

2001 CENSUS OF POPULATION AND DWELLINGS

*Introduction  
to the  
Census*

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## ***Preface***

*Introduction to the Census* provides an overview of the 2001 Census of Population and Dwellings. It places the survey in the context of census-taking within New Zealand, relates the census to the social and population statistics framework, and places the census in an international context. Strategic directions and operational elements of the 2001 Census are summarised to provide users of census data with information on changes in process, which will enable them to better understand the data.

Statistics New Zealand makes census data available to a wide range of people. The data is important to planners and policy-makers in both the state and private sectors, a large number of researchers in many different disciplines, community groups and the general public. In addition to published statistical information, Statistics New Zealand can provide customised information to meet the specific needs of users.

I express my appreciation for the work of the staff in the Population and Census Division in producing this report. Thanks are also due to the large number of people involved in the 2001 Census, either through completing their forms or through planning, collecting, processing, and using the information.

A handwritten signature in black ink, appearing to read 'B. Pink', with a large, sweeping flourish that loops back to the left.

Brian Pink  
**Government Statistician**  
STATISTICS NEW ZEALAND



## ***Acknowledgement***

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## Chapter 1:

# Organisation

The census is the official count of population and dwellings in New Zealand, providing a snapshot of our society at a point in time. The New Zealand census is taken every five years.

The 2001 Census of Population and Dwellings was undertaken on Tuesday 6 March 2001. The official time that the census was taken was midnight on that day. The 2001 Census was the thirty-first carried out and was 150 years after the first census was taken in this country.

This publication seeks to provide an overview of some basic information about the 2001 Census; the history of census-taking; the importance of confidentiality; how the 2001 Census was planned, undertaken and processed; and the resultant outputs.

## Why have a census?

The census provides a unique source of detailed demographic, social and economic data relating to the entire population at a single point in time. The information that the census collects is used by the government, local authorities, businesses and community organisations for policy-setting and implementation, research, planning, and other decision-making. The census is often the primary source of information used for the allocation of considerable public funding, especially in areas such as health, education and social policy.

The key strength of the census is its ability to provide data for small geographic areas and small population groups.

The Treaty of Waitangi established principles for political, social and economic relationships between the Crown and Māori. An implication of the Treaty of Waitangi is that the Crown has an obligation to produce official statistics on Māori, in a form consistent with the requirements of the Treaty. The census is the only instrument currently capable of producing iwi population and Māori descent statistics on a national basis.

Census population data is essential in helping to determine both national and local electoral boundaries. As the census is the principal source of statistics relating to Māori descent it provides the authoritative data for determining the Māori electoral boundaries in addition to the General electoral boundaries.

The census in New Zealand is taken under the authority of section 23(1) of the Statistics Act 1975, which states that:

“The census of population and dwellings of New Zealand shall be taken by the Department in the year 1976 and in every fifth year thereafter.”

The questions that are asked in the census fall into two main categories:

- mandatory questions, which include name, address, sex, age and ethnic origin of every person, and location, number of rooms, ownership and number of occupants on census night for every dwelling, and
- other questions, which can be included in the census at the discretion of the Government Statistician, for example questions on occupation, marital status, birthplace, income, the type of dwelling and the tenure of the dwelling.

The United Nations has a role in guiding how censuses are taken and has issued a series of handbooks and technical reports intended to assist countries in carrying out population and housing censuses. Such handbooks and reports are reviewed to reflect new developments and emerging issues in census taking. The international recommendations relating to a census are contained in the publication *Principles and Recommendations for Population and Housing Censuses*.

The objectives of the principles and recommendations are:

- to help in improving census operations and the utility of census results in national terms, and
- to increase, to the extent possible, international comparability.

## Scope of the census

The census covers all dwellings in New Zealand on 6 March 2001 and every man, woman, child and baby alive in New Zealand on 6 March 2001 who was:

- on New Zealand soil
- on a vessel in New Zealand waters, or
- on a passage between New Zealand ports.

Overseas residents and other people in diplomatic residences in New Zealand, including housekeeping staff, uniformed military personnel or members of diplomats' families are included in the census, as are foreign military personnel and their families located in New Zealand on census night (including foreign warships in New Zealand territorial waters on census night).

New Zealand military, naval and diplomatic personnel and their families located outside New Zealand on census night are not included in the census.

The geographic coverage of the census includes the North Island, South Island, Stewart Island and the Chatham Islands, plus off-shore islands including the Kermadec Islands, Three Kings Islands, Mayor Island, Motiti Island, White Island, Moutohora Island, Bounty Islands, Snares Islands, Antipodes Islands, Auckland Islands and Campbell Island. The Ross Dependency is excluded from the population count.

## Census budget

The 2001 Census budget of \$38 million was based on a five-year cycle, which ran from July 1997 to June 2002. This was then further broken down to a yearly budget based on the amount of work that needed to be carried out in each of those years to ensure a successful census was achieved. That breakdown was as follows:

1997/1998	\$ 1.7 million
1998/1999	\$ 2.9 million
1999/2000	\$ 3.4 million
2000/2001	\$25.5 million
2001/2002	\$ 4.5 million.

This gives a good insight into the amount of work involved in the five-yearly census cycle:

- years one and two – planning and development of the systems and processes
- year three – testing and enhancing the systems and processes, as well as holding a census dress rehearsal
- year four – delivery and collection of the census forms and the processing of the data, and
- year five – the production of information to meet users needs.

## Organisation of the Census Division in Statistics New Zealand

The initial step in working out a suitable organisational structure for the running of the census was to determine the main activities that were essential to any census and then to detail the functions required for each of those activities.

Every major function to be carried out as part of the 2001 Census project was then allocated to a project manager, and this organisation of the overall census project was reflected in the composition of the Census Division, which was established in 1997.

See appendix 1 for an overview of the organisation of the Census Division within Statistics New Zealand.

## Strategic planning

A strategic planning paper was developed in 1998, which set the direction for the 2001 Census developments. It clearly defined the place of the census in the wider social and population statistics system and recognised the limitations of the census as a self-administered survey delivered to the whole population. A number of fundamental principles outlined the strategic direction for all census work. Particular emphasis was placed on participation of everyone in the community, meeting the information needs of Māori, the approach to quality and the application of project management and risk management processes.

## Census timeline

Part of the initial planning for the 2001 Census involved the setting up of a timeline which charted all activities that were to be undertaken and their impact on other activities. This timeline was an essential part of the overall exercise as it provided a very specific guide to the progress of each area and alerted managers to areas where problems existed and needed addressing. It also provided the staff with a clear indication of where and how their role impacted on the overall census exercise.

As the monitoring of this timeline was an essential part of the management of the census exercise, weekly timeline meetings involving all project managers and team leaders were held. The format of these meetings involved reporting on progress in each area. Decisions were made on actions required to deal with any problems or potential delays that could have an impact on meeting the designated dates. Potential risks that could effect the deadlines and what actions would be required to negate their possible effects were also considered at these meetings.

Refer to appendix 2 for an illustration of the census survey cycle.

## Further information

An additional reference report for the 2001 Census is available: *Definitions and Questionnaires*. This report will complement the range of outputs that are to be produced from the 2001 Census. It provides users of census statistics with definitions for terminology used in outputs from the 2001 Census. It also provides a copy of questionnaires from the 2001 Census and censuses dating back to 1906, where they are available. This report and further information on the 2001 Census can be found on the Statistics New Zealand website at [www.stats.govt.nz](http://www.stats.govt.nz).

## Chapter 2:

# Confidentiality

### Overview

Confidentiality is crucial to create public confidence in the census, as such guarantees encourage greater public participation and hence more accurate information relating to the population. The success of a census is determined by the public's acceptance of its necessity and their willingness to provide the requested information. Although they are legally obliged to do so, the public's willingness to provide information in a census can be directly attributed to the trust they have that their information will be kept confidential. Statistics New Zealand, acknowledging the private and personal nature of the information that is collected, has a well-deserved reputation for integrity with regard to the security of census records and consequently, has been very successful at census-taking.

All answers given in a census are confidential to Statistics New Zealand and no other government department or agency has the power to access individual answers to census questions. All employees of Statistics New Zealand must sign a declaration of secrecy which remains in effect for life.

Names and exact addresses remain confidential and are not part of the final computerised information – they are used to ensure that all forms have been collected. Furthermore, the names and relationships spelt out on the dwelling forms determine how each person in a household is related to the other members and this determines the household type.

The information Statistics New Zealand collects in the census is released to the public as aggregated data. The information can only be used for statistical purposes. There are strict rules in place to safeguard the confidentiality of individual information. These are all required by law.

Statistics New Zealand employs a number of methods to protect the confidentiality of individuals in the output of data. These methods are discussed in more detail below.

### Statistics Act 1975

The confidentiality of all information provided in the census is protected by the Statistics Act 1975. Section 37 of the Act also guarantees the security of the information provided. It specifically requires that this information must only be used for statistical purposes, must be kept confidential and will only be published in a way that ensures that no individual can be identified. Under section 21, every employee

of Statistics New Zealand (including temporary enumeration and processing staff) must make a statutory declaration of secrecy, before commencing their duties, which will remain in effect for life.

Under section 37, access to the individual questionnaires is strictly limited to staff working on the census, all of whom must have signed the secrecy declaration. Any staff member breaking this declaration commits an offence and Statistics New Zealand is proud of the fact that it has never had to prosecute an employee for a confidentiality breach.

The Statistics Act 1975 goes further with regard to information supplied in individual questionnaires in that it overrides provisions in any other Acts so that no one has the power under any other Act to access this information.

### Privacy Act 1993

There is no conflict between the Privacy Act and the collection of census information under the Statistics Act for two reasons:

- The Privacy Act contains a clause acknowledging that Statistics New Zealand has the power under the Statistics Act 1975 to collect information for statistical purposes.
- The census is not in conflict with any of the 12 principles in the Privacy Act which relate to personal information. Statistics New Zealand collects personal information purely for the purpose of producing statistics and publishes these statistics in a way that prevents the identification of the person(s) to whom the statistics relate.

### Security

It is essential that the information collected by Statistics New Zealand in the 2001 Census is handled and stored in a secure manner. As with previous censuses, measures were put in place during the 2001 Census to protect confidentiality and to ensure the security of information at all times.

### Enumeration

As mentioned above, all people involved in the census must sign a declaration of secrecy before commencing their duties, and this applied to all those involved in the enumeration phase of the 2001 Census, irrespective of whether the person was working as a permanent or temporary employee, either on a part-time or full-time basis.

Enumerators were trained in the importance of maintaining the security of forms and the confidentiality of the respondents' information at all times. They were made aware of the need to secure both the blank and completed forms. Wherever possible, enumerators were assigned to areas away from where they lived.

If an individual wished to keep their personal information private from other members of their household, their individual form could be sealed in a personal envelope and opened by the enumerator. If an individual wished to keep their personal information private from the enumerator, they could either seal their form in an envelope with a privacy sticker or request a freepost envelope in order to post the form directly to the district supervisor. It was also possible for a dwelling form to be placed in a privacy envelope.

Following the completion of the enumeration process all census material, whether used or not, was returned to the district supervisor.

## **Transportation and storage**

The transportation of the completed census questionnaires and other census materials from the field to the warehouse was subject to very strict security guidelines.

The Statistics New Zealand site for the storage of census documents, including the completed census questionnaires, was secured at all times. This included restricting access to forms to Statistics New Zealand staff who had the express permission of the Stores Supervisor or Processing Manager, and securing the storage area with access to the forms limited to Statistics New Zealand staff who required it. This was also controlled by the use of swipe cards and an access pin number being required to gain entry.

## **Processing**

Security and confidentiality was a high priority during the processing stage. This was ensured by the following:

- All people working on the processing of the census, including contractors, were required to sign a declaration of secrecy under section 21 of the Statistics Act 1975.
- All census forms were stored on a Statistics New Zealand site in Christchurch while the scanning and processing of images was taking place.
- A security guard was on site at all times while the processing was in operation.
- A swipe card was required to gain access to the building and identification cards were worn at all times by all Statistics New Zealand staff when in the processing building.

- A register of visitors was implemented and maintained, and all visitors were accompanied by Statistics New Zealand staff while they were in the building.
- Once the forms were scanned, images of forms could not be printed.
- At the completion of processing the images were destroyed.
- Access to the processing system was restricted to processing staff and contractors of the processing system for maintenance.
- Any census processing contractors only had access to those parts of the building they required access to.
- The training of the processing operators emphasised the importance and nature of security and confidentiality required in the census.
- The processing system was contained within a separate computing network which meant that other users outside of the processing environment were not able to access any of the components of the processing system.

## **Published statistics**

Section 37, subsection (4) of the Statistics Act 1975 requires that published statistical information "be arranged in such a manner as to prevent any particulars ... being identifiable by any person (other than the person by whom those particulars were supplied)" – and, for the purposes of this subsection, the Government Statistician is required to make such office rules as he considers necessary.

Statistics New Zealand has adopted certain techniques called Confidentiality Assurance Techniques (CATs) to ensure that no person can be identified from the published data.

Before a CAT is used, Statistics New Zealand would ensure that it protected the confidentiality of the data in all tables, that it changed the original data as little as possible and that it was acceptable to users of the census data. The main CAT currently used by Statistics New Zealand for census data is random rounding.

Random rounding was developed by Statistics Canada and has been adopted by Statistics New Zealand for all censuses since 1981. While the Canadians use a base of 5, Statistics New Zealand rounds to base 3. When the data in a table has been randomly rounded to base 3, every value in the table is a multiple of 3. The probabilities of rounding up or down are set so that in the long run the expected value, after rounding, equals the original count. The randomness of this kind of rounding may result in a

total which differs slightly from the sum of the individual cells contributing to this total. This non-additivity of the census tables may prompt doubts that the figures are reliable. However, Statistics New Zealand produces the best statistics possible within the constraints it works under. Rounding is carried out on the final data only and not on any intermediate calculations. It does not affect the data to any great extent as the disturbance caused by random rounding is likely to be minimal. These minor adjustments to the raw data protect the confidentiality of the information about individual people while allowing the maximum of detailed, accurate census data to be released. For further information on the mathematical details of random rounding refer to *Confidentiality Assurance for 1981 Census of Population and Dwellings*, Mathematical Statistics Division, Department of Statistics (1980).

## Confidentiality rules for the release of aggregated census data

The general confidentiality principle is that, under the Statistics Act, staff are required to withhold any output which might identify the characteristics of a particular person or undertaking. In other words, there is a requirement that data must not be released where characteristics of individuals can identify a particular individual.

There are five confidentiality rules to effect this principle. In particular output in which there are both small geographies and small populations is restricted.

- Rule 1: All census data for individuals, families, households and dwellings will be random rounded to base 3 (see previous section 'Published statistics').
- Rule 2: Any derivations from census data (for example percentages and ratios) will be derived from random rounded counts, with the exception that sub-totals and totals are independently randomly rounded.

Rule 3: For any geography (such as a meshblock, or area unit) with an unrounded total population (individuals, families, households or dwellings) of 0–5, there will be no further disaggregation of this population.

Rule 4: For any geography with an unrounded total population (individuals, families, households or dwellings) of 6–50, there will only be disaggregation by one further variable. Meshblock data can only be released with one further dimension, and categories must be at the highest level of the classification.

Rule 5: For any geography (aggregation of meshblocks up to and including New Zealand), tables of two dimensions or more can only be released where the proportion of the (unrounded) total subject population to the number of cells (excluding totals and subtotals) is greater than one.

These rules apply to all data released from Censuses of Population and Dwellings.

## Archiving of census forms

For the 2001 Census respondents were asked whether they would agree to the information they supplied on their census forms being archived (stored securely) for 100 years, after which, anyone who wanted to see it would be able to do so. For everyone who did not agree to their information being archived, their personal questionnaires were destroyed by shredding once they were no longer required by Statistics New Zealand. All dwelling questionnaires for the 2001 Census were destroyed.



## Chapter 3:

# History of the census in New Zealand

Census-taking began in China and the Middle East with one of the earliest recorded censuses taking place in the Babylonian Empire nearly 6,000 years ago. These early censuses are mentioned widely in early Middle Eastern literature, with references to them in a number of places in the Bible. According to tradition, Jesus was born while his parents were returning to their home village to be counted in the census.

Censuses of population were first taken in England and Scotland in March 1801, Ireland in 1811 and Australia in 1828. The first New Zealand census was undertaken in 1851, although this census excluded Māori.

## Early census-taking in New Zealand

Before 1840, counts of the European population in the various settlements were made sporadically. From 1840 onwards, these became reasonably regular but were not coordinated or comprehensive enough to be called censuses.

To comply with a Royal Injunction, Blue Books (which were basically books of tables) were: 'to be annually filled up with certain returns relative to the revenue and expenditure, militia, public works, legislation, civil establishments, population, schools, course of exchange, imports and exports, agricultural produce and other matters in the said Blue Book, more particularly specified to the state of our sociology'. Blue Books were issued annually from 1840 to 1847, when they were no longer officially required. They were, however, still produced from 1848 to 1852 by both of the provinces when New Zealand was split into New Ulster and New Munster. Subsequently, they were also produced by the six provinces which were in existence from 1852 to 1876. The Blue Books were not intended for publication but three copies were to be prepared for the Colonial Secretary's Office, the New Zealand desk in the Colonial Office and the House of Commons Library.

1851 saw the first population census in New Zealand. A Census Ordinance was announced that year making provision for a triennial census, and a census was then carried out every three years until 1874.

In 1877, the Census Act was passed repealing previous legislation and setting a requirement for censuses to be held every fifth year. Censuses still took place in 1878 and 1881 but, thereafter, they have been held every five years with only two exceptions:

- The 1931 Census was abandoned when the New Zealand economy was in the height of the Depression.

- In 1941, the scheduled census was abandoned as it was during World War II.

The 1946 Census was taken earlier than scheduled. In 1945, an electoral 'Country Quota' system was in place under which a loading of 20 percent was added to rural populations resulting in more country electorates in relation to population than urban electorates. The Labour Government of the time, wanting to introduce legislation abolishing this inequitable situation, brought forward the census to September 1945 in order to have available the redefinition of electorates for the 1946 election. The subsequent census still occurred in April 1951 as if the previous census had been taken in 1946. This change disturbed the five-yearly time series of the statistics. In addition to this, since the 1945 Census took place while World War II was ending, thousands of young men were still overseas and the economy was geared to wartime conditions.

## Census of Māori

The 1858 Census was the first attempt to collect comprehensive statistics on the Māori population. Sixteen years passed before the second official census of Māori took place in 1874, which collected data on age and sex at the hapu level. In 1886 details of numbers, sex, age, principal tribes and county of residence of Māori were obtained, while livestock particulars and details of land under cultivation were included in later censuses. In 1906 a Census of Natives took place as part of the census but the information was still limited and was roughly classified into two age groups, those under 15 years and those 15 years of age and over. In this census a distinction was made between Māori still living as members of tribes and those who lived in 'European' communities as individual families.

By 1921 the range of questions had been expanded to include sex, age, current residence, usual residence, trade or occupation, whether or not married to a European, and whether full-blood or half-blood Māori.

In 1926 a separate Māori census was conducted in a similar way to a general census, although a special Māori questionnaire remained in use until 1951. However, Māori in the North Island were able to use schedules printed in Māori on request. The 1926 Māori schedule contained greater detail than previous schedules, but there were still considerably fewer questions than the European version.

A trial was undertaken in the South Island in 1936 in which the same schedule was distributed to both the general population and Māori families. In 1945 schedules in both Māori and English were offered to all Māori families, but only 25 percent of the Māori population chose to use the Māori language schedules. In 1951 Māori families were issued with the same schedules as those distributed to the rest of the population. Although no schedules in Māori were printed for the 1956 Census, interpreters accompanied sub-enumerators where necessary. Bilingual questionnaires were available for both the 1996 and 2001 Censuses.

The 1867 Franchise Act gave Māori people separate parliamentary representation and made it necessary to collect statistics on the Māori population in the census. Until 1951 the Māori and general populations were enumerated in separate censuses. In 1951 the two censuses were combined and a question was included that asked people what their race was. A question on race/descent/ethnic origin has been asked in every census since then. Since the 1991 Census the question has been asked specifically on Māori descent. Also since the 1991 Census, an ethnicity question based on self-identification or cultural affiliation, rather than racial descent was included. Ethnic group is determined by a self-identification process. It has a social and cultural base, as opposed to the biological base used in defining ancestry or ethnic origin.

A question on iwi affiliation was included in censuses up to 1901 but was not asked again until the 1991 Census. Statistical information on Māori tribal populations is needed in order to monitor the performance of Treaty of Waitangi obligations by the Crown and iwi, and to assist the Waitangi Tribunal in decisions relating to land ownership and fishing rights. Iwi also use the data for social and economic planning. For these reasons a question on iwi was included in the 1996 and 2001 Censuses.

The Census of Population and Dwellings has been the only source of data on the size and distribution of the Māori descent population needed to meet the statutory requirement of the Electoral Act 1993.

## **Census enumeration**

New Zealand's first census was taken on a 'settlement' basis and the local census authority was the armed constabulary or the Resident Magistrate. During the time of the six provincial governments, the Provisional Superintendents organised the enumeration in each province. Once the provinces were abolished, the Registrar General became responsible for carrying out the enumeration process. In these earlier years of the census, illiteracy was common among Europeans (in fact, more so than among the Māori population at that time) and the

census collector was required to fill in the schedules if the householder was unable to do so. In the early days of poor communication infrastructure the task of the sub-enumerators in the country areas, especially in the more remote regions of New Zealand, must have been very difficult, particularly when the weather was bad. There was even a casualty; in the 1911 Census a sub-enumerator was drowned while crossing a swollen river on horseback.

In 1916 the Post Office agreed to assist the Statistics Office in the physical enumeration of the population and this dramatically improved how the census was carried out. Districts were redefined to suit the new system of enumeration. Postmasters of towns centrally located within the new districts were appointed as enumerators. They, in turn, appointed sub-enumerators and organised the collection routine in their own areas. This system had two significant advantages: firstly, postmasters had good local knowledge and, secondly, since postmasters were well known and respected figures in their districts, the major part they played created a favourable atmosphere for the census to be conducted in. The 1981 Census was the last census in which the Post Office was involved. To constrain costs and have greater control over the enumeration process, Statistics New Zealand has carried out the enumeration phase of the census since 1986.

## **Questionnaires**

Personal schedules were issued to occupants of private dwellings for the first time in 1926. Prior to this, they were for the 'use of inmates of hotels, boardinghouses, clubs, ships, trains ...'. The primary census form was the Householder's Schedule. The head of the household had the responsibility for completing the particulars relating to each member of the household, a method of collection that meant there was little or no privacy for individuals. In 1926, in addition to special dwelling and family schedules, personal schedules were circulated for all individuals included in the European census. The head of the household was still responsible for completing the dwelling schedule, for filling in the forms for the children of the household and for seeing that every person in the household complied. Individual schedules could be enclosed in an envelope to ensure privacy. Since 1945 only personal and dwelling schedules, or questionnaires, have been used.

## **Legislation**

There are several acts of parliament which have formed the legal basis for the collection of statistical data and census taking as it has developed over the years.



The Census and Statistics Act 1910 created the Office of the Government Statistician, which was seen as recognition of the special skills and expertise required in statistical work. Under the Act, however, the Government Statistician was to be appointed within the office of the Registrar General. A considerable improvement in status occurred in 1915 when the Government Statistician was moved from the Registrar General's Office and up several places in the departmental hierarchy. At this time the government had the power to direct the Government Statistician to collect or cease to collect particular information.

The Census and Statistics Act 1926 took the place of the 1910 Act and brought about a major improvement regarding the collection of census information. The duty of the occupier or person in charge of the "dwelling store or apartment" to fill out the householder's schedule for all people in the household on census night was restricted to his/her own family. For the first time a relative or boarder in the household was given the opportunity to preserve the confidentiality of his/her personal information enabling more sensitive questions, such as income, to be included within the scope of the census. Unfortunately, however, the Act also removed the Government Statistician's right to present his/her observations on the statistics directly to Parliament without any departmental vetting.

The Statistics Act of 1955 clearly defined the duties of the department and the Government Statistician for the first time. The office of Deputy Government Statistician was created as a result of this act and it also substantially tightened up the secrecy provision. Employees of the department were required to subscribe to an oath of secrecy concerning the disclosure of information from individual returns, no particulars regarding the individual supplier's return could be published without that person's prior consent, and statistical tables were arranged to render the identification of an individual impossible from the published data.

The Statistics Act 1975 clarified that the information contained in returns is to be used for statistical purposes only. It also specified which particulars it is mandatory to collect in the census and which particulars are able to be collected if the Government Statistician considers it in the public interest to do so. This Act also established the independence of the Office of the Government Statistician. Cabinet interference with regard to the collection of specific information has now been effectively prevented as this Act also enabled the Government Statistician to use the powerful sanction of making public, without comment, any ministerial direction should the need arise.

For a full copy of the Statistics Act 1975, Part III, refer to appendix 3.

## **The use of technology**

The 1921 Census marked the first occasion on which automatic sorting and counting machines were employed in New Zealand, enabling the major portion of census compilation to be carried out mechanically. The system installed for this census was purchased from the United States, which had been employing mechanical tabulation for census work since 1870.

For the 1966 Census, sorting machines were replaced by computers. Statistical tables were also produced by computer for the first time and results became available much earlier with a large number of additional cross-classifications of the census data being possible. The use of punchcards for each individual and dwelling was continued until 1976 when an automatic, electronically-based system was introduced. Mechanical tabulation has been replaced by electronic data capture and handling as the speed and capacity of computing technology has improved.

In 1996 the scanning and imaging of census forms was introduced, further demonstrating that Statistics New Zealand is now fully immersed in the era of information technology, with analytical tools and information at a level incomprehensible to the department of earlier years.



## Chapter 4:

# Planning and development for the 2001 Census

## Overview

Thorough and careful planning is critical to carrying out such a large-scale operation as the census, which aims to enumerate the entire population. Planning for a census will begin even before the previous one is finished and must encompass every phase in the census cycle to ensure that timely and accurate data is available to the public.

The development of procedures and processes for the 2001 Census attempted to make use of what worked well in previous censuses, and to build on recommendations for improvements. In particular, comprehensive reviews of all aspects of the 1996 Census were an essential aspect in the planning of the 2001 Census.

Eight fundamental principles guided the planning and development of the 2001 Census:

- All processes for the 2001 Census need to be managed as the cornerstone of New Zealand's population and social statistics system. All change needs to be evaluated for its effect on the population statistics system.
- The topics included in the 2001 Census will be consistent with the fundamental purpose of the census, practical limits to its size, and its character as a community activity that requires full participation through goodwill.
- The 2001 Census will be conducted so as to obtain the fullest compliance from all groups within the community, through building upon their goodwill and supporting their capacity to provide information.
- The 2001 Census will provide Māori with information of importance to them in their policy needs as a people, and for government to advance the well-being of Māori as effectively as possible.
- The 2001 Census will have a clear definition of 'fitness for use' of all variables, for the measurement of change and levels, and for cohesiveness with other statistics. Statistics New Zealand will provide the highest practical level of accuracy to the foremost census variables (age, sex, location and ethnicity).
- The census is a statistical activity where few risks can be taken, and statistical processes need to manage all aspects of quality in the census, while balancing accuracy, timeliness and cost.

- The census is a public activity where few risks can be taken, and management practices need to be highly effective.
- The census is a statistical activity where few risks can be taken, and statistical processes need to be developed with a high certainty of success.

These eight principles underlined each development phase in the census, and were of the utmost importance during planning. At all stages consideration had to be given as to how these principles would be achieved.

Planning needs to account for several aspects of running a census including; content and questionnaire development, enumeration procedures, the communications project, the development of the processing and output systems, and the requirements of printing. These aspects all interact with each other and each play a part in determining the quality of the data that is produced. Each phase therefore requires careful methodical planning and testing.

## Preliminary issues for planning and development

### Census date

One of the most important decisions made in the planning for the census is the actual date it is to be held. Once this is approved, a detailed timetable for enumeration, communication, questionnaire development, processing and output can be confirmed, and planning and development for the census can begin in earnest. The decision on the census date of 6 March 2001 was made in September 1998 and took into account the following issues: consistency with the timing of previous censuses, daylight savings, school and tertiary institution term times, holiday breaks, and electoral processes.

### Electoral requirements

The Electoral Act 1993 requires population data from the census to be used in the calculation of electoral populations. This enables the Representation Commission to produce new electoral boundaries for the next general election. Due to the timing of the 2001 Census and the probable timing of the next general election in November 2002, there is limited time to undertake the statutory and administrative processes necessary to have new electoral districts ready for a general election. This has meant that

electoral data was required to be output earlier than the release of the final census data. This requirement was an important factor for the development of the 2001 Census. The processing of the census continued after the release of the electoral populations on 17 September 2001.

## Key areas of development

Development projects were split into five areas of interest:

- content
- questionnaire development
- enumeration development
- processing development
- output development.

Within each of these areas, development project teams were set up to plan for and develop the different census components. These areas are discussed in more detail below.

## Management of the development projects

A Statistics Project Management (SPM) method was used to provide direction for the planning and development of the different census components. Three Project Managers were put in place late 1997 with their main role over the next 6–12 months being to set up planning documentation for 2001. This documentation involved high level enumeration, communication, processing and output strategies, in line with the fundamental principles outlined in 'Overview' (above). Also, a scope was prepared which detailed business objectives, success criteria, inclusions and exclusions. A project plan followed with several critical components – a milestone table, budget, risks, project dependencies and quality plans. A large project was broken into stages of approximately 6–12 months with more detailed planning. Reports on each project were then presented to the Census Project Board which met monthly and approved these plans.

Following reviews of the 1996 Census, key issues concerning development were identified. These included the impacts of electoral requirements, the format of the Māori/English forms, the return of forms from the public (whether the forms were to be mailed back or collected by enumerators), the construction of a statistical frame for dwellings, and reviewing the logistics of all processes. These issues were carefully evaluated during the planning and development phase.

## Development of the content of the questionnaires

A central factor in the planning and development of a census is determining the content of the questionnaires. Ultimately, the questions that are asked will form the basis of the information available to the government and the community. There are constraints on the type and number of questions that can be asked in the census, and certain criteria that must be met. Statistics New Zealand goes through a process of consultation with a number of other government agencies, businesses, educational institutions and individuals in order to determine the output requirements from the census, and finalise the content of the census forms.

One constraint in particular is the legislative requirement of the census to ask certain questions. The statutory questions that must be asked are prescribed by section 24 of the 1975 Statistics Act. These are: name, address, sex, age, ethnic origin, location of dwelling, number of rooms, ownership, and number of occupants. The 1993 Electoral Act implicitly requires Māori descent and the usually resident population to be derived from the census.

In addition to these topics, others may be included. To determine these, Statistics New Zealand undertakes a process of public consultation which includes receiving written submissions and holding public forums with interested parties.

In the first stage of development of the content, the likely requests for topics to be included were identified and decisions made on whether these topics could be realistically included in the census. The publication *Preliminary Views on Content* then outlined Statistics New Zealand's initial views on topics for inclusion in the 2001 Census in May 1998. Advertisements were placed in daily newspapers inviting submissions on the content of the census from the public and an 0800 number was provided for those wanting additional information or submission forms.

Public forums were then held in Auckland, Hamilton, Wellington, Christchurch and Dunedin. Liaison with Māori and Pacific peoples was an important part of the consultation process. Fourteen hui were held throughout the country to determine the needs of Māori in terms of outputs from the census. Three fono were held in Auckland, Wellington and Christchurch to enable consultation with Pacific peoples.

Submissions were made by major government policy agencies such as Te Puni Kokiri, Ministry of Health, Social Policy Agency, Ministry of Women's Affairs, Ministry of Education, and Ministry of Labour. Other submissions were received from city councils, private individuals, businesses, and expert data users such as educational institutes and special interest groups.

The decisions made on the content of the census were subject to certain criteria and constraints.

The criteria for inclusion of topics in the census:

- public acceptance (that the questions are not unduly intrusive, sensitive, or controversial)
- quality of information
- value of statistics
- census as the 'most appropriate' information source (for example, only include questions which involve the total population)
- change and continuity.

The constraints on content:

- cost
- questionnaire limitations
- topics required by law
- respondent burden/resistance
- continuity/relevance
- integration.

All topics submitted for inclusion in the census were carefully evaluated against these criteria and constraints.

The process of consultation resulted in the retention of questions on language and religion, and the development of new questions on activities and ownership of housing. Fewer topics than in 1996 were included in the 2001 Census questionnaires (smoking and fertility were not included in 2001 but were in 1996). This consultation process will be repeated in 2002/2003 for the 2006 Census.

The publication *Final Report on Content* outlined the process used for public consultation on census content and the evaluations of each of the topic areas in more detail.

For a copy of the *Preliminary Views on Content* and *Final Report on Content* publications, refer to appendix 4.

## Development of the census questionnaires

The question wording and layout of the census questionnaires is crucial to census quality and so demands careful planning and development.

The census questionnaires in 2001 comprised six different forms: an English Dwelling Form, an English Continuation Dwelling Form, an English Individual Form, a Māori/English Dwelling Form, a Māori/English Continuation Dwelling Form, and a Māori/English Individual Form. The Continuation Form was required by private households which had more than 10 respondents on census night.

Following the direction taken with the development of the content of the census, questionnaire development built on the experiences of 1996, while implementing improvements where possible. An important consideration of the questionnaire development was to minimise respondent burden where possible. Other fundamental considerations included the requirements of content, printing, and scanning, and the size of the forms. The questionnaires for the 2001 Census needed to produce data that met output requirements and had comparability with past census data.

As with the planning and development of the content of the census, the development of bilingual questionnaires involved a specific targeted testing and consultation programme with Māori. In mid-1999, an external kaiāwhina (assistant) was contracted to the questionnaire design project, to provide advice on te reo Māori, tikanga Māori, and any issues arising from cognitive testing and peer reviews. Advice and formal review of te reo Māori and the bilingual questionnaires, was provided by external agencies including Te Taura Whiri i te Reo Māori (Māori Language Commission).

The questionnaires were rigorously tested in one on one cognitive interviews. Cognitive testing is a process of testing forms, which aims to understand how the respondent fulfils the task of answering the questions and, in particular, to detect any actions or understandings which the designer did not intend.

The questions in te reo Māori were tested on over 2,000 respondents to ensure the language would be well understood, and would produce data which met information needs. Change to the English questions was restricted to questions where topic specifications had changed, or where cognitive testing identified the need.

In addition, the questionnaires were tested in three pilot surveys: April 1999, 600 households; May 1999, 90 households; and July 1999, 2,000 households. These pilot surveys tested the functionality of the forms for scanning and processing, rather than the wording of the questions. The census dress rehearsal of 12,000 households in March 2000 enabled a final trial run of the forms to be carried out.

## Printing

Once design of the census questionnaires was finalised, work on printing the forms began. This work must encompass not only the printing of census questionnaires (English and bilingual), but also the other enumeration and communications material. Field documents required to be printed included the fieldbooks, helpnotes, language leaflets, freepost envelopes, and 'in your absence' slips. Planning for printing in the census covered all the printed material that was to be used by Statistics New Zealand during the 2001 Census.

A contractor was used for printing the census forms and fieldbooks, and for warehousing and distribution for the 2001 Census printed material.

Several decisions regarding printing were made early in the planning process including confirmation of the timetable for the delivery of files to the printers, the completion date of printing, confirmation of the paper to be used for the questionnaires, the number of questionnaires to be printed, the number of fieldbooks to be printed, what is to be warehoused, the number and addresses of field locations, and the start and finish delivery dates to the field. Time also needed to be allowed for thorough checking and proofing of the forms. The requirements of scanning were also a vital consideration in the planning for the printing of the questionnaires, taking into account form design and the quality of printing.

In addition to the requirements of printed material for the census, printing was also needed for the various tests that were carried out, the dress rehearsal, and the training of field staff. Sample forms were also required to test scanning.

Careful planning of the timetable for printing was required. Time was allowed for proofing forms and ensuring that quality was maintained.

Paper for the 2001 Census questionnaires was ordered from an Australian paper mill as the type of paper required was not available in New Zealand. 760 reels of paper were needed, each 6,000 metres in length with a diameter of just over a metre. The total order was approximately 155 tonnes. This was the biggest single paper order for a New Zealand printing job.

The number of forms printed for the 2001 Census were:

4,000,000	English Individual Forms
500,000	Bilingual Individual Forms
1,600,000	English Dwelling Forms
150,000	Bilingual Dwelling Forms
10,000	English Continuation Forms
4,000	Bilingual Continuation Forms.

And in addition there were:

2,000,000	helppnotes
8,500	fieldbooks

## **Development of enumeration**

Enumeration was the largest area of direct public involvement in the census. It required careful planning to ensure such a large-scale task would be carried out effectively and within the necessary time and budgetary constraints. The 2001 Census enumeration involved the delivery of forms to each occupied dwelling in New Zealand prior to census night, and then the collection of completed forms for every dwelling and persons present in New Zealand on census night.

There are a number of issues specific to enumeration that require thorough planning. These include how to enumerate areas and groups of people that are historically difficult to enumerate, how to manage a process that is spread throughout the country, and how to manage logistics.

Other issues for the development and planning of enumeration in 2001 included:

- mailback of forms
- the use of computers in the field by Area Managers to facilitate communication and documentation
- mapping required for enumeration areas
- estimates of population and number of dwellings for each enumeration area
- district model for determining the number of enumeration districts in New Zealand
- sub-district profiles which provide estimates of dwelling and population counts and characteristics, and details for enumerator contracts such as kilometres to travel, within each sub-district
- enumerator contract payments
- field management
- delivery of two form types (English forms and reorua (bilingual) Māori/English forms)
- prosecutions for refusals to complete census forms
- helpdesk services during the enumeration period.

## **Development of the 2001 Census communications project**

The overall purpose of the communications project was to encourage and enable the full cooperation of the public in the 2001 Census so that a complete and accurate census form would be completed by every person in New Zealand on census night. The communications project was developed to ensure that the public understood when and how to take part in the census, why it was important, that the census responses were confidential, and to answer any concerns the public may have had about it.

The 2001 Census communications project looked to build on the success of the 1996 Census communications programme. However, there were differences in what Statistics New Zealand needed to communicate as a result of changes to the census processes, the external environment, in the focus that Statistics New Zealand needed to place on some of the audience groups and in the way that Statistics New Zealand wanted to present the census in 2001. In particular this related to the distribution of the

reorua (bilingual) Māori/English census forms, the focus on reducing the undercount in particular groups of the population and the need to portray Statistics New Zealand as more of a supplier of information than a gatherer.

One key development for the 2001 Census was the need to raise the awareness of the bilingual census forms for all New Zealanders prior to the census so that those who wished to do so could request it for use during the census.

The 1996 Post-Enumeration Survey (PES) identified those groups where there was a higher undercount (those the census had been more likely to miss) in the 1996 Census. These groups included the youth populations of Māori and Pacific peoples. Extra work was then needed in the planning of the communication project for the 2001 Census in order to develop more effective methods of communicating the key messages of the census to these people.

The development of the communications project started in April 1999.

There were a number of communications issues and strategies that underlined the development of the communications project:

- building the trust of the public in Statistics New Zealand as an authoritative, independent organisation of integrity, whose role is to carry out the census
- educating and informing the public about the census process
- building public understanding of why the census takes place
- providing help services to answer public enquiries
- actively promoting the availability of the reorua (bilingual) Māori/English forms
- developing relationships with different cultural communities within New Zealand
- raising awareness of the census among Māori.

Included as part of the overall communications project were the following specific projects:

- public and media relations
- a Māori communications strategy
- a community groups liaison programme
- the development and operation of the census helpline
- an advertising campaign which ran from 1 February 2001 to 25 March 2001
- an education programme for schools
- the production of publicity materials
- the development of the census logo

- the selection and management of media kaitakawaenga and community liaison officers for Pacific peoples
- the production of the help notes
- census web help pages.

## **Processing system development**

Development of the census processing system was an integral part of the overall planning and development programme for the 2001 Census. One of the guiding principles of the 2001 Census was that it was not innovative in the systems and processes put in place, but was to use the 1996 systems as a basis, and improvements were made only where they could be justified. This principle formed the basis of the planning for the 2001 Census processing system. Two innovations that were introduced for 2001 were the dwelling control file and alpha recognition. Work developing these new features of the processing system began soon after the end of the 1996 Census processing, following the reports and recommendations that were made. Further information on these new features can be found in Chapter 6 'Processing'.

Other important development projects for the processing system included:

- preparing for the early supply of electoral data
- dealing with the implications of having two types of forms, English and bilingual
- imaging of the census forms as the means of data capture
- integrating computer systems for enumeration, processing and output
- deciding how non-private dwellings were to be treated in the census processing system
- putting in place a Management Information System (MIS) to extract information that allowed managers to monitor the progress of census questionnaires and data through the enumeration, processing and output systems, and which provided information for the planning and development of the 2006 Census
- 'balancing' the data so that the correct people and the correct number of people were allocated to, and processed within, the correct household (balancing in the processing phase determined the actual number of dwellings and people in the census)
- reviewing codefiles so that they were up-to-date and relevant to 2001
- data validation to check for any potential quality issues that were introduced in the processing system

- family coding whereby codes were allocated to people in private dwellings according to who they live with
- quality monitoring within the processing system
- the transfer and output of the data from the processing system to the Statistics New Zealand databases.

## Output development

The main aim of output development was to provide detailed and complete system specifications and to provide a fully developed and tested output system. These systems were then utilised for the output of the final census data with the further aim of improving the timeframe in which census outputs became available. This meant that careful planning was necessary to meet these aims, and close interaction with other areas of census development and planning was important. As with the other major development areas for the 2001 Census, the output systems were not innovative, but built on the experiences of 1996, and improvements were made where necessary.

Major projects in this area were:

- data extraction
- derivations
- final databases
- macro-evaluation
- provisional output
- review of classifications
- system evaluation.

## Testing

A comprehensive testing programme was established for the 2001 Census which covered a two-year period from 1999–2000. Development of the computer systems and questionnaires in particular were tested over this period. This work culminated in a final dress rehearsal one year out from the census where all components of the census were tested.

### Field testing

A skirmish test and field tests were carried out early in the overall testing programme to test specific components of the census process. A skirmish test is used to test some combination of methodology and questionnaire with very tightly defined objectives. A small group of potential respondents is used to test one small aspect of the survey process. The components tested at this stage were the delivery and completion of the bilingual and English

questionnaires, alpha recognition, forms management, enumeration field procedures, and the provisional counts system. These tests took place between April 1999 and August 1999, and involved up to approximately 2000 households.

### Market research

Market research was carried out during 1998–2000. It formed an important part of the testing of certain aspects of the census, and the results provided important direction for the overall planning and development of the 2001 Census. Market research was undertaken by contracting with external research companies to gather information on public reaction and attitudes to the census and to understand what motivated people to participate in the census. Market research allowed Statistics New Zealand to obtain a greater understanding of the public's general reactions, concerns and preferences towards the census.

Included in this market research were the following specific studies:

- How to encourage people to take part in the 2001 Census. This research was undertaken to gain a greater understanding of the attitudes of the public towards the census and what would motivate them to complete their census forms. This was especially important to provide direction for the communications project.
- Which ethnic group question to use in the 2001 Census. Concern had been raised that changes to the ethnicity question in the 1996 Census encouraged respondents to answer on the basis of descent rather than cultural affiliation, and to identify with more than one ethnic category. The objective of this research was to assist Statistics New Zealand in determining which ethnic group question to use so that respondents would answer in terms of their cultural affiliation rather than their descent.
- The reactions of young Māori and Pacific people to the census. These groups in particular were identified in the 1996 Post-Enumeration Survey (PES) as being more likely to be missed in the census. This research was important in developing effective messages which would encourage active involvement in the census by young Māori and Pacific people.
- Public opinion on the use of Māori language. This research was used to enable Statistics New Zealand to select the most appropriate format for the bilingual questionnaires.



- The determination of the public's attitude toward the retention and archiving for 100 years of individual census records. This market research aimed to collect statistically representative data that would help the Government Statistician to make an informed decision about retaining and archiving the individual census questionnaires for 100 years, subject to the permission of the respondent, or to destroy them with no option to archive.

## **In-house testing**

Module testing involves the independent testing of each module, or component, within a process to ensure that it functions as required. This kind of in-house testing for the 2001 Census began in November 1999 and went through to April 2000. The modules tested were separated into different stages according to the timeframe in which they were developed. The modules included forms management, balancing, electoral, code and edit, and family coding. This testing involved small numbers of test data created by developers and testers from Statistics New Zealand.

The final integration testing in April 2000 was the final test of the processing system prior to the dress rehearsal. In this test, all modules were tested in the order and manner in which they were to function in the dress rehearsal and the census in 2001. Once the modules have been independently tested and are working as required, they must be tested to ensure they work in the same manner when integrated into a complete processing system.

Following the dress rehearsal, some small changes were made to improve on systems. These small changes meant that some components were tested again, along with a further integration test.

The final tests carried out prior to the census were load tests. The load tests were designed to test and confirm assumptions made about the performance of the form management, processing and output systems when under volume loads equal to or exceeding that expected during the census. The load tests also tested the ability of the hardware to operate efficiently under the load of large volumes of data. This included the speed of operation of the PCs, the capacity of all servers used and the transfer of data between systems. Final assessments of the performance of all hardware were undertaken. This testing took place between August 2000 and March 2001. The last load test involved 100,000 forms.

## **Dress rehearsal**

The census dress rehearsal was a final rehearsal of all systems, processes and questionnaires. All processes from enumeration to output were tested in a real-life situation. Only minor changes were to be made between the dress rehearsal and the 2001 Census. The dress rehearsal 'census day' was 7 March 2000. Processing the dress rehearsal data began in April 2000 and was completed in June 2000. Approximately 12,000 households and 26,000 people took part in the dress rehearsal. The areas enumerated were Tauranga, Gisborne, the Hutt Valley, and Wainuiomata. These areas were selected as they provided a range of different populations to help test the design of the census form, the methods of delivering and collecting the forms, and processing the information. Aspects of the communications project tested during the dress rehearsal included the establishment and operation of an 0800 helpline, the production of help notes, the availability of help web pages on the Statistics New Zealand website, and news releases for the media.

Participation in the dress rehearsal was voluntary. No data was published from the dress rehearsal, but mock outputs were produced. All forms were destroyed once the processing was complete.



## Chapter 5:

# Enumeration and communication

## Overview

The efficient delivery and collection of census forms to the entire population is essential to the success of a census. Without the response from the public, there would be no information to process and then output. Therefore, the enumeration phase of the 2001 Census was crucial. For the 2001 Census, a public communications campaign was carried out to ensure that everyone took part in the census and were counted, while being aware of the importance and benefits of doing so.

The enumeration and communication phases of the census are discussed in more detail below.

## Enumeration

The word 'enumerate' simply means 'to count' or 'to mention one by one' (*Concise Oxford Dictionary*). The aim of the enumeration phase of the census process was therefore to count everyone who was in New Zealand on census night. Approximately five million census forms (one for every person and one for each occupied dwelling) were delivered prior to census day and then collected back in by enumerators (a person who delivers and collects census forms). The volume of paper and people involved, and the need to perform the exercise in the most efficient and thorough manner, meant that the organisation of the enumeration phase had to be carefully planned with the necessary procedures in place to ensure that everyone in New Zealand on census night was included.

Statistics New Zealand divides New Zealand into units of land called meshblocks. A meshblock is the smallest geographic unit in which data is collected and processed and it is based on a standard system established in 1976. A meshblock may contain as many as 100 houses, although not all of these might be occupied. Water areas such as lakes and coastlines are also included in a meshblock area. The average urban size of a meshblock is approximately 60 houses, or 150–200 people. At the time of the 2001 Census there were 38,366 meshblocks in New Zealand. Groups of meshblocks were combined together to form around 5,900 subdistricts. A subdistrict is a census workload area that one enumerator can cover, delivering and collecting census forms in the time allowed. On average, an enumerator's subdistrict would contain around 230 dwellings.

Considerable time was spent in producing maps that assisted the enumerators in their role. Every meshblock must appear on a map. For the 2001 Census, Statistics New Zealand worked closely with a mapping provider in producing around 8,000 maps. Some subdistricts required more than one map due to size or complexity and there were also maps for the field managers and supervisors.

## The enumeration team

Around census time, the most visible part of the census were the 5,900 enumerators who went door to door delivering and collecting forms. It was this group of people who formed the key part of the field operation. Recruitment of enumerators started in December 2000. First and foremost, enumerators had to have good people skills as it was the meeting on the doorstep which was often crucial in obtaining cooperation in completing a census form. Enumerators also brought with them a good knowledge of their community and organisational skills.

Supporting the enumerators was a team of 407 district supervisors. Employed from January to April 2001, it was their responsibility to put together, train and support their team of enumerators. They also contacted community groups, charities, hotels, motels, prisons, hospitals, camping grounds and other places where people may have been living on census night so that forms could be distributed to everyone.

Providing support to the 407 supervisors were 20 area managers and 20 kaitakawaenga (Māori Liaison Officers). An area manager and kaitakawaenga operated as a team in providing this support, and ensured that the census message went out into the community. These area management teams were assembled in September 2000. The field teams worked closely with the Pacific liaison officers in recruiting staff and promoting the census in the community. The field teams were also supported by staff located in the census main office in Christchurch.

The 20 large census areas that New Zealand was divided into were diverse, and ranged from a compact central Auckland area to the ethnic diversity of South Auckland to a West Coast/Southland area that stretched for most of the length of the South Island.

## **Training**

One of the keys to a successful census is training. In 2001, a team of 11 specialist trainers was employed to train the supervisors and area management teams. The main role of the training officers was to provide quality training to the district supervisors who then trained the enumerators. Every enumerator was provided with a video in which the basics of the job and the sorts of situations that they might find themselves in were shown. Examples in the training video included how to communicate with someone who does not speak the same language, and how to deal with someone who refuses to complete a census form. Every enumerator attended two active training sessions where opportunities to practise the skills needed were provided.

## **Delivery and collection**

Delivery of census questionnaires commenced around 20 February 2001 and continued until census day. There was a peak of activity around census day, 6 March 2001, as many institutions such as hospitals, prisons and hotels did not have forms delivered until close to the time they were needed. In these situations, the district supervisor would have made contact with these organisations prior to the forms being delivered. The collection of census forms from places such as hospitals was usually done on census night or early the following day.

For the majority of households, the delivery of census forms was straightforward. The enumerator left two types of forms, one dwelling form and an individual form for everyone who would be in the dwelling on census night. Some brief details were then recorded in the enumerator's fieldbook. If the enumerator could not make contact after three attempts and they believed that it was likely that there would be residents there on census night, then forms were left. Collection of the census forms started immediately after census day. Once again, for most households, the collection of their forms was straightforward. Once the enumerator had checked that the correct number of forms were there and that the front page information was present, the forms were stored securely in the bag for return to Statistics New Zealand. If the enumerator could not make contact after three attempts, then a freepost envelope was left for the forms to be returned in.

For some places, the enumeration process had to be a little different. Special enumerators were employed for trains and shipping. For example, for the overnight Wellington to Auckland train, an enumerator boarded at each end, distributed forms and then swapped trains at National Park to return home. Ferry passengers were issued with forms at the entry terminal, and the forms were then collected before sailing. Forms were also left in DOC huts and with camper van companies. Making contact with

local city missions and other community support services ensured that the homeless were also counted in the census.

District supervisors often organised a community type event to help people to complete their forms. This was sometimes with the assistance of groups such as the Refugee and Migrant Service.

In the 2001 Census, members of the public could request a bilingual Māori/English form. This was promoted in the advertising campaign and also via a sticker and badge attached to the enumerator's bag. In Northland and parts of the East Cape of the North Island, the bilingual Māori/English form was the only form issued.

## **After the collection**

All the forms were returned to the district supervisors. They were then packed to send back to Christchurch for processing. District supervisors then turned their attention to following up forms that were not collected by the enumerator. Sometimes forms were not collected because the enumerator could not make contact but there were also a small number of people who refused to complete census forms. One of the district supervisors' key roles at this point was to attempt to persuade those who refused to participate in the census, and on many occasions they were successful.

By mid-April, the district supervisors had finished, followed by the area management teams finishing in mid-May. Each part of the field team was asked for its view on how the process could be improved for next time. This is part of the continuous quality improvement process that will contribute to the development of the enumeration phase for the 2006 Census.

## **Communication**

Although the census is compulsory, Statistics New Zealand has increasingly recognised that the legal requirement to complete the census is not in itself enough to achieve the high response rate that is desired.

For Census 2001 there was a broad public information campaign. The primary purpose was to encourage people to take part and provide assistance to help them to do so. The main messages covered when and how to take part in the census, why it is important and how the information is used, guarantees of confidentiality, and the availability of bilingual forms. The campaign aimed to communicate these messages and have a positive impact on the quantity and the quality of census data collected.

The campaign was aimed at the population as a whole, but Statistics New Zealand had also identified youth and Māori and Pacific peoples as target groups. On the basis of field tests and the results of the 1996 Post-Enumeration Survey, which was confirmed by market research, these groups had been identified as those which Statistics New Zealand had not reached as successfully as the general population in the past.

There were several different components to the public information campaign. Advertising on television, radio and in the press was key to raising awareness of the census. A programme of news releases updating the media on the stages of the census led to extensive coverage of the census in the news media, with television and radio news stories, as well as news and longer features in the metropolitan and provincial newspapers. There was also a series of programmes aimed at specific sectors of the population: schools, community organisations and leaders, and Māori and Pacific communities.

Help services were put in place in the form of an 0800 helpline service (0800 80 2001) and help notes, which were delivered to every household with their census forms. The Statistics New Zealand website also had a set of census pages, carrying information and free, downloadable copies of many of the written resources.

## Schools

For the schools programme, Statistics New Zealand's Education Services team generated relevant classroom resources on the census. These were targeted at years four to eight in the curriculum areas of maths, social studies and geography. The aim was to encourage school-age students to take the census message home to help ensure a full participation in the census by all school-age children and their families and whanau. The resource comprised an English language resource book, a te reo Māori resource book (*Te Kete Tatauranga*), a bilingual regional map of New Zealand and supporting activities in both English and te reo Māori on the website.

## Community organisations

The Census Community Liaison Officer made personal contact with a wide range of community groups to discuss the needs of their members. The community groups were considered to be facilitators, who would pass information to their members through their own networks. As the census included everyone in New Zealand on census night and counted people where they were on that night, there were a number of practical issues to be covered. To this end the community liaison programme included contact with associations or support groups working

with the sight impaired, physically impaired, mentally impaired, new migrants, visitors and people away from home, students, the homeless, people in refuges, people who live in inaccessible places or rural areas, the elderly, youth, and people at sea taking part in recreational activities.

The enumeration field teams of area managers, kaitakawaenga and district supervisors followed up these contacts at the regional and local levels. They were assisted in specific locations by Pacific liaison officers and four regional media kaitakawaenga. Information was prepared by the Census Community Liaison Officer for newsletters published by community groups. These stories contained relevant material on the census for the audience concerned. Over 40 different groups received information for newsletters prior to census.

Statistics New Zealand also produced resources to assist particular groups in gaining information about the census. The resources were:

- an information kit
- a presentation kit for use by the enumeration field teams
- an information leaflet in 14 languages
- a census flyer issued to international arrivals at airports
- a guide for visitors (who completed the first 11 questions) in the five most common tourist languages
- a video and teaching programme for the English Speakers of Other Languages Home Tutor Scheme
- an 0800 fax line for the hearing impaired
- an audio tape reading of the census forms and help notes, and information on the Royal New Zealand Foundation for the Blind's Telephone Information Service (TIS).

Resource packs were mailed out to a contact list of community organisations, libraries, enumeration field offices and the media from mid-November 2000. Mayors, MPs and MPs' offices were also sent information packs and census updates as appropriate over the period of the census campaign.

## Māori communities

A Māori communications advisor and a team of four regional media kaitakawaenga (Auckland, Rotorua, Wellington and Christchurch) worked alongside the census communications team to communicate the messages about the census to Māori communities. Their main task was to ensure that the mainstream messages were structured in a way that would get maximum buy-in from Māori, as well as implementing a programme using Māori media and appropriate Māori channels to inform Māori of the census. They

worked with the field kaitakawaenga to create publicity opportunities and provide stories and profiles to their regional media, for example demonstrating the uses of census data to different Māori community groups.

In the 2001 Census, there was an increased use of the Māori language, including bilingual help notes, more emphasis on the promotion of the availability of the bilingual Māori/English form and bilingual opening messages on the 0800 helpline. The Māori communications team greatly assisted the process of raising awareness of the bilingual forms and how to obtain copies. The field kaitakawaenga were provided advice on the best methods for reaching Māori youth across the country.

### **Pacific communities**

The Pacific communications programme had a key role in explaining why it was important to take part in the census and how census information is used.

The programme ran alongside the mainstream communications. A Pacific communications advisor and a Statistics New Zealand Pacific Liaison Coordinator lead the Pacific peoples component. They also acted as the link to the overall public information campaign.

Five Pacific Liaison Officers were recruited to help drive the campaign via Pacific radio, Pacific television programmes, promotion of Pacific language posters/fliers, fono (meetings) and community gatherings. They worked with the area management teams in closing any gaps around the enumeration and communication operations in their regions. The five liaison officers covered areas of high presence of Pacific peoples and were based in Auckland (two), Hamilton, Wellington and Christchurch.

Specially designed Pacific posters and leaflets were produced to carry key messages about the census. The Ministry of Pacific Island Affairs assisted in the promotion. They featured information about the 2001 Census in their February 2001 newsletter and inserted a Census 2001 Pacific poster and leaflet.

The ministry mails to over 3,000 key community organisations and leaders throughout New Zealand.

The Pacific peoples campaign was essentially about targeting Pacific communities, communicating in Pacific languages, providing relevant explanations, using Pacific media and community networks. It was important that those fronting, facilitating and presenting the campaign were all Pacific peoples, and voices on the advertising on Pacific media were also Pacific.

### **Helpline**

Statistics New Zealand ran an 0800 census helpline to assist the public with their enquiries about the census and how to take part. It was active from 19 February 2001, the week in which forms started to be delivered to households, through to 17 April 2001, when the enumerators and the district supervisors had finished their work collecting forms. There was a message service available 24 hours a day and operators working seven days a week, usually from 8am to 10pm. The helpline had operators who could offer assistance in seven languages: English, Māori, Samoan, Tongan, Mandarin, Cantonese and Korean.

The helpline used a system of messages (interactive voice response) to allow callers to select the language in which they wanted to make their enquiry, and then there was an option of talking to an operator or leaving a message for enquiries about the delivery or collection of census forms. The message system also allowed callers to leave a message if an operator was not available.

The helpline clearly played an important role in helping the public to understand what happens at census time and in helping them to take part. Around 248,000 calls were made to the helpline, which was a 164 percent increase on the number of calls made to the Census 1996 helpline. Queries about the delivery or collection of census forms were the main type of enquiry, but the public also commonly asked for assistance on how to complete their forms, the reasons for the census and issues of confidentiality.

## Chapter 6:

# Processing the 2001 Census

## Overview

The information provided on the census forms must be processed in order to produce data which can then be tabulated for output and analysis. This is the purpose of the processing phase of the 2001 Census.

As with the earlier phases in the overall census cycle, the processing phase was directed by the need to produce data that is fit for use while adhering to the constraints of a strict timetable and budget. The eight fundamental principles that guided the planning and development stage of the 2001 Census also underlined the procedures of the processing phase.

The 2001 Census processing system built on the knowledge and experience of scanning and imaging gained from the 1996 Census. Some changes to the processing system were incorporated, however. These changes included:

- a focus on the foremost variables (location, age, sex and ethnicity) to ensure that they were of a high quality for users, in line with the guiding fundamental principles for the 2001 Census
- software changes to facilitate the latest Windows NT software used
- the new dwelling control file, which accounted for every household in the 2001 Census
- automatic coding and recognition.

All of these changes were tested in the 2000 census dress rehearsal.

As occurred in 1996, in 2001 a contractor provided the hardware, software and staff for imaging, and the software and technical support staff (programmers) for processing.

The processing phase of the 2001 Census could be split into two separate components, the capture phase and the data phase. Within each of these components there were different stages through which the information from the census forms were processed and then output to the Statistics New Zealand databases. These processing phases are discussed in more detail below.

## Processing – capture phase

### Receiving and storing the forms

Completed census forms were collected in by enumeration district supervisors within approximately two weeks of census day (6 March 2001) and were transported over a three-week period to the forms

warehouse located in Christchurch. A total of 46,673 forms were also posted directly to Statistics New Zealand by respondents.

As cartons of forms arrived in the warehouse they were 'receipted in' using the Forms Management System (FMS). The forms were then stored in order of enumeration district prior to being scanned. After scanning, the forms were returned to their cartons and again stored in enumeration district and sub-district sequence. After the completion of processing, the census forms were either destroyed by shredding or archived, as indicated by each respondent on their individual forms. Approximately 600 square metres of space was required to store all the forms.

## Bilingual forms

In the 1996 Census, bilingual forms were transcribed on to English forms prior to scanning and processing, as only English forms could be scanned in the imaging system. In the 2001 Census, Statistics New Zealand greatly improved on this manual process by scanning and directly processing bilingual forms. The reorua Māori/English forms were streamed to operators with Māori language capability for processing. These new processes were also successfully tested in the 2000 dress rehearsal, as was an improved method of processing iwi responses. These initiatives were put in place for the processing of the 2001 Census in order to improve overall data quality.

## Imaging (scanning and recognition)

### Imaging

Imaging encompasses the scanning, retrieval, recognition, and repair of census forms. In 1996, Statistics New Zealand used tick box and numeric recognition successfully as well as scanning and retrieval of images to complete coding and editing of questionnaires. In 2001, Statistics New Zealand continued with imaging using improved scanners and recognition engines.

Imaging has allowed Statistics New Zealand to complete processing far quicker than in the past. This has resulted from being able to electronically process responses from the images, and also to efficiently translate forms. A paperless processing site (other than the storage of forms as they are scanned) has also been an advantage.

Scanning involves taking an electronic image of each page of the questionnaires. The scanning of the census forms started in the week beginning 26 March 2001. Forms were scanned initially at the rate of

120,000 forms per day, this rate was increased to 140,000 forms per day and the scanning was completed by 21 May 2001. Approximately 5.1 million forms were scanned over 45 working days using two Kodak 9500D scanners. The base software used for scanning was HPA Bureau 98.

A scanning preparation team was in place to ready the forms for scanning. The team took the forms, on a regional basis, and unpacked them from the cartons and wallets the forms were stored in and this action was recorded on the Forms Management System. The forms were then groomed for scanning by checking they were the correct way round, that no corners were folded over, and that no forms were torn.

Once scanned, the images of each page were sent through a process which stripped the background away ('form removal'), leaving only the tick box and written responses. The data was then compacted and uploaded to the image server, with each form image being given a unique reference number within the system. At the same time, a unique batch number was allocated for each set of household forms, and this reference was used extensively throughout the processing as the main identifier of separate households.

Following scanning, the images then went to the recognition phase of the processing system. Recognition is the most important part of the capture phase. It was here that the tick box and specific handwritten responses were converted to data, using Optical Mark Recognition (OMR) and Intelligent Character Recognition/Optical Character Recognition (ICR/OCR) software. Three questions – language, religion and occupation – were designed to go through an alpha recognition process and match with codefiles during the forms recognition process, a new development for the 2001 Census. The result from the recognition process was a crude dataset for a household, covering all tick box responses, numeric responses and alpha responses (in the case of language, religion, and occupation) in the dwelling and individual form(s). During processing, value was added to this dataset by checking the numerics through visual checking or editing of tick box responses, and by key entering additional information from form images where it was not possible to capture that data directly. These processes are described further in the sections below.

## **Numeric repair**

Numeric repair was one of the first phases following recognition. Numeric responses that were unable to be recognised came up before an operator to 'repair', or key enter, the correct number(s). Numbers that

could be recognised but did not meet the required confidence level also came up before an operator for confirmation or correction. All questions with numeric responses came up for numeric repair including, on the dwelling form, number of occupants, number of bedrooms, and rent paid, and on the individual form, date of birth and hours worked. During the processing, 89.6 percent of households came up to operators for numeric repair.

## **Balancing**

Balancing was the last part of the capture phase in which every household and every person within those households on census night was accounted for. This information went towards the count of dwellings and people in New Zealand, so it was a very important and exacting operation. Enumerator fieldbooks and the survey frame, called the dwelling control file, together with the images of the forms, were essential input to balancing.

## **Dwelling control file**

The dwelling control file (DCF) was a new development for the 2001 Census. Prior to the start of census processing, the DCF was a pre-compiled electronic list of the estimated individual dwelling numbers in New Zealand by their geographical location. No physical address information was listed. The DCF was created from an estimates system which used the data from the 1996 Census along with building consents data to estimate the number of dwellings in each meshblock in 2001. The DCF was then used as the basis for the enumerator fieldbooks, with extra lines printed so the enumerators could record any new dwellings. Having the DCF meant that the fieldbooks did not have to be scanned as occurred in the 1996 Census.

The process of updating the electronic DCF from the information in the returned fieldbooks was called the DCF maintenance phase. During enumeration, the enumerators assigned a unique fieldbook line number to every dwelling they located in their area. All forms then issued to a dwelling were also allocated the same fieldbook line number. During processing, forms were matched up with the DCF line number during the balancing phase. Empty dwellings and those known to be temporarily vacant on census night were listed in the fieldbook with a certain code which related to whether the dwelling was empty, the residents were absent, or the dwelling was under construction. This information was then added to the electronic version of the DCF and accounted for all unoccupied dwellings in New Zealand on census night. Any lines not used by the enumerator in the fieldbooks were deleted and any extra lines created were added, so that the updated DCF reflected exactly the dwellings identified during enumeration.



As forms came into the processing system and to the balancing phase, they were 'marked off' against their respective lines in the DCF. On completion of balancing, each line on the DCF that had not been deleted and that had not been recorded as an unoccupied dwelling had a household batch number written against it representing the dwelling and individual forms that have come in for that household. The DCF and fieldbook role was to ensure that there were forms in the census for every valid household.

At the completion of balancing and the DCF maintenance phase, the DCF became the final frame of all the occupied and unoccupied dwellings in New Zealand.

## **Balancing the households**

Balancing the number of people in a household was done within each set of images for a dwelling. The dwelling form showed the number of people present on census night at that dwelling, and for whom individual forms had been completed. The names of those persons and their relationship to the 'reference person' were also stated and should have agreed with that number. The final check was the actual number of individual forms received for that dwelling. So a three-way simple balance was necessary before any household was deemed to be complete. If this three-way balance was completed automatically, the household was officially balanced and passed through to the next phase in the processing system. Over 55 percent of dwellings in the 2001 Census, or 775,000 dwellings, balanced automatically in this way.

Households that did not successfully balance automatically were brought up to operators to look at. Individual forms had to be numbered in the correct order as per the dwelling form, so that the correct relationships and living arrangements could be allocated to the correct people. Any inconsistencies found here were brought up to an operator to rectify. Households that were incomplete due to people being missed, initial refusals to complete forms, or forms that arrived in separately by post were held back by the processing system and then balanced once all other balancing was complete. If the missing individual forms were not received by the end of the balancing phase, substitute forms were created which then balanced the household and it could pass to the next phase. Where Statistics New Zealand knew an occupied household existed, but no forms at all were received, substitute dwelling and individual forms were created for the entire household.

Balancing was a very important phase in the processing of the census which determined the number of people included in the census, and it took several months to complete this phase. In the 2001 Census, processing commenced on 2 April and

balancing was completed on 30 June. While balancing was underway, those households that balanced automatically went through to the next phase, which was operating simultaneously so that the balancing of all households did not need to be completed before the next processing phase could start.

## **Processing – data phase**

Having identified and captured the details of households and people included in the census, the next task was to convert the responses into data for statistical analysis, and to validate the responses where necessary. The validation of data in the processing phase followed the Quality Management Strategy (QMS), and more information on this part of the processing can be found in Chapter 7, 'Quality'.

### **Alpha capture**

Although perhaps a capture phase, alpha capture has been included in the data phase because the information, when key entered, was matched under a 'batch' process (an automatic system process) with descriptions on the various codefiles and converted immediately into output data. Any responses to the three questions that went to alpha recognition and could not be matched automatically came before an operator during the alpha capture phase for key entry where necessary. All other text responses on the images of the questionnaires came up before an alpha capture operator to key enter.

In all, 1,267,968 households came up for alpha capture taking 27,894 operator hours, or 1 minute 19 seconds per household. This was the most labour intensive module of the whole operation in terms of person hours. Approximately 70 percent of alpha descriptions were able to be directly matched against codefiles with the remaining 30 percent coming up in the code and edit phase.

So that the necessary data could be output for the electoral requirements, the processing of data was split into two stages: the electoral phase and the code and edit phase.

### **Electoral phase**

A subset of census data was required early by the Representation Commission to review the electoral boundaries for the 2002 General Election. Accordingly, priority was given to the processing of certain questions: usual residence address, census night address, age, ethnicity, dwelling type, iwi and Māori descent. Following balancing, there was a small phase within the processing system called 'alpha electoral' which captured and coded text responses for ethnicity and dwelling type, and this was followed by a coding phase ('electoral code and edit') which used the same codefiles as the general

coding phase ('code and edit'). Consistency checks were made on the other questions and then the full dataset for the selected variables was transferred to the Statistics New Zealand output database.

The average time for the electoral alpha capture phase was 28 seconds per household while for the electoral code and edit phase the average time was 24 seconds. The total time for the 420,586 households that went through the electoral alpha capture phase was 3,384 hours, and for the 571,531 households that passed through the electoral code and edit phase, 3,856 operator hours. 851,415 households went through the latter process automatically, thereby reducing the workload considerably.

## **Code and edit**

### **Automatic coding**

Automatic coding was first used in 1991 and reintroduced in 2001 where alpha descriptions from the forms were keyed (or read via alpha recognition) and automatically compared against Statistics New Zealand codefiles for a match. Only those that had no match were returned to an operator for manual coding. Very high match rates were achieved for simple to code fields like ethnicity, birthplace and relationship to occupier.

### **Manual coding**

In the code and edit phase, operators were required to cross-check responses to questions with other available information, verify certain tick box questions for multiple responses, and code descriptions against official codefiles. A codefile is a comprehensive list of probable survey responses and the categories to which they are coded. The total number of households that passed through this phase was 1,207,449. Any responses the code and edit operators were unable to easily identify and code were sent on to a separate phase in the processing system called query resolution (QR). The QR operators were able to spend more time tracking down difficult responses in the codefiles and had more resources available to them in the form of reference materials. In addition they could call on expert help from Statistics New Zealand staff. The average time taken to process a household in code and edit was 1 minute 51 seconds; however sending a household batch to QR generally added a further 3 minutes 5 seconds to the time.

## **Family coding**

All people in private dwellings went through the family coding process, either automatically, or in more difficult cases, coded by an operator. Family coding is based on the types of groups people live in, such as a family nucleus, a group of related people, a

group of unrelated people, or people living alone. The coding reflects the relationships between people within a private dwelling, whether they are living alone, or are a member of an extended family. Absentees are also included in the family coding. The family coding phase occurs after the coding and editing of individual data. Approximately 91 percent of private households went through the family coding phase automatically, with the remaining households coming up to an operator to be coded. All non-private dwellings did not go to family coding, but passed straight through to the next phase of the processing system.

Most of the information on families was captured directly from the tick box responses to questions on the dwelling form and the individual form, such as relationship to occupier, living arrangements, sex, age, and usual residence. For most families, the family code could be derived automatically from these responses. More complex relationships and extended families that could not be automatically coded were brought up to an operator to enter the correct codes, after analysing the responses to the necessary questions. The average time taken for manual family coding was 47 seconds per household batch.

## **Derived data**

Some census outputs were derived from other responses given on the census forms. Derivations were performed both within the processing system, and after the data had been output to Statistics New Zealand databases.

Examples of derivations include:

- age of youngest child in family
- total hours worked
- highest qualification
- work and labour force status.

These derivations were determined using the responses given to a number of questions on the census forms. A simple example of a derivation is 'total hours worked', which was derived from the responses to two questions: hours worked in main job per week, and hours worked in other jobs per week. A more complex example is work and labour force status, which took into account an individual's responses to several questions: employment status, hours worked each week, looked for work, and available for work. These two examples were derived automatically once the data was output to Statistics New Zealand's databases. Examples of derivations done within the processing system include age, family codes, and years since arrival in New Zealand.

## **Imputed data**

Data is imputed for age, sex, usual residence and work and labour force status where responses have not been provided on the census forms. Imputation occurs during the processing phase of the census. For more detail on this process, refer to Chapter 7, 'Quality'.

## **Processing staff**

The processing of the census incorporated a six-day working week, with two shifts of eight hours each

day. Processing commenced on 2 April 2001 and the bulk of census processing was completed on 22 September 2001. The provision of operators for the processing of the census was contracted out for 2001. A recruitment agency supplied 150 processing operators. Statistics New Zealand directly employed 12 team leaders and two shift supervisors.

See appendix 5 for a diagram of the processing system and appendix 6 for a glossary of terms relating to the processing system.



## Chapter 7:

# Quality

### Overview

Producing high-quality data that is timely and fit for use is the central purpose of running the census. Only the census collects information on the total population at a given time. Ensuring that the data produced is of high quality is vital to the success of the census. It is important that the users of the data be assured of its authenticity, and that an accurate picture of New Zealand society is presented. This ensures the credibility of the census data and of Statistics New Zealand.

An extensive effort is put in to all aspects of the census process to ensure quality is constantly being maintained to the highest level necessary for use; that is, to maximise the accuracy of the data as a true reflection of New Zealand society.

Measurement of quality is also important as monitoring and evaluating quality at each stage of the census process will help Statistics New Zealand in the development and planning of the next census in 2006.

The following chapter outlines how Statistics New Zealand ensures that the data produced from the 2001 Census is fit for use. Fitness for use takes into account the restraints inherent in running such a large project involving the entire population and the limitations of this kind of self-administered survey. There are several factors used in order to achieve this:

- an overall Quality Management Strategy (QMS)
- thorough testing of all phases including a census dress rehearsal
- edits and imputation built into the processing system
- system and macro-evaluation of the system and output.

This chapter then outlines how quality is measured. The Post-Enumeration Survey (PES) attempts to provide a measure of how well the census carried out its primary purpose of providing an accurate count of all people and dwellings in New Zealand.

### Quality management strategy

Statistics New Zealand has in place a Quality Management Strategy (QMS) to ensure data from the 2001 Census is fit for use. The QMS identified key actions Statistics New Zealand were to undertake during all phases of the 2001 Census cycle to ensure data quality.

The QMS recognised the need to manage quality effectively in the 2001 Census by:

- managing and reducing risk at all phases
- monitoring data quality
- employing effective project management, including a thorough review process.

The key aim of the QMS was to agree on the quality of census output and to introduce measures at each stage of the census process, from form design to outputs, to produce data that is fit for use.

The QMS identified five key actions in order to meet this aim early in the development cycle:

- differentiate between levels of quality
- agree on quality standards for outputs in 2001
- identify areas of high risk to quality throughout the census process
- manage and reduce this risk
- monitor and measure quality and provide feedback to users.

### Data quality

Recognising that the census is subject to a fixed timeframe and budget constraints, the Statistics New Zealand QMS outlined a three-tier approach to data quality. This identifies census variables as being in one of three groups:

1. foremost variables
2. defining variables
3. supplementary variables.

The distinction between these three levels are:

1. The **foremost** variables are the core census outputs and the key reason that Statistics New Zealand conducts a census. Data for these outputs (and combinations of these outputs) are of the highest quality practical given the purposes for which the data is used, and constraints of time and budget. Continuity of concepts between censuses and related surveys is essential. A large percentage of resources were invested in these outputs to ensure that the quality levels were met and every effort was made to minimise non-sampling error. This includes a focus on form design (with simple, easy to answer questions, critical questions on the front page, and detailed, concise guide notes), enumeration (increased coverage, ensuring that respondents complete the front page), processing (micro-editing,

imputation where necessary, minimising operator and system error), and outputs (derivations, macro-editing).

The foremost variables in the 2001 Census are:

- age
  - sex
  - location
  - ethnicity.
2. The **defining** variables are also very important to the census, although had second priority in terms of resources. These variables define key sub-populations for which census provides measures that are important for policy. They are used a lot in cross-tabulations with the foremost outputs. They represent sub-populations that are of high public interest. Examples of defining variables include iwi, country of birth, and work and labour force status. The defining variables are closely linked to the main purpose of a census.
3. The **supplementary** variables, while still of importance to some groups, are of less importance overall than the foremost and defining variables. These variables had the least amount of effort and resources applied to them. However, there are minimum quality levels that must be met in order to make the output data fit for use. These variables do not directly fit in with the main purpose of a census, but are still of importance to some groups. Statistics New Zealand could run a census without most of these outputs. Examples of supplementary variables are fuel type used to heat dwelling, access to telecommunication systems, number of motor vehicles, and unpaid activities.

The Fitness for Use specifications established the quality standards for the three levels of quality, based on the overarching goal that outputs will be fit for use in 2001. The aim of these specifications was to inform the census development teams of the requirements of users for the outputs. They contained all the information that the development teams (Questionnaire Design, Enumeration, Processing, and Output) needed to write their specifications by outlining the level of data quality that was required by users. This provided strong direction during the development of the census systems.

The QMS is an underlying feature in the development and implementation of all the census processes and procedures. All outputs from the 2001 Census must meet the quality guidelines it defines.

Outlined below are other procedures undertaken by Statistics New Zealand to ensure the quality of the data at various parts of the process, all of which adhere to the guiding principles of the QMS.

## Testing and the dress rehearsal

Testing of all processes and systems is an integral part of ensuring the quality of data. Pilot testing, module testing, cognitive testing and the census dress rehearsal in 2000 were all part of the overall testing strategy aimed at minimising the risk of any parts of the census process not working to specification. Testing of all field procedures, the questionnaire, processing systems, and output systems was carried out during the development phase of the 2001 Census. More detail on the testing process can be found in Chapter 4, 'Planning and Development'.

## Edits and imputation

At the processing phase of the census, certain quality assurance procedures are implemented to ensure that the data is recorded accurately and that any inconsistencies are minimised as the data is coded. Edits and imputation are two procedures within the data processing phase that help ensure data quality. It is important to note that both edits and imputation follow the guidelines set out in the QMS and do not attempt to change the respondents' answers.

### Edits

The role of edits in the processing system is to minimise introduced error in the data. An edit is essentially a check on the data to make sure consistency is maintained. Edits can detect and correct errors and improve the quality of the data. Following on from the QMS and the Fitness for Use specifications, a High Level Editing Management Plan was put into place to indicate the direction editing was to take for the 2001 Census. The strategy of the editing management plan was in line with the new international view that editing is part of the total quality improvement process. Rather than trying to detect and correct all errors in the data, the new focus on editing is to identify and collect data on errors, problem areas, and error causes to provide a basis for a continuous improvement of the whole survey vehicle.

The following are some of the main reasons for editing:

- to detect and adjust unacceptable, improbable, erroneous data caused by introduced errors (processing errors or enumerator errors)
- to satisfy user quality requirements
- to make the data represent real life as closely as possible
- to provide feedback to improve census processes for 2006
- to satisfy output tool requirements.

Edits have three important functions:

- to provide information about the quality of the data
- to provide the basics for the future improvement of the census
- to correct error.

There are two types of editing in the 2001 Census: micro-editing and macro-editing. Micro-editing is the more traditional method of editing the data and occurs at processing. Macro-editing is mainly done by specialist output staff who evaluate the impact on the estimates before making any decisions about whether or not any further action is required. The specialist output staff are part of the Macro-Evaluation team, (see the 'System and Macro-evaluation' section below).

### Micro-edits

Micro-editing is the investigation of unit record data. Planned micro-edits are built into the processing system and are in place prior to processing, while 'fixit' micro-edits can be put into place and implemented during processing.

There are four types of micro edits:

#### **Field edits**

These are run at the time of question coding, and check for consistency between categories within a question.

#### **Inter-field edits**

These are run at two stages in processing:

- After a record has completed all coding and field edits
- After age imputation.

These edits check for consistency between fields within a record.

#### **Household edits**

These are run when coding and inter-field editing have been completed on a household, and check for consistency between records within a private dwelling.

#### **Family edits**

These are run at the processing stages of Operator Code and Edit, Family Coding and Age Imputation, and check for consistency between family coding and other fields. 'Family coding' in the processing system classifies people and groups of people within a dwelling according to the relationships they have with others in the same dwelling.

Each type of micro-edit can be either:

- Definite** – displayed to an operator at processing and a change must be made to at least one field
  - the correction procedure is displayed on screen
- Warning** – displayed to an operator at processing but not necessarily changed
  - 'accept' button used to clear edit
- Automatic** – not displayed to an operator but automatically changed in the processing system as directed in the correction rules.

### Macro-edits

Macro-editing is the investigation of aggregated data. At various stages of processing the data was sent to output and loaded into the output system where macro-editing occurred. Tables were run and checked against predicted frequencies and tolerances to identify any problems in the data.

The action that follows macro-editing can be:

- no action
- a global change on aggregated data
- a unit record sent back to be reprocessed
- the addition of a new micro edit or a change to a micro edit.

Both macro-editing and micro-editing require thorough testing before they are put into production.

### Imputation

Imputation is a statistical procedure which replaces particular missing fields, for which there is no valid response, with values which it is hoped are as close as possible to true values. Imputation is carried out using information that Statistics New Zealand does have for an individual, and knowledge of the patterns of response in the whole population. The quality and complexity of an imputation generally depends on how much information is used to generate the imputed value. Imputation cannot give the correct answer for a given missing field, but it can make the distributions for those variables look reasonable.

The imputed variables in the 2001 Census are:

- age
- sex
- usual residence
- work and labour force status.

Following the QMS, these particular variables are imputed as they are the core census variables that form part of most cross-tabulations in the census outputs. In terms of maintaining the level of quality for these foremost variables, it is better to have a value statistically imputed than to have no value or non-response.

**Age:** Age imputation supplies an age in years where this value is missing for an individual. This means that age will be imputed if it cannot be calculated from the response to date of birth. Age is imputed using various other responses from the individual, for example whether they are legally married, and the known distribution of ages in the population.

**Sex:** Sex imputation supplies a value of male or female where the response for the sex variable is missing. If they are available, the name of the person, or their relationship to others in the household may be used to impute a value. Otherwise a value is assigned randomly, with 49 percent being imputed as male.

**Usual Residence:** The usual residence imputation supplies a value for the usual residence meshblock, where a meshblock cannot be coded from the address information supplied by the respondent. The usual residence meshblock imputation uses whatever level of geographic information that has been given, and various other responses from the individual. A usual residence meshblock is then imputed based on the distribution of known usual residence meshblocks for similar people.

**Work and Labour Force Imputation:** Work and labour force status imputation supplies a value for labour force status, where this cannot be derived from the labour force information supplied by the respondent. The labour force status imputation uses whatever labour force information has been given, and various other responses from the individual (for example, age and income). A labour force status is then imputed to equal the known labour force status of a similar person. Imputations require thorough testing before they are implemented.

## System/Macro-evaluation

### System evaluation

System evaluation is undertaken to monitor performance measures within the processing system and to ensure that all systems and processes are accurately delivering outputs on time and to specification. The system evaluation process monitors and reports on systems and processes, detects any problems and introduces corrective procedures where necessary. This process differs from the macro-evaluation (described below) in that the role of macro-evaluation is *data* evaluation, with the expectation that the systems and processes are working correctly and have not introduced error into the data.

In summary, system evaluation:

- monitors census enumeration, processing and output systems and processes to ensure that they are working to specification

- develops procedures that will enable any contractual agreements to be measured against agreed standards
- facilitates corrective actions to systems and processes as required.

### Macro-evaluation

Macro-evaluation can be described as investigating what the data is showing, what the results are, comparing the results to identified trends, expectations, other data sources, running cross-tabulations, and investigatory analysis. Where problems are discovered, options for correction are explored and suggestions for solutions are proposed.

The role of macro-evaluation is to review the census data produced by processing to:

- ensure edit specifications have been met, and where they haven't, identify these instances
- detect invalid or illegal data and possibly offer solutions or initiate appropriate research
- analyse the data and compare against the expectation, external data, QMS, trends and determine consistency
- investigate outliers and document these, and where appropriate propose corrective solutions.

The basic aim of macro-evaluation is to describe and evaluate the data, but not to change it.

Macro-evaluation and system evaluation work closely together to ensure that the data which is output from the processing system is correct and not subject to introduced errors.

Both the Census 2001 system evaluation and macro-evaluation processes are guided by the quality principles set out in the Quality Management Strategy and the High Level Editing Management Plan. These strategies are based on the premise that Census output data quality will vary according to the use and importance of variables. The 2001 Census of Population and Dwellings has a clear definition of 'fitness for use' of all variables, for the measurement of change and levels, and for cohesiveness with other statistics. Statistics New Zealand will provide the highest practical level of accuracy to the foremost census variables.

### 2001 Post-Enumeration Survey

Statistics New Zealand conducted a Post-Enumeration Survey (PES) for the first time after the 1996 Census and again in 2001. The objective of the PES was to measure the level of coverage of New Zealand residents and dwellings in the 2001 Census. It is an independent measure of how many



New Zealanders were missed or counted more than once; that is, it is a measure of the level of net undercount or coverage. Because the PES is primarily a check on the completeness of census coverage, it is a key measure of how successful the census was in enumerating the New Zealand population. It is therefore a measure of the performance of the census, and another way to ensure quality.

The United Nations *Principles and Recommendations for Population and Housing Censuses* states that a post-enumeration survey serves two principal purposes:

- to inform users about the accuracy attached to census figures.
- to aid census officials in the improvement of subsequent censuses.

In New Zealand the information from the PES is used to inform users, and the public, not only about the level of census coverage, but also to adjust the base population used for deriving post-censal population estimates and to improve the procedures for following censuses. These uses are in line with the United Nations recommendations.

The PES involves interviewing members of selected households to see if they had been counted on census night. The interview involved asking for certain demographic information (age, sex and ethnicity) and geographic information (address) from the members of the household. This helps to identify if some particular groups of people have higher or lower levels of undercount in the census.

The size of the sample population in the PES for 2001 was 11,000 households and 25,000 people, selected randomly throughout New Zealand.

The sample population was drawn from New Zealand residents who were either:

- usually resident in a private dwelling, or
- staying at one during the survey period.

Overseas visitors and non-private dwellings were excluded. Other exclusions were:

- people who had died since census night
- overseas diplomatic people and their families/people living with them
- people living in diplomatic residences
- babies born after census night
- temporary private dwellings (caravans, tents, etc)
- people in off-shore islands (except Waiheke Island, which was included).

Once the field information was collected it was processed. Processing of the PES happened at the same time as processing of the 2001 Census. This enabled dwellings and the people within the households in the PES to be matched back to their census records with the intention of matching a person in the PES with the same person in the census. Matching was done by address, name, age and sex. This matching then identified any people that were missed in the 2001 Census, or who may have been counted twice.



## Chapter 8:

# Output

### Overview

The data released from the 2001 Census will provide important information about New Zealand and New Zealanders for the measurement of development in our society, and for making decisions about the future needs of our communities. The data that will be released from the 2001 Census also aims to provide users with information that meets their requirements and, where appropriate, their expectations. As with other phases of the 2001 Census, the output of data is underlined by the fundamental principles of the census to provide users with timely data of the highest practicable quality. At all times the confidentiality of respondents is maintained.

Statistics New Zealand will be making a variety of data and data-based products available from the 2001 Census for users. This output ranges from simple counts of population and dwellings to a sophisticated web-based table building service and the traditional customised data service from the Statistics New Zealand Information Centres.

There will be several changes in the way much of the 2001 Census data is made available, compared with previous censuses. The primary means of disseminating output from the 2001 Census will be the Statistics New Zealand website, providing a single data repository for users. A large proportion of the standard census outputs will be available at no charge when accessed through the website.

Statistics New Zealand will not be producing a SuperMap product for the 2001 Census output, concentrating instead on the dissemination of data rather than software development. However, two companies, MapData Sciences and Critchlow Associates, have confirmed that they will be developing mapping products which combine census data to meet this market.

Overall, the product range for the 2001 Census is based on that from previous censuses in order to provide continuity for users, with development being based principally on an evolutionary, rather than a revolutionary, approach.

### Products available from the 2001 Census

The main products derived from the 2001 Census are listed below, along with a brief description.

### Territorial authority leaflets

Based on the 1996 community leaflets, this product will mainly be disseminated via the web with hardcopies also available. At territorial authority level, with comparable data in each table for all New Zealand, there will be one output containing data for both the total usually resident population and the Māori ethnic group population. This differs from the 1996 product where the usually resident population and Māori ethnic group population were available as separate brochures in hardcopy and as a single output on the web. The data will be presented in the form of brief (bullet point type) descriptions and associated tables and graphs.

### Topic-based series

A range of 18 publications each containing a number of tables on a specific topic, such as education, work, families and households. For the first time, where possible, the topic-based series titles will contain tables for both the total census usually resident population count and the Māori population.

Four of the titles will be produced both as traditional glossy publications and on the web, while the other 14 titles will be available via the Statistics New Zealand website, and may also be requested in hardcopy.

The topic-based series can be downloaded from the website at no charge.

The full list of titles in the topic-based series are:

#### **Web-based technical series**

- Introduction to the Census*
  - published 21 December 2001
- Definitions and Questionnaires*
  - published 21 December 2001

#### **Glossy/web**

- National Summary*
  - to be published by 30 April 2002
- Regional Summary*
  - to be published by 31 May 2002
- Population and Dwelling Statistics*
  - to be published by 31 May 2002
- Māori*
  - to be published by 31 May 2002

**Web-based – all to be published by 30 June 2002**

*Iwi*

*Ethnic Groups*

*Pacific Peoples*

*Asian People*

*People Born Overseas*

*Population Structure and Internal Migration*

*Families and Households*

*Education*

*Work (Employment, Unemployment and Unpaid Activities)*

*Incomes*

*Housing*

*Electoral Profile - 2002 Boundaries*

**Community Profiles**

*Community Profiles* will be available for New Zealand, regional councils, territorial authorities and area units. These are intended to provide a broad range of useful data to a reasonably fine geographic level for a variety of users.

The product replaces the Standard Regional Tables of 1996 and the Regional Reports publications of 1991. The content of the *Community Profiles* will be based on these products to provide continuity.

A 'selected characteristics' table will provide a quick overview for a chosen geographic entity, while another 27 tables will cover a number of variables, including income, qualifications, household composition and family type.

*Community Profiles* will be accessible from the Statistics New Zealand website at no charge.

**Table building functionality**

Following the decision not to develop a fourth SuperMap product, and the emphasis on web-based dissemination, Statistics New Zealand has signed an agreement to utilise table building software as the means of providing users with access to a range of data similar to that previously available in the SuperMap products, via [www.stats.govt.nz](http://www.stats.govt.nz).

**Customised output**

For clients who find that the standard products available from Statistics New Zealand do not fit their requirements, customised output can provide the answer. This service, available through our Information Centre, allows a user to specify the variables required, and the area for which this data is to be provided.

**Other output**

In addition to these general products, a number of specialised outputs such as *Iwi Profiles*, *Pacific Peoples Profiles*, and an analytical series of publications, similar to the *New Zealand Now* series of 1991 and 1996, will draw upon data from the 2001 Census for much of their content.

## Chapter 9:

# Follow-up surveys

## Overview

Statistics New Zealand undertook a Post-Enumeration Survey (PES) and two special post-census surveys in 2001 following on from the 2001 Census. The PES was undertaken to ascertain the level of coverage achieved in the 2001 Census; in other words, how successful the census was in achieving the goal of counting all people and dwellings in New Zealand on 6 March 2001. The first of the special post-census surveys was the Survey on the Health of the Māori Language, sponsored by Te Puni Kōkiri. The interviewing for this survey took place in May and June 2001. The second was the Disability Survey, which ran from June to September 2001.

Post-census surveys are typically of a relatively small or dispersed population, and the sample for the survey is drawn using variables collected in the census. This method focuses survey resources and reduces the need for time-consuming and expensive screening for the target population. The population for the Māori Language Survey was people of the Māori ethnic group aged 15 years or older. The Disability Survey defined its sample using two census questions that allow respondents to report having 'activity limitations'. Activity limitation is defined as: 'Any self-perceived limitation in activity resulting from a long-term condition or health problem; lasting or expected to last six months or more and not completely eliminated by an assistive device.'

## Post-Enumeration Survey

The Post-Enumeration Survey (PES) was an important survey to check the enumeration processes of the census and the level of net undercount, or coverage, of the population. The PES was independent of the census, managed and run by a different group of Statistics New Zealand staff.

The United Nations (UN) publication *Principles and Recommendations for Population and Housing Censuses* states that a post-enumeration survey serves two principal purposes:

- to inform users about the accuracy attached to census figures, and
- to aid census officials in the improvement of subsequent censuses.

The New Zealand PES was conducted immediately after the census and followed the UN recommendations. Using a small sample of the population (approximately 11,000 households), members of the selected households were interviewed to see if they had been counted on

census night. Certain questions were asked which would help identify if any particular groups of people were undercounted or overcounted in the census. Participation in the PES, if selected, was compulsory under the Statistics Act 1975.

In 1996 the PES revealed that the 1996 Census had a net coverage of 98.8 percent.

For further information on the PES and how it relates to quality in the census, refer to Chapter 7, 'Quality'.

## Survey on the health of the Māori language

In 1999, the Government approved funds to be allocated to Te Puni Kōkiri for a major Māori language survey. The survey results will be used to develop policies and programmes for the Māori Language Strategy that the Government adopted in 1997. The overall aim of this strategy is to revitalise the Māori language, and its objectives for achieving this include:

- increasing the number of people who know the Māori language by increasing their opportunities to learn and use Māori, and
- improving people's proficiency levels in Māori.

Te Puni Kōkiri will use survey results to assess how well the Māori Language Strategy is working and to develop directions for the future. In particular, the Government invests in education and broadcasting to achieve the objectives of the strategy. The survey will provide information on government investment by showing how many Māori listen to Māori radio, watch Māori television programmes and study Māori language courses. The survey results will also show to what extent the strategy is working by providing estimates of the numbers of Māori who speak te reo at different proficiency levels. This will provide an indication of whether revitalisation is occurring evenly across the Māori population or whether some groups are benefiting more than others. It will help with decisions on whether to target programmes to particular groups or regions, and whether to develop new programmes. The information gathered in the survey will be used to establish the benchmarks against which Māori language revitalisation is to be measured over time.

A random sample was selected from those aged 15 years and over and who identified their ethnicity as Māori on their census forms. About 5,000 people were interviewed. Those selected to take part had the choice of an interview in either Māori or English. Interviewing was face to face in respondents' own homes.

The questions covered:

- respondents' experience of Māori language as a child within their home, eg which family members spoke to them in Māori
- how well respondents can speak, understand, read and write Māori language
- where (at home, at work, at school, on the marae, etc) people speak or hear Māori
- whether people listen to Māori radio or watch Māori television programmes and for how long
- what material written in Māori people read or see
- whether people write Māori language letters, emails or articles, etc
- what Māori language courses respondents have attended, and
- whether respondents' children attend kōhanga reo, or bilingual or immersion units at school.

Provisional results from the Māori Language Survey were released on 7 December 2001 by Statistics New Zealand. Te Puni Kōkiri followed this with their own release on the same day. Final results will be published in June 2002. Later, Te Puni Kōkiri will publish a comprehensive report on the status of the Māori language based on the survey results.

## Household disability survey

The key objectives of the 2001 Household Disability Survey were:

- To measure the prevalence of activity limitations among children, adults and older people at the national and regional levels; and Māori and Pacific peoples at the national level.
- To provide information on the nature, duration, severity and cause of activity limitations among the population with activity limitations.
- To obtain data on the socio-demographic characteristics of the population with activity limitations, including their age, sex, ethnicity, marital status, educational qualifications, labour force status, income, and household and family circumstances.

The secondary objectives were:

- To provide information on the types of activity limitation related expenses which are incurred by individuals with activity limitations and their families.

- To identify the current use of, and unmet needs for, technical and personal support services, both formal and informal and the reason for the need remaining unmet among the population with activity limitations.

The first part of the disability survey asked about activities that the respondent may or may not be able to do. People who have an activity limitation were then asked questions on how it affects their life. These questions covered:

- Education, housing, transport, employment, and assistance needed for everyday living, for example, household work or personal care.
- Special equipment or services used – for example, walking stick, guide dog, hearing aid.
- Support received from government agencies – for example, benefits, health cards.

Activity limitations for adults are classified as follows:

Physical – mobility  
agility

Sensory – hearing  
seeing

Psychiatric/Psychological

Intellectual

Other – speaking  
learning  
remembering  
other

A separate Disability Survey of Residential Facilities – not a post-census survey – was held in November 2001. The population for the residential survey were people aged 15 and over living in residential facilities such as retirement homes, psychiatric hospitals, and long-stay wards of hospitals. Results of the household and residential surveys combined are due in April 2002. Statistics New Zealand undertook very similar Disability Surveys in 1996 and 1997. Statistics New Zealand has published a report using the 1996/97 Disability Survey data called *Disability Counts* and this is available from the following website at:

[http://www.stats.govt.nz/domino/external/pasfull/PASfull.nsf/AllBooks/Disability+Counts~Reference+Reports+\(1998\)](http://www.stats.govt.nz/domino/external/pasfull/PASfull.nsf/AllBooks/Disability+Counts~Reference+Reports+(1998)).

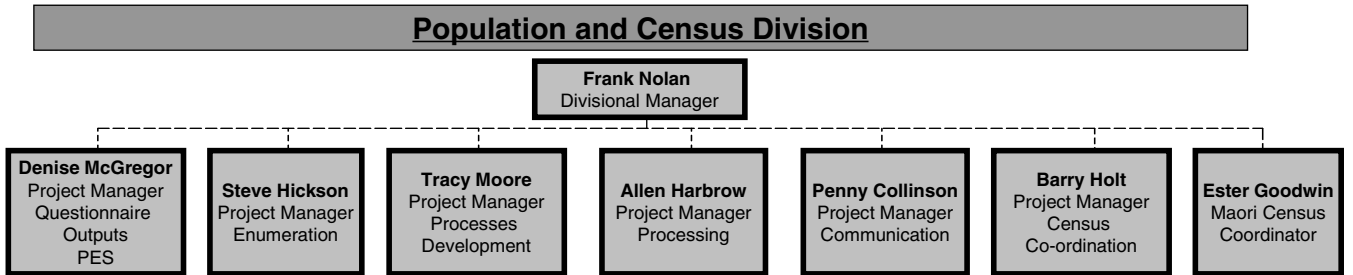
The contacts page contains a list of the tables in the report.

The Ministry of Health and the Health Funding Authority published the report *Disability in New Zealand: Overview of the 1996/97 Surveys* using data from the 1996/97 Disability Surveys. This is available from the following website at:

<http://www.moh.govt.nz/moh.nsf/c7ad5e032528c34c4c2566690076db9b/749faa67e948a0dd4c256695007374a0?OpenDocument>

## Appendix 1:

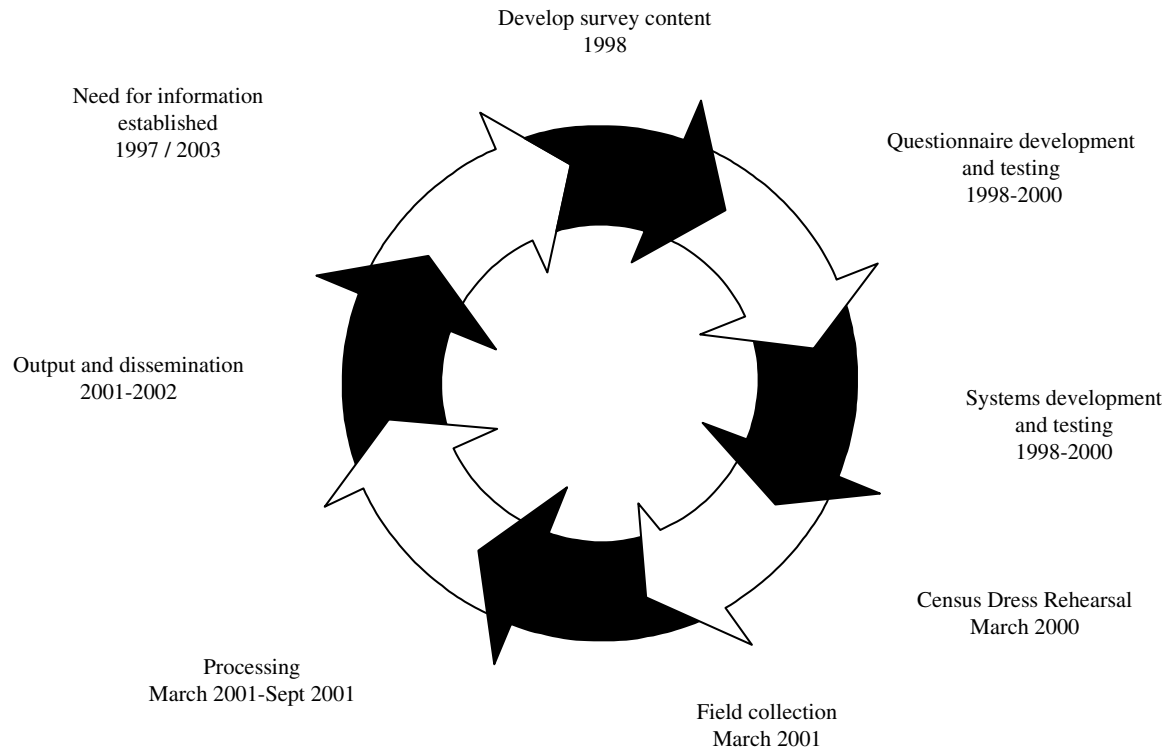
# Organisation of the Census Division







## Appendix 2: Census survey cycle





## Appendix 3:

# Statistics Act 1975, Part III

## PART III—CENSUS OF POPULATION AND DWELLINGS

### 22. Provisions to apply to census of population and dwellings—

The provisions of this Part of this Act shall apply with respect to the quinquennial census of population and dwellings, and to any statistical inquiry taken directly with and as a part of that census; and, with respect to any matter not provided for in this Part of this Act, the provisions in the other Parts of this Act relating to statistics generally shall, so far as they are applicable, apply with respect to that census and any such inquiry.

Cf. 1955, No. 45, s.20

### 23. Census of population and dwellings—

- (1) The census of population and dwellings of New Zealand shall be taken by the Department in the year 1976 and in every fifth year thereafter.
- (2) The day on which the census of population shall be taken and the time with reference to which the particulars shall relate shall be appointed by the Governor-General by Proclamation.
- (3) At a suitable time after the Proclamation made under subsection(2) of this section the Statistician shall publish, by advertisement in such newspapers as may appear to the Statistician to be sufficient for notifying the public of New Zealand, the date of the census, the place where advice and guidance related to the census may be sought, and the names and addresses of [census district supervisors] in the vicinity from whom schedules may be obtained if they have not been delivered.

Cf. 1955, No. 45, s.21

In subs. (3) the words in square brackets were substituted for the words “enumerators and sub-enumerators” by s.4 of the Statistics Amendment Act 1985.

### 24. Particulars to be collected at census—

- (1) At every census of population and dwellings particulars relating to all of the following matters shall be obtained from every occupier or person in charge of a dwelling:
  - (a) The name and address, sex, age, and ethnic origin of every occupant of the dwelling:
  - (b) Particulars of the dwelling as to location, number of rooms, ownership, and number of occupants on census night.
- (2) At any census of population and dwellings the Statistician may, if he considers it in the public interest so to do, obtain from every occupier or person in charge of a dwelling particulars relating to all or any of the following additional matters:
  - (a) The profession or occupation and industry in which employed, nationality and citizenship, health, marital condition, religion, birthplace, duration of residence in New Zealand, address where living at previous census or previous year, number of children, number of hours worked per week for wages or salary or financial reward, status in employment, name and address of employer, mode of transport to and from work, time taken to travel to work, income, address of usual residence, and service in the armed forces of every occupant of the dwelling:
  - (b) Particulars of the dwelling as to type and tenure of dwelling and nature of materials of structure, household amenities, rent paid, and details of any livestock:
  - (c) Any information relating to the kinds of statistics for which information may be required pursuant to section 4 of this Act or as may be prescribed by regulations under this Act.

Cf. 1955, No. 45, s.22

## 25. Duty of persons to obtain census schedule—

It shall be the duty of any person who, because of any omission by an employee of the Department or other cause, has failed to receive any schedule relating to the census of population and dwellings by personal delivery at his dwelling to obtain that schedule by application to the nearest [census district supervisor] or to the Statistician or to an employee of the Department and to retain any schedule until it is collected from him by the [census enumerator] for his district or in accordance with an arrangement of which he has been notified, and the fact that any schedule was not delivered at his dwelling shall be no defence in any prosecution against him under this Act for failure to fill in the schedule.

Cf. 1955, No. 45, s.23

The words in the first set of square brackets were substituted for the word “enumerator” by s.5 (a) of the Statistics Amendment Act 1985, and the words in the second set of square brackets were substituted for the word “sub-enumerator” by s.5 (b) of that Act.

## 26. Duty of occupier and other persons abiding in dwelling—

- (1) It shall be the duty of every occupier or person in charge of a dwelling to ensure that the particulars demanded in the schedules relating to any census of population and dwellings are furnished with respect to every person abiding in the dwelling of which he is the occupier or person in charge on the day of the census and who is alive at midnight at the end of that day, and who, not being already included in any other census schedule, arrived in that dwelling after that midnight and before midday on the day following.
- (2) If any person in respect of whom particulars are required to be furnished pursuant to subsection (1) of this section is not a member of the family of the occupier or person in charge of the dwelling, it shall be the duty of that person to furnish to the occupier or person in charge the particulars necessary for filling in any schedule or schedules, and to fill in any schedule or schedules personal to himself, and to hand the completed schedule or schedules to the occupier or person in charge:

Provided that any person over the age of 15 years may, if that person so wishes, enclose the completed personal schedule or schedules in an envelope endorsed with the census district number, the census sub-district number, the schedule number or numbers, and his name, and seal the envelope before delivery to the occupier or person in charge.

- (3) Every occupier or person in charge or [census enumerator] who opens any such envelope commits an offence against this Act:

Provided that it shall not be an offence for a [census enumerator] to open the envelope where these particulars have not been properly endorsed on the envelope and he has been unable after reasonable endeavours to have these particulars completed by the respondent.

- (4) Where a dwelling is occupied by 2 or more persons jointly, the duty imposed on the occupier or person in charge as to the furnishing of the particulars of the dwelling schedule for the census of population and dwellings shall lie upon the occupiers or persons in charge severally, save that the performance of the duty of the occupier or person in charge by one of the joint occupiers or persons in charge shall discharge the obligation of the other or others.

Cf. 1955, No. 45, s.24

In subs. (3) the words in the first and second sets of square brackets were in each case substituted for the word “sub-enumerator” by s.6 of the Statistics Amendment Act 1985.

## 27. Particulars of persons not abiding in any dwelling—

- (1) The Statistician shall obtain the required particulars in respect of persons not abiding in any dwelling on the night of the census of population and dwellings in such manner as he determines.
- (2) Every person who can be lawfully required to provide such information pursuant to this Part of this Act shall, on being required so to do, furnish to the best of his knowledge and belief the required particulars relating to persons who were not abiding in any dwelling on the night of the census of population and dwellings.

Cf. 1955, No. 45, s.25

## Appendix 4:

# Reports on content

As part of the process for determining the content of the 2001 Census, Statistics New Zealand produced two reports: *Preliminary Views on Content* and *Final Report on Content*. These reports can be found on the Statistics New Zealand website as follows:

<http://www.stats.govt.nz/domino/external/pasfull/pasfull.nsf/web/Census+2001+Census+2001+Preliminary+Views+on+Content+30+June+1998?open>

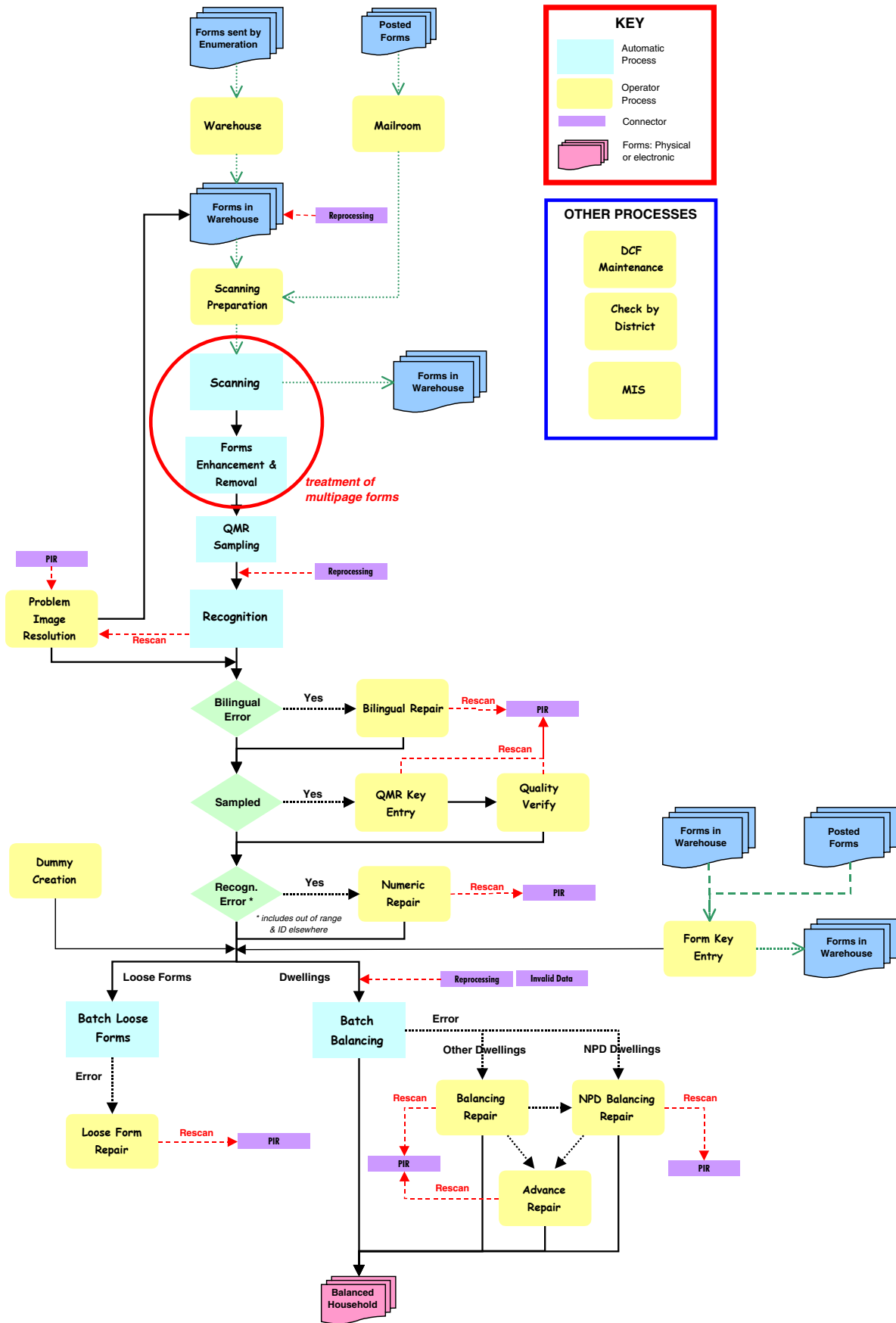
<http://www.stats.govt.nz/domino/external/pasfull/pasfull.nsf/web/Census+2001+2001+Census+of+Population+and+Dwellings+-+Final+Report+on+Content+16+October+1998?open>



***Appendix 5:***

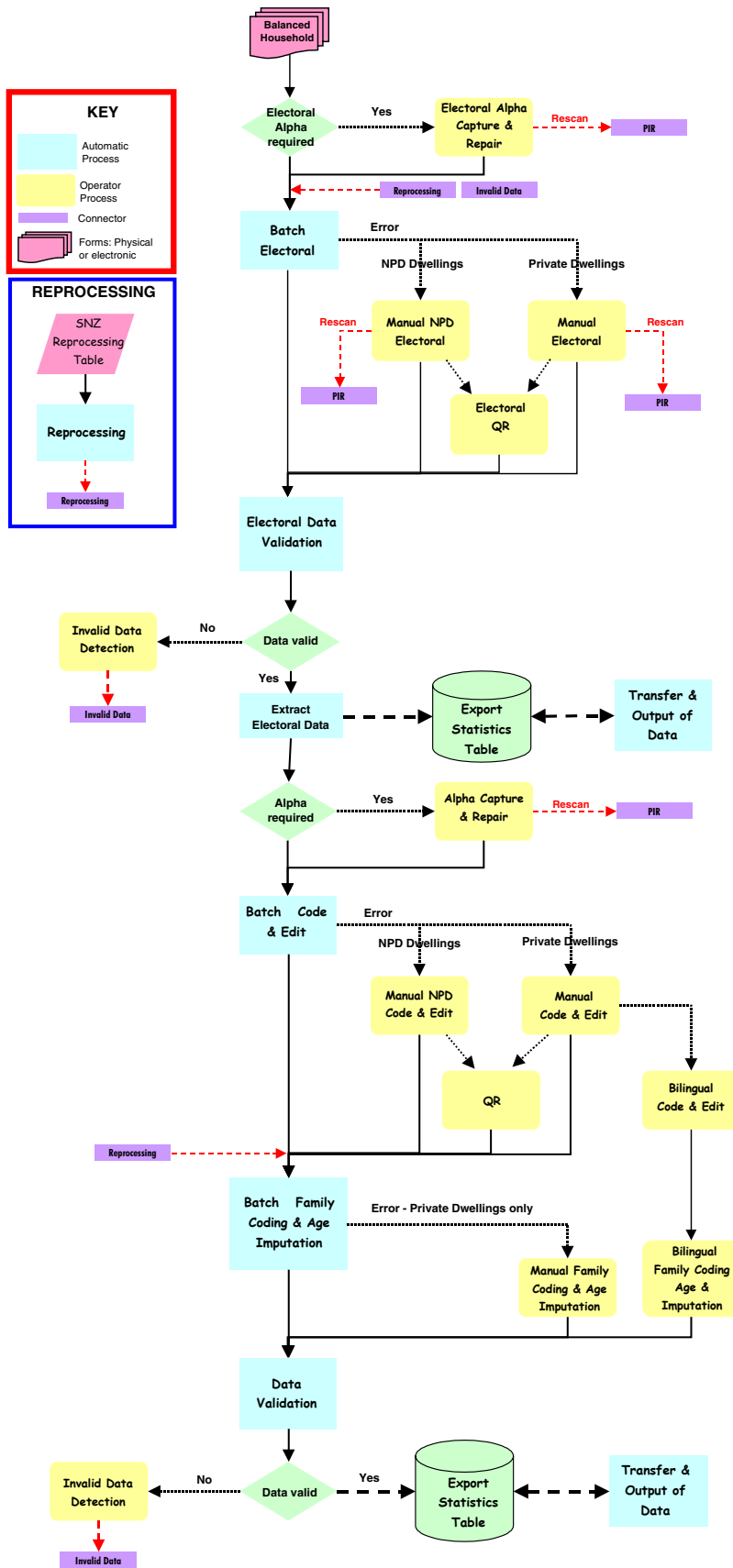
**Diagram of the processing system**

CENSUS 2001 BUSINESS REQUIREMENTS  
WORKFLOW - CAPTURE PHASE





CENSUS 2001 BUSINESS REQUIREMENTS  
WORKFLOW - CODING PHASE





## Appendix 6:

# Glossary of census processing terms

### Alpha capture/repair

Fast key entry phase by which either selected unrecognised alpha fields or alpha fields not put through recognition appeared for an operator to key enter.

### Balancing

Process where forms within a household were matched by their ID fields to ensure that the right number of forms existed.

### Batch code and edit

Automatic process where editing and coding was done on the household.

### Codefiles

A codefile is a comprehensive list of probable survey responses and the categories to which they are coded.

### Electoral phase

Mini code and edit system that allowed certain variables to be processed early for electoral purposes.

### Export

Automatic process which included data validation and final export of completed households to the Statistics New Zealand database.

### Family coding and age imputation

Operator phase where specialist operators resolved 'hard to code' family coding. Family edits and age imputation were carried out automatically where required.

### Fieldbook

A fieldbook is a document used by enumerators in the field to record the number of census forms delivered and collected from each address. Also recorded in the fieldbooks are any unoccupied dwellings and their unoccupancy status, whether the occupants are temporarily away, the dwelling is empty, or it is under construction.

### Form management

Warehouse operation where:

- wallets containing census forms were received from the field
- posted forms were received via the mailroom with relevant name and address information sent to the field via fax

- form preparation and checking prior to scanning was carried out
- wallets were stored for later use, and
- transcribed and rescanned forms were prepared.

### Manual code and edit

Operator phase where codes not assigned or edits that needed to be resolved were brought up for an operator to address.

### Numeric repair

Fast key entry phase where unrecognised, out of range numeric responses, and changes to the ID on the first page of the forms appeared for an operator to repair.

### Quality monitoring of recognition

Quality control of recognition was where a sample of images were selected for comparing recognition results with key entry to determine if the recognition process was working correctly. This indicated where action was required if recognition fell below a certain standard.

### Query resolution

Operator phase where specialist operators resolved 'hard to code' alpha questions which were sent by code and edit operators. This included bilingual responses.

### Recognition

Recognition was the computer process that matched the dark and light pixels in a certain response area of an image enhanced form to the closest character it could find in a certain character library, in other words, the computer 'read' written response areas on the image.

Recognition in the census processing system also referred to the process by which certain response areas on the image enhanced forms were put through either tick box, numeric or alpha recognition.

### Scanning

Process by which forms were scanned in various batch types, and image enhancement techniques applied.

### Substitute form

A substitute form can be either a substitute dwelling form or a substitute individual form.

Substitute dwelling forms are dwelling forms created by Statistics New Zealand where there is sufficient evidence that an occupied dwelling exists but for which Statistics New Zealand does not have a dwelling form.

Substitute individual forms are individual forms created by Statistics New Zealand where there is sufficient evidence that a person exists, but for whom Statistics New Zealand have no individual form.

Substitute forms are created to ensure every person and every dwelling is counted in the census.

### **Validation of loose forms**

Process by which loose form IDs were checked. A loose form was an individual form that had not been linked to a household.

## ***Appendix 7:***

# **Historical summary of the scope of the census**

The following is a brief summary of the personal and dwelling questions that have been asked in European, Māori and general New Zealand censuses from 1916 to 2001. The table also has a column for pre-1916 censuses. When using the list it is important

to remember that the same personal questionnaire has only been issued to both Māori and others since 1951. When referring to earlier years, unless otherwise stated, the questions applied to both the Māori and European questionnaires.

Introduction to the Census

Historical Summary of the Scope of the Census																		
INDIVIDUAL FORM	pre-1916	1916	1921	1926	1936	1945	1951	1956	1961	1966	1971	1976	1981	1986	1991	1996	2001	Comments
Question																		
Address on census night	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Age	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1851-1911)
Children																		Resident females 15+ (1981); voluntary (1996)
- born alive													*					(pre-1916: 1911), only married women, only existing marriages, E (1911-1921); E, MCI (1945); all marriages (1945, 1971-1976)
- deceased	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1911), only married women, E
- dependant (under 16)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	E (pre-1951)
- still living	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1911), only married women, E
Cigarette smoking													*	*	*	*	15+	
Country of birth	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1851-1911), E (pre-1951)
- of father																		E
Descent																		
- Māori descent																		Included in 1976 in response to Māori Affairs Act 1974, Electoral Act 1974 and Electoral Act 1975 changes of definition of Māori; included in 1991-2001 when ethnic group rather than ethnic origin question was asked.
- race/ethnic origin	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1874-1911), E (pre-1951)
Education																		
- courses for personal interest												*						15+
- duration and level										*	*	*	*	*	*	*	*	15+
- establishments attended in past									*	*	*	*	*	*	*	*	*	15+
- establishments being attended	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1851-1911), E (pre-1916: 1874-1911), E (pre-1951)
- qualifications																		
- study/training course attendance (see also Unpaid work/activities)																		
- Sunday schooling	*															*		(pre-1916: 1858-1911), E
Employment																		
- address of workplace											*	*	*	*	*	*	*	15+
- hours worked										*	*	*	*	*	*	*	*	E (1949); 15+ (1971-1981); distinction between first, second and other jobs (1981-1996)
- industry	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1851-1911), E (pre-1951), 15+ (1971-2001)
- intended industry in peace-time																		E, Armed forces
- intended occupation in peace-time																		E, Armed forces or 'manpowered' individuals only
- means of travel to work												*	*	*	*	*	*	15+
- name of employer									*	*	*	*	*	*	*	*	*	E (pre-1951), 15+ (1971-1986)
- occupation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1874-1911), E (pre-1921), 15+ (1971-1986)
- postponement of retirement																		E
- status in employment	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(pre-1916: 1891-1911), E (pre-1951), 15+ (1971-2001)
- time taken to travel to work									*	*	*	*	*	*	*	*	*	E (1949), 15+ (1971)
- working time lost through other causes																		E
- working time lost through sickness/injury																		E
Ethnic group															*	*	*	
Health																		
- disability																		
- limitations due to health problems																	*	Health problem or condition lasting six months or more
- sugar diabetes											*	*	*	*	*	*	*	Treatment methods used
Income																		
- income from Social Security benefits													*	*	*	*	*	15+
- income group						*	*	*	*	*	*	*	*	*	*	*	*	E (pre-1951); from 1981 15+
- income support payments															*	*	*	15+
- sources of															*	*	*	15+

Introduction to the Census

Historical Summary of the Scope of the Census																		
Question	pre-1916	1916	1921	1926	1936	1945	1951	1956	1961	1966	1971	1976	1981	1986	1991	1996	2001	Comments
<b>INDIVIDUAL FORM</b>																		
Infirmities	*	*																(pre-1916: 1851-1911), E Asked in 1991 for the first time since 1901
Iwi	*																	E
Languages																		(pre-1916: 1851-1911), E
Life insurance sum assured			*															E
Literacy		*	*															(pre-1916: 1851-1911), E
Marital status		*	*															(pre-1916: 1911); E, only married women (pre-1916: 1851-1911); E (pre-1926); 15+ (1851-1916, 1971-1986, 2001); 16+ (1921-1966)
- duration of current marriage		*	*															MCI
- legal marital status		*	*															(pre-1916: 1851-1911)
- social marital status		*	*															(pre-1916: 1901-1911), E, British subjects only (pre-1921), all Europeans (1921)
- whether married to a European		*	*															(pre-1916: 1874-1911), E, actual nationality asked in 1921
Name (full name)		*	*															E
Nationality		*	*															(pre-1916: 1851-1911)
- how acquired		*	*															(pre-1916: 1901-1911), E, British subjects only (pre-1921), all Europeans (1921)
- whether British or foreign		*	*															(pre-1916: 1874-1911), E, actual nationality asked in 1921
Orphanhood		*	*															E
Relationship to occupier or person in charge of the dwelling		*	*															(pre-1916: 1851-1911), E (pre-1945)
Relationship to other members of the household		*	*															(pre-1916: 1851-1911), E (pre-1926), voluntary
Religion		*	*															(pre-1916: 1851-1911)
Sex		*	*															(pre-1916: 1851-1911)
Tenure holder																		
Unemployment																		
- availability for work			*															E
- duration of		*	*															(pre-1916: 1851, 1861-1911), E
- infirmities causing inability to work		*	*															(pre-1916: 1896-1911), E
- job search methods		*	*															Includes methods used to look for work
- persons unemployed		*	*															E
- seeking work in last four weeks		*	*															15+; study/training course attendance asked as an unpaid activity (1986, 1991 and 2001)
- whether registered																		
Unpaid work / activities (see also Education - study/training course attendance)																		
Usual residential address																		
- no. of years lived at			*															E (1936, 1945)
- usual address			*															
- one year ago			*															
- five years ago			*															
War services																		
- forces in which served			*															E (1936)
- wars in which served			*															E (1936); 15+ (1971)
- whether receiving war pension			*															E
Years since arrival in NZ/years lived in NZ		*	*															(pre-1916: 1851-1858, 1901-1911), E (pre-1951)
<b>Abbreviations:</b>																		
E General European Census only																		
15+ Asked of those 15 years of age and older																		
16+ Asked of those 16 years of age and older																		
MCI Asked of Māori living in North Island or Chatham Islands only																		

Introduction to the Census

Historical Summary of the Scope of the Census																		
DWELLING FORM	pre-1916	1916	1921	1926	1936	1945	1951	1956	1961	1966	1971	1976	1981	1986	1991	1996	2001	Comments
Question																		
Absentees																		
- details of each absentee											*	*	*	*	*	*	*	P, including full name, age, sex, relationship to person filling out dwelling form, whether in New Zealand on census night and, if not, how long away from New Zealand (2001)
- number of											*	*	*	*	*	*	*	P, E, number of each sex (E 1926)
Address of dwelling																		
Amenities (see also Telephone, Telecommunication systems)																		
- bath or shower						*	*	*	*	*	*	*	*	*	*	*	*	
- bathroom																		
- clothes washing machine																		
- cooking facilities							*	*	*	*	*	*	*	*	*	*	*	Census of Māori (1945); for flats only (1951)
- cooking, means of																		Electric (1956-1971); Fully automatic (1976-1981); Not fully automatic (1981)
- deep freeze																		For flats only
- electric clothes dryer																		E (1945)
- electric light							*	*	*	*	*	*	*	*	*	*	*	Census of Māori (1945)
- electrical supply, source of																		E
- flush toilet							*	*	*	*	*	*	*	*	*	*	*	For flats only (1951) ('toilet' not 'flush toilet')
- motor powered lawn mower											*	*	*	*	*	*	*	
- radio																		
- refrigerator																		
- telephone/access to telecommunication systems																		
- television											*	*	*	*	*	*	*	P; New question in 2001 asked whether or not had access to telephone/fax/internet; access to telephone only had been asked 1966-1981, 1996
Water supply										*	*	*	*	*	*	*	*	Asked whether colour or black and white (1976-1981)
- hot-water service																		
- piped water supply							*	*	*	*	*	*	*	*	*	*	*	Census of Māori (1945)
- rain-water tanks							*	*	*	*	*	*	*	*	*	*	*	Census of Māori
- water supply, principal source of										*	*	*	*	*	*	*	*	E
Bees										*	*	*	*	*	*	*	*	
Bicycles/power cycles																		
Caravans																		P
Date dwelling constructed										*								
Distance to nearest (see also Post Office)																		
- public primary school							*	*	*	*	*	*	*	*	*	*	*	E
- shopping facilities																		E
- transport services							*	*	*	*	*	*	*	*	*	*	*	E
Domestic servants, number of																		
Flat built as such													*	*	*	*	*	(pre-1916) 1901, E
Heat insulation (ceiling and outer walls)																		E (1926)
Heating of dwelling																		P
- principal means of																		
- source of energy for										*	*	*	*	*	*	*	*	P (1986-2001)
- water heating of main supply																		
- water heating of secondary supply																		



Historical Summary of the Scope of the Census																		
DWELLING FORM	pre-1916	1916	1921	1926	1936	1945	1951	1956	1961	1966	1971	1976	1981	1986	1991	1996	2001	Comments
Question																		
Holiday residence, address of											*							P (1971)
Home vegetable production							*	*	*	*	*	*	*					P (1971)
Material of outer walls	*	*	*	*	*	*	*	*	*	*	*	*	*					(pre-1916), 1851-1911; E (pre-1951); P (1976-1981)
Material of roof											*	*	*					P (1976-1981)
Name of non-private dwelling				*	*	*	*	*	*	*	*	*	*					E (1926-1936)
Name of occupier or person filling out dwelling form							*	*	*	*	*	*	*					E (1945)
Number of bedrooms											*	*	*					
- guest beds in non private dwelling											*	*	*					P (1981-2001)
- in private dwellings											*	*	*					E (pre-1951)
Number of rooms	*	*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1951)
- in non-private dwellings	*	*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1951)
- in private dwellings	*	*	*	*	*	*	*	*	*	*	*	*	*				*	Part of 'Type of dwelling' question in 2001
Number of storeys																		
Occupants																		
- names																		
- number of	*	*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1951)
- relationship to person filling out dwelling form											*	*	*					E (pre-1951)
Permanent or temporary dwelling				*														
Pleasure boats											*	*	*					E (1926)
Post office																		P (1981)
- distance to nearest post office		*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1951); rural areas only
- name of nearest post office		*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1951); rural areas only
Poultry	*	*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1945); P (1971)
Rent																		Rented or leased dwellings only
- amount paid	*	*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1951); P (1911-2001)
- from whom rented																		P
- furnished / unfurnished																		E (1936); P (1971-1986)
Tenure	*	*	*	*	*	*	*	*	*	*	*	*	*					E (pre-1926); P (1971-2001)
Type of dwelling - non-private																		E (pre-1926); not asked in the 1996 questionnaire - the enumerator coded it
Type of dwelling - private	*	*	*	*	*	*	*	*	*	*	*	*	*					Not asked in the 1996 questionnaire - the enumerator coded it
Vehicles available for use																		
- motor cars											*	*	*					P
- motor cycles or scooters													*					P
<b>Abbreviations:</b>																		
E																		General European Census only
P																		Private dwellings only



## Appendix 8:

# New Zealand census dates

The following table gives details of the dates of New Zealand Censuses of Population and Dwellings, together with the lengths of the intervening periods.

Date of Census <sup>1</sup>	Period Since Previous Census (Years)	
November-December	1851	-
Friday 24 December	1858	2 <sup>2</sup>
Monday 16 December	1861	3
Thursday 1 December	1864	3
Thursday 19 December	1867	3
Monday 27 February	1871	3
Sunday 1 March	1874	3
Sunday 3 March	1878	4
Sunday 3 April	1881	3
Sunday 28 March	1886	5
Sunday 5 April	1891	5
Sunday 12 April	1896	5
Sunday 31 March	1901	5
Sunday 29 April	1906	5
Sunday 2 April	1911	5
Sunday 15 October	1916	5.5
Sunday 17 April	1921	4.5
Tuesday 20 April	1926	5
Tuesday 24 March	1936	10
Tuesday 25 September	1945	9.5
Tuesday 17 April	1951	5.5
Tuesday 17 April	1956	5
Tuesday 18 April	1961	5
Tuesday 22 March	1966	5
Tuesday 23 March	1971	5
Tuesday 23 March	1976	5
Tuesday 24 March	1981	5
Tuesday 4 March	1986	5
Tuesday 5 March	1991	5
Tuesday 5 March	1996	5
Tuesday 6 March	2001	5

<sup>1</sup> Statistics New Zealand (1997). *An Introduction to the Census*, Wellington, p 111.

<sup>2</sup> Period since incomplete enumeration of March 1857.

In the interests of uniformity a Census Act was passed in 1858 which repealed the 1851 Ordinance and instituted three-yearly general censuses. The first was taken in December 1858 and the series continued up to and including the census of 1874. The abolition of the provinces in 1876 made new legislation necessary, and a Census Act passed in 1877 provided for general censuses to be taken in 1878, 1881 and every fifth year from then on. The 1931 Census was abandoned under direction of the Census Postponement Act 1931 because of the depressed state of the economy, and the census due to be taken in 1941 (during World War II) was

postponed until 1945, the census due in 1946 was not held.

It had become customary to hold the census in the autumn but in 1945 this sequence was broken. The Labour Government was anxious to introduce legislation abolishing the 'country quota' which had existed previously. Under this system a loading of 20 percent was added to rural populations which meant that there were more country electorates, in relation to population, than urban. Government wished to have the redefinition of electorates available in time for the election in 1946, and so advanced the date of the census to September 1945.