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The future of censuses and their role for national statistical systems**Strategic direction for the New Zealand Census of Population and Dwellings****Note by Statistics New Zealand***Summary*

This paper examines the options for a new strategic direction for the Population and Dwellings Census in New Zealand. The major driving factor behind the need for frequent census data is the high rate of external and internal migration in New Zealand. However, the rising cost of the census has been the catalyst for discussions to find new strategic directions. Questions have been raised about whether New Zealand could move to a census model which reduces reliance on census collectors. The increasing availability of alternative data sources for producing statistical information and technological developments require rethinking of the census processes. It appears that use of administrative data sources is necessary for reduction of the cost of producing census information.

I. Introduction

1. The New Zealand Census of Population and Dwellings is the cornerstone of official population and social statistics in New Zealand. It provides the authoritative count of the New Zealand population and dwellings, and is the only comprehensive source of information about local communities and small population groups. The census is a key source of information about the indigenous population (New Zealand Māori) and the only source that provides socio-economic information on tribal groupings (iwi). In this context, ethnicity and Māori descent are seen as key demographic variables.

2. Census data is used extensively by a wide range of stakeholders and has become embedded in many government processes. The census plays a critical role in the electoral system, and is essential to the production of population estimates and projections. These population statistics are used: to allocate large budgets through population-based funding allocations in health, education, social welfare, transport and local government; to estimate the future costs of government social expenditure programmes; and to inform a wide range of infrastructure planning and service delivery at national, regional and local levels.

3. The first New Zealand census was held in 1851, with three-yearly intervals at first. Since 1881, censuses have been held every five years, apart from 1931 during the Depression and 1941 due to the Second World War (Statistics New Zealand (Statistics NZ), 2006). The five-year interval was continued through legislation in the Statistics Act 1975. The recent decision not to hold the 2011 Census due to the major earthquake in Christchurch is only the third interruption to this long series.

4. The New Zealand 2011 Census was called off 11 days before census day on 8 March 2011 as a result of the 22 February earthquake in Christchurch. The census was fully operational with 140 field offices set up, 7,500 field staff employed and 25% of forms delivered. The 2011 Census could not be completed due to the national state of emergency and the probable impact on census results. The next New Zealand census will be held on 5 March 2013, seven years after the last completed census in 2006. Under existing legislation, the following census will be held in 2018 unless the New Zealand Government decides to change the Statistics Act.

A. Key features of the New Zealand census

5. The major driving factor behind the five-yearly census is the high rate of external and internal migration in New Zealand, resulting in rapid population change. High population flow is very much a part of the story of New Zealand. Flows of migrants into and out of New Zealand are among the highest in the world. The 2006 Census reports that 23 percent of people usually living in New Zealand were born overseas. New Zealand has the fourth highest level of foreign-born population in the OECD, after Luxembourg, Australia, and Switzerland. New Zealand is second only to Ireland in the percentage of the population born in New Zealand that is living in another OECD member country (Dumont and Lemaître, 2005).

6. Levels of internal migration are also high, with around half the population moving address in the five years between the 2001 and 2006 Censuses (Statistics NZ 2006).

7. The estimated resident population for New Zealand in 2013 is expected to be around 4.5 million people living in 1.8 million dwellings. The budget for the 2011 Census was \$NZD 90.4 million. The 2013 Census will be very similar to that planned for 2011, and is expected to cost around \$74 million. The 2013 budget is reduced from the normal cycle because of the high level of re-use of processes and systems.

8. The collections phase comprises the single largest component of census costs, accounting for around half of the total. A large temporary work-force is employed at each census to physically enumerate, deliver and collect census forms for every dwelling in New Zealand. The number of households choosing to mail back census forms has been increasing (9 percent in 2006), though mail back has not been actively encouraged. The internet was introduced as a response mode in the 2006 Census, although uptake of the online form was low (7 percent). A target of 35 percent has been set for the 2013 Census.

9. The Statistics Act 1975 was changed in 2010 to provide for more flexibility in the methods used to deliver census forms to households. The requirement that all census forms be hand delivered to households has been removed and the Act now provides for either personal delivery, delivery by post or by electronic means. Although there was insufficient time to change the delivery and collection processes between the 2011 and 2013 Censuses, this amendment to the Statistics Act creates opportunities for reducing collection costs at future censuses.

II. Future directions

10. The rising cost of the Census of Population and Dwellings has been the catalyst for discussions about the sustainability of the current full enumeration census model. While the cost of the New Zealand census compares favourably with other countries, increases in population size and inflation have led to significant cost increases between consecutive five-year censuses. Questions have been raised about whether New Zealand could obtain better value for money by moving to a ten-yearly census, or by moving to a census model which reduces reliance on census collectors.

11. The increasing availability of alternative data sources for producing statistical information, technological developments, and concern about our long-term ability to maintain adequate population coverage using the current census model, are other drivers for considering change to the way in which we produce census information.

12. The potential for adopting different approaches to census-taking in New Zealand is discussed in Bycroft, 2011, with an emphasis on the impact of different frequencies. Statistics NZ, 2012 presents issues and options and proposes a strategy for future censuses in New Zealand.

13. In early 2012, Statistics NZ presented a paper to the New Zealand Government on the strategic direction for the New Zealand census. The aim is to deliver key census statistics in a more efficient and cost effective way. The proposed strategy proceeds from a short-term focus on modernising the current census model to a long-term goal of developing a new model based on administrative data sources.

14. Given international experience, it appears that a census model based solely on suitable administrative sources is the only alternative model that provides a radical step change in the cost of producing census information.

15. International results suggest it is realistic for New Zealand to implement approaches to reduce census collection costs through reducing the size of the field force. However, considerable uncertainty still exists about the viability of a census based largely on administrative sources because the pre-conditions for successful international approaches do not exist in New Zealand at present. It is too early to make long-term decisions, but there is sufficient encouragement to investigate the use of administrative data further, with coordinated support across government agencies.

16. The future census strategy is that Statistics NZ continues with a five-yearly census, implementing changes that will reduce the costs of collection and other efficiencies, alongside a work programme to investigate administrative census options.

17. An advantage of this strategy is the availability of census information every five years to test administrative solutions against. This is expected to result in a faster transition towards an administrative census than longer census intervals.

18. Transitioning away from the current five-yearly census model will take some time due to the complexity and inter-connectedness of census data in feeding into the official population and social statistical system, as well as acting as the trigger for a number of other government processes.

19. A phased and parallel approach to the investigation of an administrative census is proposed, to ensure that progress and prospects are clearly signposted and that investment requirements can be reassessed as required and targeted effectively. Evaluation stages will be built into the work programme. Reports will be submitted to government and the direction of the next phase determined by government's response.

III. Work programme

20. Three main strands of work guide the future census strategy:

- (a) Improve the efficiency and reduce costs of the current census model;
- (b) Improve population statistics between censuses;
- (c) Investigate alternative census options, including extending the census cycle to 10 years, and the feasibility of an administrative census.

A. Reduce census collection costs

21. In the 2011 Canadian census, Statistics Canada has demonstrated the success of a census collection approach that reduces the role of field staff in all phases and aggressively targets internet response. The 2011 census of England and Wales also significantly reduced the size of the field work force, although savings in the field were balanced by development costs (pers comm). Given these examples, it seems likely that New Zealand could implement a similar strategy that would in time achieve a reduction in census costs, while maintaining high response rates and overall quality.

22. The proposed new collection model shifts the role of field staff to one where they are used in situations where they can be most effective in maintaining a high coverage. As much of the population as possible will be asked to self-respond, preferably by Internet, or by mailing back forms. However major reductions in field staff are enabled only by removing them from the enumeration and delivery phases as well. This requires a high quality dwelling frame with accurate addresses. Then Internet codes and census forms can be mailed to dwellings. Field staff are used mainly where address information is poor, or where people do not respond within a certain time frame.

23. There is no national address register in New Zealand; however administrative and commercial address listings are being investigated, supported by a new geo-spatial infrastructure being implemented at present. The 2013 Census will be used to test the quality of these address listings, and this will determine the extent of the first implementation of mail-out. The proposal at present is to implement the new model in the 2018 Census for areas where a high quality address listing can be assured, and to increase mail-out areas in the following census.

B. Improve population statistics between censuses

24. All population statistics depend on the census to maintain their accuracy over time. The census provides the basic stock data about how many people there are, where they live, and the structure of the population by age, sex, ethnicity and Māori descent.

25. Population statistics in between censuses depend on administrative data for measures of population change. Births, deaths and external migration data have been in use for over a century and produce good measures of the national population in between censuses. However, information about internal migration is problematic, with no direct measures available. The accuracy of population statistics generally decreases over time, particularly at sub-national levels, due to the high mobility of New Zealand's population.

26. This strand of work aims to improve the quality of sub-national population estimates in the current five-yearly interval, and to gauge the ability of administrative sources to sustain robust population statistics for a longer period than at present. The Christchurch earthquake has given this work an added impetus as it has resulted in unusual shifts in population distribution at local levels, and at the same time has delayed the census, the only direct measurement source. While important at present, the work also supports the long-term goal of an administrative census, as greater understanding and use of administrative and commercial sources materially informs the options for an administrative census.

27. It is expected that population statistics in between censuses will be improved through greater use of administrative data. Investigation of a much wider range of administrative and commercial data is underway and new sources have been used to produce the 2011 mid-year subnational population estimates (Statistics NZ, 2011a, 2011b).

28. Exploiting the ever-increasing quantities of administrative sources is challenging, as this data is almost always noisy or incomplete. Bayesian modelling techniques for using administrative data with partial information about the population are being developed (Bryant and Graham 2012). The Bayesian approach creates a formal statistical model using data sources at aggregate levels. It has the potential to increase the efficiency and transparency of the estimation process, and generates formal uncertainty measures. It remains uncertain whether the results would be sufficiently accurate over an extended period at the level of detail required.

C. Ten-yearly census

29. In developing the strategy for future censuses, Statistics NZ has considered other changes taking place internationally, particularly with respect to frequency (Bycroft, 2011). A longer period between censuses, such as a ten-yearly census, remains an option, but depends on the outcomes of other work described above.

30. The main objective of a ten-yearly census cycle would be to save costs. However, one census every decade does not reduce the costs of running a census by half compared with two five-yearly censuses. And there are consequences for the uses of census data. A key risk is that any cost savings would be offset by shifting costs to other government departments as a direct impact of decreasing accuracy of population statistics or out-of-date census information.

31. A ten-yearly census would not provide fit-for-purpose population statistics over the ten year period using current methods, and so requires substantial improvements from new methods that can be sustained over time. An interval of ten years between censuses is seen by stakeholders as too infrequent to be able to successfully monitor outcomes for small areas and small population groups of policy interest. The census is as an efficient frame for

sample surveys targeted at Maori, and people with a disability. A longer period between censuses also means that these post-censal surveys must be conducted less frequently. With a ten-yearly census cycle and the present three-yearly electoral cycle, electorates would remain in place for three or four elections (rather than one or two elections), and the consequences for the electoral system would need to be resolved.

32. An associated issue is alignment with when censuses are taken in other countries, in particular Australia. Alignment of census timing with the end of the decade is a lower priority than meeting the needs of key users of census information. Once new methods for population statistics can be tested, and the impact of the seven year gap caused by the Christchurch earthquake is understood, an adjustment back to the previous cycle may be given greater weight.

D. The potential for an administrative census

33. Statistics NZ has examined the feasibility of moving to a register-based census (Bycroft, 2010) and concluded that New Zealand currently meets none of the pre-conditions for introducing such an approach. Development of a fully register-based census would be challenging as New Zealand has neither a population register nor a unique identifier held in common across administrative systems.

34. An alternative approach may be to use existing administrative sources as the basis for establishment of a *statistical* population register. Statistics NZ has completed an initial investigation into several administrative data sources that include large sections of the New Zealand population. The most promising sources include health data and tax data, because they are national datasets and can include people of all ages. Electoral data and education data are other good sources but are restricted to certain age groups. These and other sources are already used to inform the derivation of sub-national population estimates in between censuses. But each source is incomplete compared to the national resident population. There are major differences between the administrative sources and the official data for children and for young adults. These differences become more pronounced and more variable as the data is broken down by sex, and by sub-national geographies. Neither source includes Māori descent (needed for electoral calculations), and ethnicity is absent from tax data and poorly collected in health data.

35. Despite these limitations in coverage and key gaps in census content, there is sufficient encouragement to explore the use of administrative data further, including linking across data sources. Since there is no common identifier, most linkages use probabilistic methods, which creates further issues for population estimation. There are significant parts of the population that are well covered in existing sources, and it seems reasonable to anticipate that further work and continued improvement of the coverage of these data sources will enable us to make progress. However, the feasibility and cost of constructing a statistical population register based on re-use of existing administrative data would depend heavily on whether databases could be improved and brought together to solve coverage problems and to obtain up-to-date address information.

36. The main limitation of an administrative census is that the range and quality of information that could be produced would be limited to what already exists in administrative systems. Any administrative census approach for New Zealand is likely to include a coverage survey and large sample survey to adjust for limitations in the available administrative sources.

37. The long-term goal for some kind of administrative census presents an opportunity for wider consideration of the benefits to Government and agencies through improved use of and accessibility to administrative data, including an examination of the potential

benefits to New Zealand of a formal register-based system. Government initiatives to improve information systems and for more coordinated service delivery may also present opportunities for their use for statistical purposes.

38. This type of approach risks adverse public reaction and a public consultation process would be essential. Any approach for an administrative census will have significant privacy implications and may require amendments to the Privacy Act 1993. Further work will include consultation with the Office of the Privacy Commissioner and a Privacy Impact Assessment.

IV. Other options considered

A. Continuous measurement approaches

39. Continuous measurement approaches have been implemented in some countries to overcome disadvantages of a long, or irregular, interval between censuses. A ten-yearly short-form census with a large-scale ongoing sample survey (as in the United States) or a rolling census (as in France) would counter one of the key limitations of a ten-yearly census by providing more frequent monitoring of small groups.

40. A large up-front investment over several years would be required to plan, develop and test them in New Zealand. Although costs and resourcing are smoothed over time, there is expected to be little cost saving compared to two five-yearly censuses. The benefit of more frequent data would be offset by the greater complexity of the data, and by the reduced accuracy of data for small areas.

41. The five-yearly census provides finely granulated information on the socio-economic characteristics for local communities and small population groups to a high degree of accuracy once every five years. A continuous measurement approach would need to aggregate data over five years for the smallest groups, and a sample would be subject to sampling error. Consultation has indicated a strong preference for the full set of data once every five years. Continuous measurement approaches introduce complexity that is difficult to explain and hard to justify compared to the conceptually simpler five-yearly census.

V. Summary

42. In the short term, the future census strategy for New Zealand is concerned with modernising census operations and reducing the real cost of a five-yearly census, whilst working with key government agencies to enhance and develop existing administrative data. The long-term goal is to produce census information largely from administrative sources.

43. In broad terms, New Zealand's situation is that we do not have the fundamentals of a register-based census, but we have individual administrative sources with a good degree of coverage. This situation looks worth progressing as gains from moving to a new administrative census model appear to be considerable. Because much remains unknown about the potential form of an administrative census, and the magnitude of change could be very high, the timeframe is likely to be long. The vision may shift as alternatives are tested and decisions are taken.

44. Because the census is so fundamental to population and social statistics it will be essential that transformational change is introduced and managed carefully. Key decision points for government over the next 15 years will be managed through reporting based around the existing five-yearly census cycle. An extended timeframe, with phased

investigations and decision points for government, is considered to be the best means of providing the government with advice on feasible options.

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