ABOUT MORTALITY DATA FOR NEW ZEALAND NON-MĀORI

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Important note: Due to recently discovered numerous inconsistencies in the historical data for Non-Māori, we restricted previously published series of Non-Māori data to the period 1901 onwards (for more details see the *Background and Documentation* file for New Zealand).

The Non-Māori population is a subgroup of the New Zealand population (see the *Background and Documentation* file for New Zealand for more details). Due to very serious deficiencies in the death data before 1901, the series of Non-Māori mortality estimates begin in the year 1901. However, the HMD estimates for Non-Māori for the periods 1901-1921 and, again, 1939-1947 should be used with much caution (see the section on 'Data Quality Issues' below).

The first set of problems relates to the historical data (prior to 1901). The following data quality problems are summarized below (see the *Background and Documentation* file for New Zealand for more details):

1. Notable undercount of neonatal deaths
2. Undercount of deaths occurring among Non-Māori living among Māori
3. Misclassification of ethnicity in census, birth, and death data
4. Very implausibly low mortality rates at old ages
5. Population censuses affected by undercount and age misreporting problems
6. Highly volatile in- and out-migration patterns during inter-censal periods
7. Exclusion of war-related deaths and military population (during the Boer war in 1899-1902)

Some specific problems relate to Non-Māori old age mortality estimates before 1901. Prior to 1901, our estimated death rates at older ages are implausibly low, and consequently, we get implausibly high estimates of life expectancy for those surviving to those older ages. For example, among non-Māori females in 1877, our estimate of e_{80} is 14.4 years. Life expectancies in 1881 and 1891 published by Preston, Keyftiz, and Schoen (1972) also show large discrepancies at advanced ages (see Table 1).

Table 1. Life expectancy in New Zealand (Non-Māori) in 1881, 1891, and 1901

Year	Age	Preston et al. (1972)		HMD		Difference	
		Males	Females	Males	Females	Males	Females
1881	0	53.34	56.80	53.87	57.33	0.54	0.53
	30	36.50	38.90	37.21	39.45	0.70	0.56
	60	15.88	17.00	16.88	17.69	1.00	0.69
	80	6.14	6.19	8.90	8.11	2.76	1.92

1891	0	54.50	57.73	54.87	57.65	0.37	-0.08
	30	36.91	38.91	37.11	38.61	0.20	-0.30
	60	14.51	16.86	14.79	16.37	0.28	-0.49
	80	6.22	10.86	7.05	7.00	0.84	-3.86

These discrepancies result from the fact that the original raw data for this historical period are available only in an aggregate format (i.e., five-year age groups with an open age interval at 80+), and also that there are very few deaths at very old ages. For example, among females aged 80+, there were only 16 deaths in 1877 and 29 deaths in 1878. Unfortunately, the application of the current Human Mortality Database (HMD) procedure for splitting deaths in open age intervals combined with the other HMD methods for estimating the mortality surface produces implausible estimates of old age mortality estimates for this particular period (up to 1901).

For small populations, the number of deaths at advanced ages is likely to be small and highly variable, particularly during early historical periods. Large fluctuations in death counts for the open age interval create several problems for estimating mortality using the standard HMD methods. The nature of these problems can be described in more detail as follows. First, the annual number of deaths for the open age interval 80+ tends to be unexpectedly low for some years. Second, as a consequence of applying the extinct cohort method to estimate population size at ages 80+, small numbers of deaths[1] during some years combined with larger numbers of deaths in subsequent years lead to an overestimation of population at higher ages. Consequently, these methods may underestimate mortality (because the numerator, deaths, is too small and/or the denominator, population exposure, is too large).

This problem can be solved by changing the parameters of the model for splitting deaths in the open age interval and by increasing the age interval for the smoothing of death rates (e.g. from 80+ to 70+). In other words, such cases require special procedures for splitting deaths in the open age interval. Thus, the problem results in part from the application of a uniform set of methods across all countries, which helps ensure that HMD estimates are comparable across time and across countries, but which may present problems in some special cases. The authors are working to devise a methodological solution that will help resolve this problem.

The second group of problems concerns the data for the periods around WW1 (1914-1921) and WW2 (1939-1947). The official death and population counts for these two periods do not account for numerous military deaths and very significant movements of military personnel (Statistics New Zealand, 2006). The official population estimates are not available at all for the period around WW1 (1914-1921). Therefore, we estimated annual population counts using the HMD methodology (which assumes that migration during the inter-censal periods, i.e. 1911-1916 and 1916-1921, is distributed uniformly). The newly calculated annual population estimates do not account for very substantial

[1] This may result from an undercount of deaths as well as from real fluctuations in the observed data.

movements of military personnel (40% of males aged 20-44 were mobilized) nor for military deaths and should be treated with caution.

The third group of problems refers to the low quality of Māori statistics. This issue also affects the Non-Māori data for the period after 1961 (when separate Non-Māori and Māori registers were combined into the general vital registry of New Zealand). Since then, the Non-Māori indicators have been available only by subtracting the Māori population from the total. It is not known to what degree the distortions found in the Māori data (which refer to a relatively small part of the total population) are important for the respective data on Non-Māori (for more details, see the *Background and Documentation* file for New Zealand and the *Background and Documentation* file for New Zealand Māori).

Finally, it must be noted that ethnic-specific statistics experienced several conceptual changes during the 1970s and 1980s. However, the major reforms (significantly affecting time series data) took place in the 1990s. A new, broader definition of ethnicity has been applied to the Māori population (and consequently to Non-Māori as well) for estimates since 1991. In the case of births and deaths, such a reform was not introduced until September 1st 1995. Thus, for the period 1991-1995, official data on births/deaths and population are based on different definitions of ethnicity than both before 1991 and after 1995. An attempt has been made to solve this inconsistency by introducing special adjustment factors (see the *Background and Documentation* file for New Zealand for more details).

Specific Details

For the period 1991-1995, we derived our estimates for the New Zealand Non-Māori population by subtracting the adjusted HMD estimates (i.e. births, deaths and population estimates) for the New Zealand Māori population from the HMD estimates for the New Zealand Total population. The resulting estimates for the New Zealand Non-Māori population are not fully equivalent to those that would be obtained by direct implementation of the HMD methodology to the official raw data (which can be obtained by subtracting Māori data from the total population data) for the New Zealand Non-Māori population as a whole.

REFERENCES

Statistics New Zealand (2006). A history of survival in New Zealand: cohort life tables 1876-2004. Wellington: Statistics New Zealand.

Preston S.H., Keyfitz N., Schoen R., (1972). Cause of Death- Life Tables for National Populations, Seminar Press.

REVISION NOTES

Changes with the December 2017 revision:

Life tables: All life tables have been recalculated using a modified methods protocol. The revised protocol (Version 6) includes two changes: 1) a more precise way to calculate a0, the mean age at death for children dying during

the first year of life and 2) the use of birth-by-month data (where and when available) to more accurately estimate population exposures. These changes have been implemented simultaneously for ALL HMD series/countries. For more details about these changes, see the revised Methods Protocol (at http://v6.mortality.org/Public/Docs/MethodsProtocol.pdf), particularly section 7.1 on Period life tables and section 6 and Appendix E, on death rates. The life tables calculated under the prior methods (Version 5) remain available at v5.mortality.org but will not be further updated in the future.

APPENDIX 1:

DESCRIPTION OF DATA USED FOR LEXIS DATABASE

Important note: for the period 1991-1995, we derived our estimates for the New Zealand Non-Māori population by subtracting the HMD estimates (i.e.births, deaths and population estimates) for the New Zealand Māori population from the HMD estimates for the New Zealand Total population. For a description of the input data for the New Zealand Māori population and the New Zealand Total population, please refer to the respective *Background & Documentation* files:

New Zealand Total population:
http://www.mortality.org/hmd/NZL_NP/InputDB/NZL_NPcom.pdf

New Zealand Māori population :
http://www.mortality.org/hmd/NZL_MA/InputDB/NZL_MAcom.pdf

DEATHS

Period	Type of Data	Age Grouping	Comments	RefCode†
1901-1916	Annual number of deaths for the *de facto* population by sex and age	0,1,2,3,4,5,10, 15,…,90,95+		15
1917-1947	Annual number of deaths for the *de facto* population by sex and age	0,1,2,…, max age		15
1948	Annual number of deaths for the *de facto* population by sex and age	0,1,2, … , 100+		9
1949-1979	Annual number of deaths for the *de facto* population by sex and age	0,1,2, … , max age		9
1980-1990	Annual number of deaths for the *de facto* population by sex, age, and year of birth	0,1,2,…, max age		10
1991-1995	Annual number of deaths for the *jure*	0,1,2,…, 110+	Calculated by subtracting the HMD estimates for the New	18

	population by sex, age, and year of birth		Zealand Māori population from the HMD estimates for the New Zealand Total population.	
1996-2008	Annual number of deaths for the 'usually resident' (*de jure*) population by sex, age, and year of birth	0,1,2,…, max age		10, 11, 12, 13, 14

POPULATION

Period	Type of Data	Age Grouping	Comments	RefCode†
1901-1926	Census data for the *de facto* population	0,5,10,…,80, 85+		5
1937-1947	Mid-year population estimates ("mean year ended December 31st") for the *de facto* population	0, 1, 2, …89, 90+		6
1948-1990	Mid-year population estimates ("mean year ended December 31st") for the *de facto* population.	0, 1, 2, …89, 90+		6
1991-1995	Population estimates as of January 1st for the 'usually resident' (*de jure*) population	0, 1, 2, …89, 90+	Calculated by subtracting the HMD estimates for the New Zealand Māori population from the HMD estimates for the New Zealand Total population.	16
1991-2008	Population estimates as of June 30th for the 'usually resident' (*de jure*) population	0, 1, 2, …89, 90+		7, 8

BIRTHS

Period	Type of Data	Comments	RefCode†
1901-1947	Annual counts of births by sex for the actually present (*de facto*) population.		1
1948-1990	Annual counts of live births by sex for the 'actually present' (*de facto*) population		1
1991-1995	Annual counts of live births by sex for the 'usually resident' (*de jure*) population	Calculated by subtracting the HMD estimates for the New Zealand Māori population from the HMD estimates for the New Zealand Total population.	17
1991-2008	Annual counts of live births by sex for the 'usually resident' (*de jure*) population		1, 2, 3, 4

† The reference code is used in the raw data files (Input Database) to link data with sources.