptions for the 2026 census, related to these topics. In addition to these working groups, other working groups in Canada are examining options that will have a more indirect impact on paper use, such as the working groups looking into the addition of an option to access the electronic questionnaire without a SAC, and another group investigating improved respondent support through the introduction of automated methods (e.g. a chat bot) of answering questions that respondents have about completing their census form.

A. Can paper self-response be eliminated by 2026?

27. With a major decrease in paper response to 4.1 per cent of all dwellings in 2021 (-16.4 percentage points from five years earlier), it appears in Canada that we are at the cusp of a full elimination of paper as a self-response option. As a result, one of the first areas that has been examined for the 2026 cycle is the potential to eliminate paper questionnaire (PQ) self-response through the decommissioning of the Questionnaire Request System (QRS). Demand for this system will naturally decrease, as internet access and other factors contribute to declining use of the system. Initial estimates suggest that between 2 per cent and 3 per cent of all dwellings are likely to prefer or need paper questionnaires to self-respond in 2026.

28. With this initial expected volume of requests to the system, the working group examined whether alternatives to paper self-response could be provided for this level of expected demand. In any scenario where the QRS is eliminated, the main alternative for PQ self-responders prior to the start of NRFU operations would be to call the Census Helpline (CHL) for assistance. Due to the difficulty in any census of meeting peak demand with the CHL, even with the introduction of new services and techniques to support respondents, there would also be higher NRFU workload for personal interviewing, both of which are expensive and resource intensive, if QRS were to be eliminated.

29. While there would be challenges in meeting an increase demand on CHL and NRFU, the possibility of elimination of paper in time for 2026 has met with a more important barrier.

With new legislation introduced in 2019, the Government of Canada has renewed their priority to reduce barriers to participation in society. The working group concluded that the elimination of self-response PQs for the 2026 cycle would present a significant barrier to participation for some, particularly those who are less educated, older and living in remote parts of the vast geography of Canada.

30. As a result, in 2026 a paper self-response option will still be made available. However, there remains an opportunity to further reduce access to paper questionnaires by testing options to make the on-demand PQ offer less visible. For example, testing for 2026 will likely include an evaluation of the degree to which the elimination of the QRS option on the initial invitation letter might “nudge” people to respond online.

B. Should Canada provide census representatives with devices in 2026?

31. The largest scope for paper reduction in 2026 lies with the introduction of handheld devices for the purpose of EQ collection during NRFU operations. This has been explored in previous cycles. However, there were a number of barriers to its implementation. For example, Canada’s vast territory with varying levels of internet connectivity creates challenges to the access and submission of EQs completed by census representatives. Further, the financial costs associated with procuring hardware devices for ~30,000 enumerators and the information technology (IT) system development requirements to make them compatible with census collection systems and network security requirements are also significant hurdles. However, with government investments in improving internet connectivity and reduced costs of handheld technology, a working group has recently concluded that the use of handheld devices by Canada’s census enumerators is now within reach for the 2026 cycle.

32. The deployment of handheld devices to census representatives for the collection of EQs will allow for improvements to data quality and timely processing of collected data, while at the same time improving efficiencies in NRFU collection. It will allow for improved optimization of the planning and utilization of NRFU census representatives, by reducing unnecessary attempts on dwellings which have responded and been resolved through self-response or by telephone assistance from the Census Help Line or Collection Support Unit. Further, during NRFU collection, real time registration of completed EQs will provide real-time information that is more representative of the true status of collection, unlike the lagged information that is the nature of paper questionnaire use.

33. Equally, EQ collection at the doorstep will result in the same advantages that self-response mode benefits from: automated quality control of collected data by allowing for built-in edits and skip patterns. EQ collection will also provide complementary paradata on the collection process and the behaviour when filling out the questionnaire (e.g. time to complete each page, edits that are triggered, etc.). This will enhance post-collection analyses to inform the development of future improvements.

34. This priority offers the most significant reduction to the programme’s use of PQs during NRFU. In previous cycles, the programme has used an extensive network of suppliers and warehouses to produce, transport, store and process PQs. At the end of collection, shredding requirements will also be reduced. It must be noted, however, that there will be a continuing need for paper products such as invitation letters or reminder cards left by census representatives.

35. Following extensive analysis by a working group in early 2022, the current planning assumption for the 2026 Census of Population in Canada is that a device will be provided to all field staff engaged in NRFU. A “bring your own device” (BYOD) option was discussed, but rejected on the basis of the complexity of managing and supporting a large number of users with various device types and characteristics. In addition, the BYOD option brings a number of privacy and data confidentiality and cybersecurity concerns and challenges.

36. The other major planning assumption is that the device would need to function in an offline mode, when an internet connection is not available. For relatively short periods of time, questionnaires would be securely saved on the device, until questionnaire transmission

is possible. Both this, and the provision of a government-approved device, are consistent with the current practice for all non-census household surveys at Statistics Canada.

IV. Conclusion: Next Steps

37. The priority to determine the optimal strategy to reduce paper self-response and to move to device use during NRFU will be thoroughly tested in May 2024 (along with a number of other 2026 planning assumptions) before being implemented in the 2026 collection. A testing strategy has been developed to provide oversight and governance to the testing process.

38. The testing strategy is developed to document the overall targets, proposed approach, tools and timing of test activities to be undertaken. The strategy ensures that proposed and anticipated changes to concepts, methodologies, collection instruments (including content, questionnaire format and flow, collection tools and technology) and operational processes are adequately considered for incorporation within the strategy's schedule and allocated resources.

39. Further testing on nudging respondents away from paper self-response will include qualitative interviews to gather respondent feedback on proposed communications products without a PQ option. Panel studies are also being planned with specific panels designed to measure the impact of not offering/lower offer of the PQ option. With this information, we aim to determine whether the extra workload (in terms of CHL/CSU, NRFU) can be managed with the designed plans and resources, and to better understand the impact on quality.

40. In May 2024, the programme will undertake a field behaviour test which will aim to assess the use of handheld devices in NRFU collection. Planned development to the IT system infrastructure and changes to logistics and physical infrastructure to distribute and support the devices will also be tested. Further, training for census representatives on the use of the device will be introduced, recognizing that not everyone has the same degree of comfort with technology, so training and support needs will vary. Even with improvements to internet connectivity in Canada, there are still some geographies with connectivity challenges. Therefore, the programme will employ an offline collection mode that will enable the census representatives to collect an EQ without an internet connection and then securely transmit it when they have a connection.

41. Future census cycles will leverage these innovations and improvements to introduce the next evolution of electronic data collection: a new response channel that uses administrative data in place of a traditional census questionnaire for eligible dwellings. This new response channel will seek to continue to reduce the programme's environmental footprint, make optimal use of external and internal datasets, and maintain data quality and public trust. This topic is further discussed in "The use of Administrative data for the 2026 Canada Census of Population".
