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Tatauranga Aotearoa

Deriving the 2018 Māori descent electoral population

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Stats NZ Tatauranga Aotearoa
Wellington, New Zealand

Contact
Stats NZ Information Centre: info@stats.govt.nz
Phone toll-free 0508 525 525
Phone international +64 4 931 4600

www.stats.govt.nz

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Purpose and summary

Purpose

Deriving the 2018 Māori descent electoral population describes the methodology used in the 2018 Census to derive Māori descent for electoral purposes and assesses its quality.

Summary of key points

Deriving Māori descent for all residents enumerated in the census is necessary to ensure fairness of representation in determination of New Zealand's electoral districts.

For the 2018 Census output, we updated the methodology from that developed in 1996, using data sources and methodology not available in previous censuses. This marks a shift from methods based purely on statistical imputation to an approach that includes a number of derivation methods in addition to statistical imputation.

The effect is an increase in the proportion of those allocated to Māori descent from 17.8 percent in 2013 to 19.1 percent of the total population in 2018. The new approach used additional high-quality data sources, namely from the 2013 Census and from birth registrations. The results are generally consistent with other sources of information, given the known higher level of undercount for Māori.

The new methodology provides the basis for high-quality outputs for the Māori descent population needed for New Zealand's electoral calculations.

Deriving Māori descent for all residents

We derive Māori descent for all residents enumerated in the census to ensure fairness of representation in determination of New Zealand's electoral districts.

The Government Statistician is obliged under the Electoral Act 1993 to calculate the two electoral populations, General and Māori, based on the census usually resident total and Māori descent population counts, and on the state of the electoral rolls at the end of the Māori Electoral Option held after the census. These populations are used to calculate the number of electoral districts allocated to the Māori electoral population and the North Island General electoral population, based on the number of South Island General electoral districts being fixed at 16. The electoral populations are also used to determine new electoral boundaries for all New Zealand electorates (Westbrooke & Ryan, 2000).

The quality and transparency of Stats NZ's methodology for electoral population calculations is of critical importance. There is significant and widespread public interest in the electoral boundary revision process, especially in the calculation of the number of electoral districts.

The methodology needs to create an accurate Māori descent population at the geographic levels required under the Electoral Act 1993. It needs to be soundly based, and able to be implemented readily in a short time.

Methodology for previous censuses

Following legal advice, the Government Statistician decided for the 1996 and following censuses that those not answering **Yes** or **No** to the question on Māori descent should be allocated to one of these two categories for electoral purposes. Previously those not answering **Yes** or **No** were all effectively treated as answering **No.**

Prior to 2018, Māori descent was imputed separately from census processing, in order to derive electoral populations exclusively for electoral purposes.

We derived the Māori descent electoral population in the 2013 Census using the methodology we applied to the previous three censuses (1996, 2001, and 2006). If respondents didn't answer either **Yes** or **No***,* we allocated Māori descent status as outlined in Westbrooke and Jones (2000). In summary, this involved analysing other variables in the census to identify those most closely associated with Māori descent. These variables were: Māori descent composition of entire household, iwi, ethnicity, age group, and island. Within groups of records based on the selected variables, we assigned imputed Māori descent electoral randomly to each record based on the proportion of **Yes** versus **No** responses in that group.

Changes in methodology

Early in the planning of the 2018 Census, we decided to:

- integrate this process into main census systems
- take advantage of the newly developed ability to use additional information from sources outside the 2018 Census itself to provide information where responses on particular questions were missing.

Investigations in the Census Transformation programme (Bycroft et al, 2016) found that information on Māori descent could be provided in future censuses through linked administrative data sources especially high-quality birth registration data available from 1998 and on.

Māori descent electoral derivation in 2018 Census

Methods

We used the following steps for each record (whether sourced from 2018 Census response or admin enumeration (Stats NZ, 2019b), until we obtained a **Yes** or **No** for Māori descent:

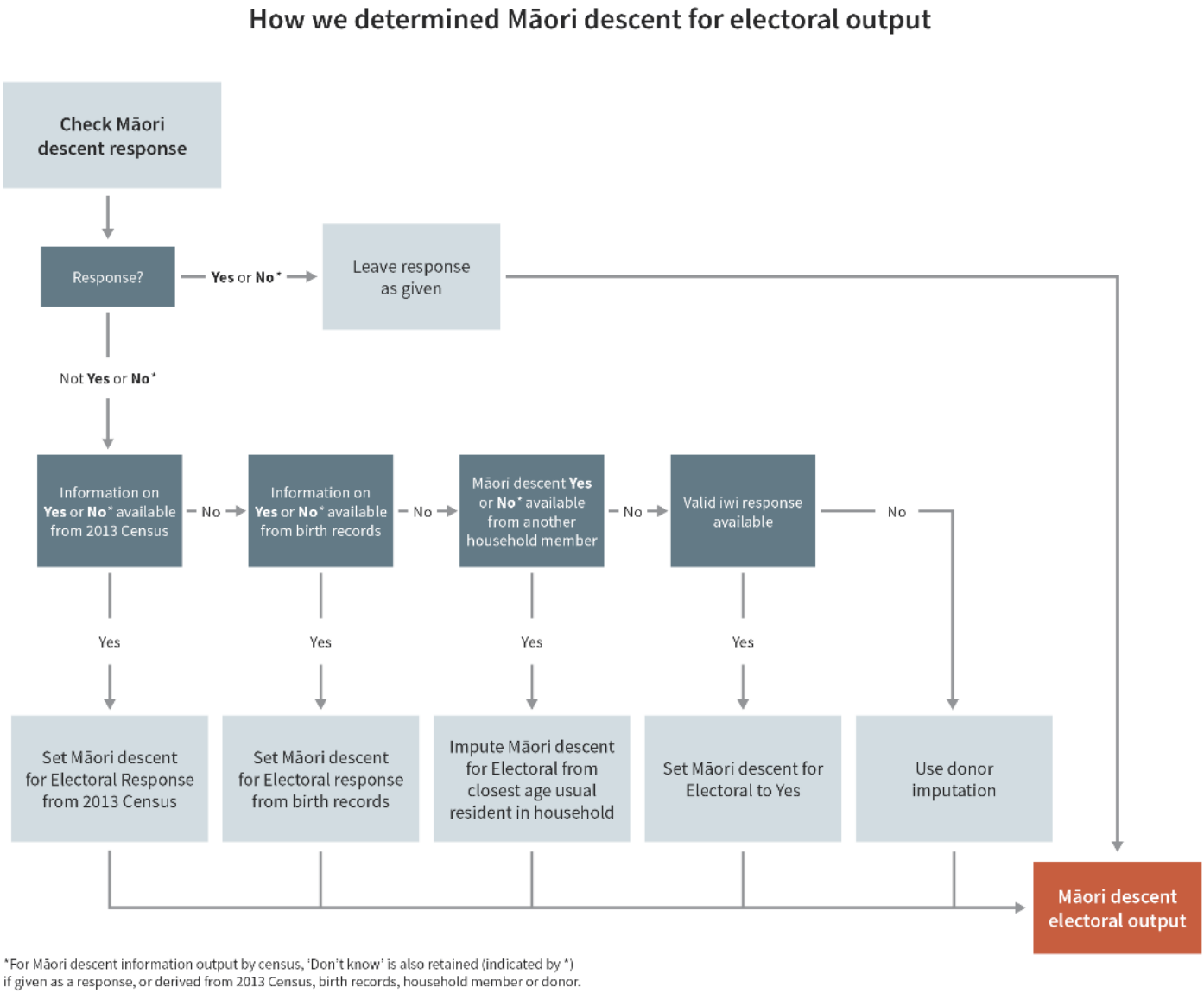
1. Start with the respondent's actual response.
2. **If response for Māori descent is not 'Yes' or 'No'** use:
    a. 2013 Census as first priority
    b. DIA birth records as second priority.
3. **If response for Māori descent is still not 'Yes' or 'No'**, use 'within household donor' imputation. Find the person of closest age in the usual residence and copy their Māori descent response as long as the response is a **Yes** or **No** value.
4. **If response for Māori descent is still not 'Yes' or 'No'**, use 2018 Census iwi responses. If there is a valid iwi response in 2018 Census then set Māori descent to **Yes**.

If Māori descent remains as missing or as **Don't Know, Refused to Answer, Response Unidentifiable, Response Outside Scope,** or **Not Stated** then CANCEIS (the CANadian Census Edit and Imputation System) donor imputation was used to set a value of **Yes** or **No.** Figure 1 illustrates the flow logic of this process.

CANCEIS uses Nearest-neighbour Imputation Methodology (NIM), which matches people based on available information (eg they have the same age, sex, and live in the same area). For a person without a 'Yes' or 'No' for Māori descent, it imputes the values from a matching donor (eg copying their Māori descent response of 'Yes' or 'No').

Donor imputation in CANCEIS occurs in modules, and Māori descent was imputed in a module that included imputation of ethnicity, Māori descent, language, religion, and study related variables. The matching variables used to select a donor were: age, sex, usual residence variables, ethnicity, Māori descent, study related variables, and birthplace. These variables differ from those used for imputation of Māori descent in the 2013 Census as the predictor variables for 2018 Census were selected for the entire module, not just Māori descent.

Figure 1



*For Māori descent information output by census, 'Don't know' is also retained (indicated by *) if given as a response, or derived from 2013 Census, birth records, household member or donor.

Māori descent derivation for electoral and census outputs

In previous censuses, deriving Māori descent beyond those answering **Yes** or **No** was only used for electoral purposes. In contrast, for the 2018 Census, we integrated the derivations for both electoral and census outputs. The only difference is that **Don't Know** is a valid response for census outputs, as for statistical purposes it is a valid response to the Māori descent question.

Figure 1 shows where this difference fits into the logic of the derivation, and * indicates the points where the derivations differ for electoral and census outputs. For electoral purposes, it is essential to allocate **all** respondents to **Yes** or **No**, as otherwise every response that is not **Yes** is effectively assigned to be **No***,* as was the case in electoral calculations prior to 1996.

See Stats NZ (in press), for additional information on Māori descent derivation for census outputs.

Results

The 2018 Māori descent population is 896,567, 19.1 percent of the total usually resident population (table 1). Of this total population, only 80,000 were obtained through statistical imputation, a figure similar to the 87,000 people with Māori descent imputed in the 2013 Census.

It is notable that the additional sources of information on Māori descent were proportionately higher in Māori descent than the 2018 Census responses, with almost one in three records contributed from 2013 Census having Māori descent, and over half of the records from birth registration. This highlights that the Māori descent population tends to be over-represented amongst people who do not provide a response.

Table 1

Sources of 2018 Māori descent electoral population counts

	2018 Census response	Historic (2013 Census)	Admin data	Imputation[1]	Total
	Māori descent				
(number)	625,600	134,300	56,600	80,000	896,600[2]
(% of contribution)	69.8	15.0	6.3	8.9	100
	No Māori descent				
(number)	3,193,600	293,900	56,000	259,800	3,803,200
(% of contribution)	84.0	7.7	1.5	6.8	100
	Māori descent as percentage for this source				
	16.4%	31.4%	50.3%	23.5%	19.1%

1. Imputation refers to all steps after birth records in the Māori descent derivation logic flowchart (see figure 1 above).
2. For illustrative purposes the Māori descent electoral population has been rounded to the nearest 100, as detailed in Stats NZ (2019c) this figure is 896,567.

Note: Counts are rounded to 100**.**
Source: Stats NZ

Assessing quality

In assessing the quality of the derivation, it is important to note that

- New Zealand and each Island (primarily North and South, but also the Chathams) are the levels of aggregration required for the electoral Māori descent population, as these are used for determining the number of Māori and North Island electorates.
- There is a 5 percent tolerance from quota (average population) at electorate level, within each electoral population, plus there can be substantial differences between the quota for each electoral population (Māori, and North or South Island General).

Checking and assessment in the census process

Derivation and imputation were integrated into the main census processing system. Internal validation was carried out as part of standard census approaches. We checked coding and outputs, as well as checks of the census cultural imputation module of which Māori descent was a component. The Census 2018 information by variable and quality: Māori descent – electoral (Stats NZ, 2019a) describes the overall quality rating as 'High'.

Validating the results for 2018

Comparing features of the 2018 results with previous results is complicated by the changes in both the Māori descent derivation and the sources used for the base census population. However, the following comparisons help isolate the composition of the change.

Comparison with previous method applied to 2018 data

The 2018 Census gave a substantially higher proportion of the population having Māori descent than in 2013 (19.1 percent for electoral, compared with 17.8 percent in 2013.) Table 2 shows counts based on the new method, compared with counts based on using the 2013 method applied with and without additional information (2013 Census responses, birth registrations).

Table 2

Derivation methods for Māori descent electoral applied to 2018 Census data			
Method		Māori descent electoral count	Percent of total population
Use only the information in 2018 census form responses for Māori descent	Impute all remaining using 2013 method	819,600	17.44
Where available, add information from 2013 Census and birth registrations to derive Māori descent	Impute remaining using 2013 method	895,300	19.05
	Impute remaining using 2018 method	896,600	19.08
Note: Counts are rounded to 100. **Source**: Stats NZ			

Overwhelmingly, the source of the higher proportion of Māori descent using the new method is the information from 2013 Census responses and birth registrations (see table 2). Once this additional information is applied, it makes negligible difference whether the 2013 or 2018 method is used to impute the remainder.

The method used from 1996 to 2013 assumed that those without a **Yes** or **No** response had similar probability of having Māori descent to those who shared other similar characteristics and had given a clear response. However, the information provided in table 2 shows that using the 2013 method and only the 2018 responses for Māori descent adds 194,600 (819,600 – 625,000), while table 1 illustrates that 190,000 (134,000 + 56,000) people have been located with descent from other sources. This suggests that those not having a **Yes** or **No** response are more likely to have Māori descent.

This result is supported by analysis by year of birth of 2018 counts before and after the addition of Māori descent derived from other sources, and comparison with 2006 and 2013 Census counts by year of birth (Stats NZ, 2019d). There is substantial degree of consistency in the increase above census responses across years of birth, as the source of the increase transitions from the high-quality birth data (Bycroft et al, 2016) to an increasing proportion of information from the 2013 Census file.

The relative increase in Māori descent population due to inclusion of quality additional information is consistent with the information known from the 2013 post-enumeration survey, where the census undercount of the Māori ethnic group was estimated at 6.1 percent, compared with 1.9 percent for people of European ethnicity.

Comparisons with other estimates at the time of the 2018 Census

There is no benchmark that derived descent populations can be compared to. All methods have potential weaknesses, however, by comparing the methods, we found consistencies between different sources and identified substantial issues or problems from inconsistencies.

Two alternative estimates are available – one based on the Integrated Data Infrastructure (IDI), the other on the estimated resident population (ERP) based on demographic accounting (Bycroft et al,

2016). The Māori descent populations by North and South islands are around 6 percent higher than the ERP estimates and 9 percent higher than IDI estimates. Much of this may be attributable to effects of undercount of Māori in the past.

Further evaluation of these differences, especially by year of birth, could increase understanding of the counts of the Māori descent population, and potentially contribute to gaining further improvements in quality.

Comparisons with previous censuses

The Māori descent population for electoral calculations as a proportion of the total population varied between 17.4 and 18.0 percent from 1996 to 2013, all using the 1996 imputation methodology (see table 3). The proportion has increased to 19.1 percent in 2018. This is overwhelmingly due to the use of additional information from 2013 Census and births registrations to allocate Māori descent instead of the 1996 to 2013 approach, which used the characteristics of the responding population to represent the non-responding population, through imputation.

Table 3

Māori descent electoral populations and total usually resident populations, 1996–2018

	Census 1996	Census 2001	Census 2006	Census 2013	Census 2018
Census total usually resident population	3,618,302	3,737,579	4,027,947	4,242,049	4,699,755
Māori descent electoral usually resident population	628,429	671,293	721,431	755,598	896,567
Māori descent electoral population as percentage of total Census population	17.4	18.0	17.9	17.8	19.1

Source: Stats NZ

Overall assessment

The absence of definitive benchmarks means that the quality of the Māori descent estimates cannot be evaluated by direct comparison. Consequently, quality has to be considered by examining the features and potential of the methodology. A general principle is that derivation of missing items in records in a survey or census is best based on using information derived from suitable sources as close as possible to the target.

The methodology we used from 1996 to 2013 was restricted to imputation using information available from the same census enumeration. The 2018 approach used additional high-quality data sources, primarily from the 2013 Census and from birth registrations, to derive Māori descent more directly. These contribute high proportions of Māori descent to substantial groups of records,

and so account for most of the increase in those Māori descent as a proportion of the overall population. The results are generally consistent with other sources of information, given the known higher level of undercount for Māori in previous censuses.

The new methodology implemented in 2018 provides the basis for high quality outputs for the Māori descent population needed for New Zealand's electoral calculations.

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