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DISCUSSION PAPERS

Population Studies Centre

No 52 September 2005

New Zealand Regions, 1986-2001: Population Dynamics

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ISBN: 1-877149-54-3

New Zealand Regions, 1986-2001:

Population Dynamics

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Abstract
New Zealand regions have markedly different population dynamics. Population change in a region is driven by three different factors: fertility, mortality and migration. A fourth factor that is often related, momentum, is analysed in a separate paper (Pool et al. forthcoming-f). The present paper analyses the degree to which the levels and impacts of these three factors differ within New Zealand. It looks at regional dynamics by analysing growth and its components, natural increase (births and deaths) and migration, both domestic and international. We first present a review of population flows, and then disaggregate these into their components; natural increase and net migration, so as to provide a demographic accounting of the factors of change. The changes are investigated for the period 1986-2001 and then for the three quinquennia of 1986-91, 1991-96 and 1996-2001.

Keywords: Fertility; Mortality; Migration; Regions; New Zealand

Acknowledgements
William Boddington of Statistics New Zealand estimated 1986-88 births. James Newell of MERA provided initial work on aspects of internal migration. Catherine Hodder, Jacquie Lidgard and Sarah Howard for providing editing assistance.
Support for this analysis comes from the New Demographic Directions Programme grant provided by the Foundation for Research Science and Technology. This Discussion Paper is part of the New Demographic Directions Programme to be included in a monograph entitled *Developing Underdevelopment and Geographical Disparities: A Social Demography of New Zealand Regions,* that will synthesise the results presented in topic-specific discussion papers.

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1. Introduction

This working paper is part of a large project, funded by the Foundation for Research, Science and Technology (FoRST), being undertaken by the Population Studies Centre. It explores the links between different sorts of population transitions, social transformations of various kinds and changes in the political economy of New Zealand's regions between the 1980s and the dawn of the 21st century. It relates to a period of rapid change at the end of which the regional architecture of the country was very different from the way it had been in 1985. The trends also represented a radical departure from what preceded these last two decades.

This particular discussion paper, using data from the five yearly Census of Population and Dwellings and Vital Statistics collected by Statistics New Zealand as well as projections calculated by Statistics New Zealand, examines population change in each region and then three different components of growth, Fertility, Mortality and Migration[1].

2. Population Dynamics

The vitality of a region is frequently assessed by looking at its population growth patterns. These are seen as being linked to areas of economic and social vibrancy. New Zealand, along with other Western Developed Counties (WDCs), has entered what some European demographers call the "Second Demographic Transition"; a population with sub-replacement fertility and low mortality. As is also true for some other WDCs, migration flows affect growth patterns.

This paper analyses the degree to which the patterns and trends of the below factors and their impacts differ within New Zealand. It looks at regional dynamics by analysing growth and its components, natural increase (births and deaths) and migration, both domestic and international. It presents a review of the different population flows, and then disaggregates these into their components – natural increase, net migration – so as to provide a demographic accounting of the factors of change.

Unlike many studies of this nature, the present project has also extended the analysis beyond natural increase and migration by taking account of growth induced by "momentum", but apart from the discussion in this introduction, further comment on this factor will be reserved for Pool et al. (forthcoming-f). Leaving to one side momentum effects, population change comes from a mix of trends in the three factors noted in the last paragraph: fertility (defined here as live births), mortality and net migration (defined as arrivals minus departures). In turn, these changes affect the structure of the population as will be discussed in Bedford et al. (forthcoming) and Pool et al. (forthcoming-g). But, shifts in the sizes of birth cohorts, and then modifications to these volumes coming from changes in patterns of migration, and notably its age-specificity have flow-on effects, termed momentum, that affect both growth and structure. Impacts of momentum and the consequent growth pattern are similar to what is popularly called "pipeline growth". It is this which has been added into our study of the

[1] Other topics covered in this series of discussion papers are listed in the end piece to this paper. The culmination of this project will be the publishing in 2005 of a monograph synthesizing the various themes explored in this series of working papers (Pool et al. forthcoming-a).

components of change (Rogers and Woodward 1988), but which is a subject to be held over to a separate paper (Pool et al. forthcoming-g).

Higher fertility and net in-migration produce younger or middle-aged population structures; lower fertility and net out-migration the inverse. Long term declines in mortality initially occur at younger ages and thus produce younger age-structures, but at much later phases of a mortality transition improvements in survivorship start to occur at older ages, thus increasing the proportions at the older ages, as is now being seen in developed countries (Pool 1994; Pool and Cheung 2002; Pool and Cheung 2003). In addition, the population structure has an effect on the dynamics of natural increase. All other things being equal, a region with concentrations of people at young adult ages will have a higher rate of natural increase than those with lower proportions.

Cutting across this are ethnic differences in the population. Regions with larger numbers of Māori will to some degree reflect Māori patterns of natural increase. Other ethnic minority migrant groups also have an impact on trends, particularly in Auckland and to a lesser degree, Wellington. Migration trends themselves, however, are more likely to be determined by other structural factors relating to the society and economy.

3. The Size of Regional Populations

3.1 Size 1986-2001

New Zealand is a long, narrow country predominantly composed of areas with intense local relief (hilly or mountainous). Not surprisingly therefore, historically, the population has been spread unevenly throughout the country and this still holds true as shown in Table 1[2]. During the twentieth century the population had, become concentrated particularly in the northern half of the North Island (Pool 2002c). By 1986, Auckland in the North had more than a quarter of the national total population and by 2001 this proportion had increased to be close to one third. By contrast, in 1986 West Coast and Marlborough each contained only one per cent of the national population. By 2001, the proportion was slightly lower for West Coast (the smallest region numerically with just 0.8 per cent of the national population) and slightly higher for Marlborough (1.1 per cent).

Over the period 1986-2001 only four regions increased their share of the national total, Auckland (very significantly), and the "retirement zones" - the Bay of Plenty, Nelson-Tasman and Marlborough. The increase in these last three regions fell, however, far below the gains made by Auckland.

[2] Throughout this paper, Tasman and Nelson regions are combined, and together constitute much of the old Nelson province. Their division into two separate regions for statistical and local authority purposes is based purely on the profiles of river catchment areas and produces some strange anomalies, among others that the boundary cuts right through suburban Nelson.

Table 1: The Number of People and Percentage of the National Total Living in Each Region, 1986-2001

Region	Number of People				Percentage of Total New Zealand Population				
	1986	1991	1996	2001	1986	1991	1996	2001	Percentage point change 1986-2001
Northland	122,832	126,786	137,052	140,130	3.8	3.8	3.8	3.7	[-0.01]
Auckland	873,906	943,776	1,068,645	1,158,891	26.8	28.0	29.5	31.0	4.2
Waikato	320,466	331,026	350,124	357,726	9.8	9.8	9.7	9.6	-0.2
Bay of Plenty	189,990	203,985	224,367	239,415	5.8	6.0	6.2	6.4	0.6
Gisborne	45,759	44,265	45,786	43,974	1.4	1.3	1.3	1.2	-0.2
Hawke's Bay	139,455	138,336	142,788	142,947	4.3	4.1	3.9	3.8	-0.4
Taranaki	108,462	107,127	106,587	102,858	3.3	3.2	2.9	2.8	-0.6
Manawatu-Wanganui	222,252	224,763	228,771	220,089	6.8	6.7	6.3	5.9	-0.9
Wellington	392,358	400,284	414,048	423,768	12.0	11.9	11.4	11.3	-0.7
West Coast	33,021	31,563	32,511	30,300	1.0	0.9	0.9	0.8	-0.2
Canterbury	430,113	438,171	468,042	481,431	13.2	13.0	12.9	12.9	-0.3
Otago	178,530	177,525	185,082	181,542	5.5	5.3	5.1	4.9	-0.6
Southland	104,280	99,954	97,101	91,002	3.2	3.0	2.7	2.4	-0.8
Nelson-Tasman	67,569	70,485	78,249	82,917	2.1	2.1	2.2	2.2	0.1
Marlborough	33,408	35,145	38,397	39,558	1.0	1.0	1.1	1.1	[0.03]
New Zealand	**3,263,283**	**3,373,929**	**3,618,300**	**3,737,280**	**100.0**	**100.0**	**100.0**	**100.0**	**----**

Source: In this table and except where otherwise noted data used in this paper comes from published census data, or from Supermap3, or from special tabulations from the Censuses of Population and Dwellings from Statistics New Zealand.

In 1986, apart from Auckland, six regions (Canterbury, Wellington, Waikato, Manawatu-Wanganui, the Bay of Plenty and Otago) each had more than five per cent of the national total population although by 2001 Otago had slipped below that level. To a considerable extent the larger population numbers in these regions reflect the geographic distributions of the main metropolitan centres, the cities of Auckland, Wellington, Christchurch, Hamilton and Dunedin (Pool et al. forthcoming-e). But, the three largest regions, Auckland, Wellington and Canterbury, incorporating the metropolitan areas of Auckland, Wellington and Christchurch, together contained 55 per cent of the total population in 2001.

Over the last decade or so the population of New Zealand has became even more concentrated in the northern part of the North Island, particularly in the Auckland region and in its neighbouring three regions (Northland, Waikato, the Bay of Plenty). In 1986 these four regions contained 46 per cent of the total population of New Zealand and by 2001 this total had increased to 51 per cent.

There is only one change in the order of regional population size from 1986 to 2001. this masks other important divergences from historical growth trends that occurred between 1986 to 2001. That one change was a shift in rank for the Bay of Plenty which went from the sixth to fifth largest region at the expense of Manawatu-Wanganui. The growth of regional populations and population redistribution, as opposed to patterns of migration, is referred to section 4 of the present paper.

3.2 Size 2001-2016

When looking at the size of the region projected into the future, Auckland is assumed to make up over one third of the population by 2016 with a large percentage point increase in the share of New Zealand population, as can be seen in Table 2. The only other region projected to have an increase is the Bay of Plenty, while Nelson-Tasman and Marlborough will show little change. In contrast, all the other regions are projected to undergo declines in their shares of the New Zealand population, with Manawatu-Wanganui and Wellington having the largest reductions.

Table 2: The Number of People and Percentage of the National Total Living in Each Region, 2001-2016

Region	Number of People		Percentage of Total New Zealand Population		
	2001*	2016	2001*	2016	Percentage point difference 2001-16
Northland	144,400	155,400	3.7	3.5	-0.2
Auckland	1,216,900	1,553,900	31.4	35.5	4.1
Waikato	369,800	401,600	9.5	9.2	-0.4
Bay of Plenty	246,900	294,600	6.4	6.7	0.4
Gisborne	45,500	43,500	1.2	1.0	-0.2
Hawke's Bay	147,300	146,700	3.8	3.4	-0.4
Taranaki	105,700	98,700	2.7	2.3	-0.5
Manawatu-Wanganui	227,500	226,900	5.9	5.2	-0.7
Wellington	440,200	465,300	11.3	10.6	-0.7
West Coast	31,100	28,400	0.8	0.6	-0.2
Canterbury	496,700	540,000	12.8	12.3	-0.5
Otago	188,300	196,100	4.9	4.5	-0.4
Southland	93,300	83,500	2.4	1.9	-0.5
Nelson-Tasman	85,300	98,100	2.2	2.2	[0.04]
Marlborough	40,700	45,100	1.0	1.0	[-0.02]
New Zealand	**3,880,500**	**4,378,700**	**100.0**	**100.0**	**---**

* This differs from earlier population as they adjust population base before starting projections.
Source: Statistics New Zealand, 2001 (base) Medium Projections.

3.3 The Growth of Regional Populations

The Growth of Regional Populations, 1986-2001

In the late twentieth century New Zealand had low fertility and mortality rates along with fluctuating international migration inflows and outflows. International migration contributed to about one-third of the 1991-1996 inter-censal population growth (Pool and Bedford 1997), and 25 per cent[3] over the quinquenium 1996-2001. The average annual growth rate for the country as a whole between 1986 and 1991 was only 0.7 per cent, but from 1991 to 1996 it climbed to 1.4 per cent, then dropped back to 0.7 per cent between 1996 and 2001.

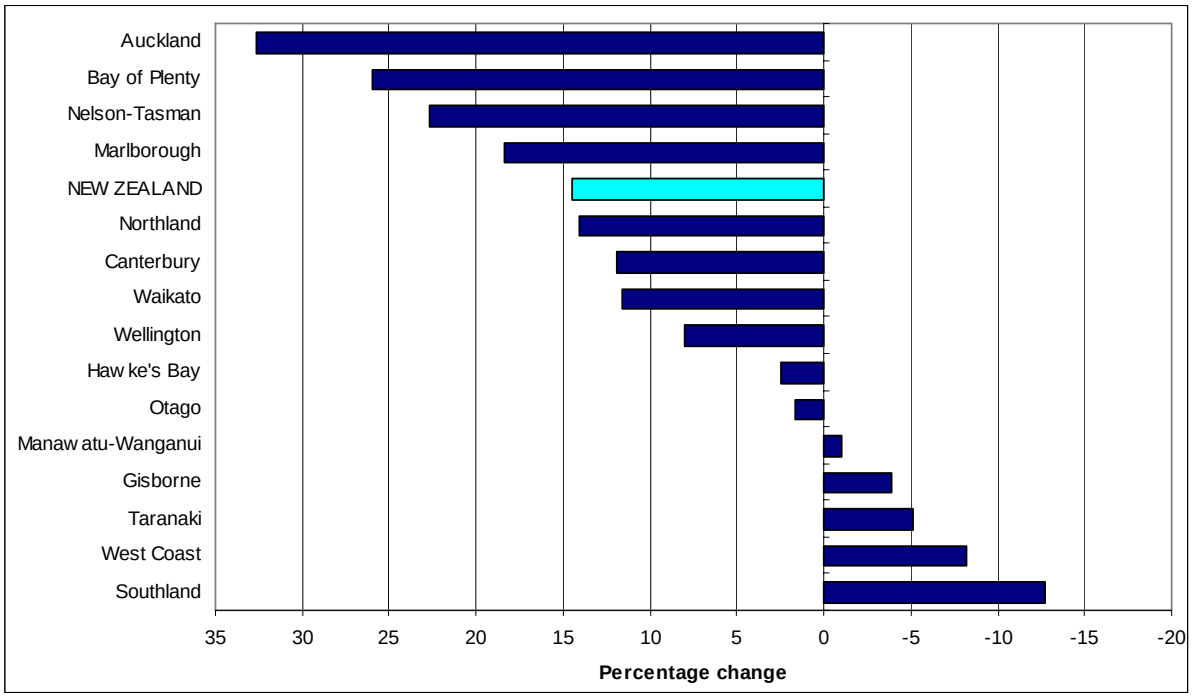
It is important to see this trend in context. The growth rates of countries in Europe and Japan for 1991-1996 and 1996-2001, were lower than that for New Zealand. For example, 0.5 and 0.1 per cent respectively for Sweden, 0.1 and 0.3 per cent for United Kingdom, and 0.3 and 0.2 for Japan (Statistics New Zealand 2002). Against that, three countries similar to New Zealand had growth rates for 1991 to 1996, and 1996 to 2001 respectively of 1.2 and 1.2 per cent for Australia, 1.0 and 1.5 per cent for the United States of America, and 1.2 and 1.0 per cent for Canada.

In contrast to the country as a whole, as is shown in Figure 1, some regions had more rapid growth, coming both from natural increase and migration, both within New Zealand and internationally. The last quarter of the 20th century and the period 1986-2001 saw high levels

[3] Total net migration is used, not Permanent Long/Term migration.

of inter-regional mobility, particularly metropolitanisation, a trend that had accelerated dramatically after a long period of relative equilibrium. Levels of inter-regional mobility in the decade and a half covered in this set of work (Pool et al. forthcoming-a) appear to have been amongst the most intense in New Zealand's history (Pool 2002c). Beyond that, some areas in the 1990's were also subject to very large net international inflows (see section 4.7).

Figure 1: Changes in Population Size, by Region, 1986-2001



At this point a distinction must be made between changes in the sizes of regional populations, or regional redistribution, and inter-regional and international migration flows. The analysis that follows examines increases and decreases in the size of the population of a region, but does not refer specifically to the migration patterns that are major causes of change in the size and composition of regional populations. Inter-regional migration patterns will be discussed in very general terms later in this paper, while the characteristics of the inter-regional flows will be detailed further in Bedford et al. (forthcoming).

Within New Zealand there were considerable variations in regional growth patterns between 1986 and 2001 as is shown in Figure 1. Over the entire 15-year period there was high regional growth in the north of both islands, notably for Auckland and more especially the "sunshine-belt", or retirement zones, of both islands – Northland and the Bay of Plenty[4] in the North Island, and Nelson-Tasman and Marlborough in the northern part of the South Island.

The largest increase in the population size over the 15-year period was in the Auckland region[5] which grew by 33 per cent, while the other regions containing metropoli (as defined

[4] Most of this increase occurred in the Western Bay of Plenty which includes Western Bay of Plenty and Tauranga Districts (territorial authorities) with a population increase of 50 per cent for the period 1986-2001. In contrast, Eastern Bay of Plenty had only a 3 per cent increase.

[5] The increase in population was reasonably even across the four Auckland urban areas with Central Auckland and North Shore being around 25 per cent, whereas for the other two urban areas it was over 35 per cent.

here) increased more modestly[6]. In contrast, five peripheral regions showed declines, and some regions barely changed at all.

During this fifteen year period there were inconsistencies between the three quinquennia in terms of the percentage changes in population, with regional growth patterns fluctuating considerably between the three five-year periods as shown in Table 3. While the population of Auckland and the "sunshine belts" of both islands increased systematically over all three periods, the rates of change were higher between 1991 and 1996 than in the other two periods. Waikato, Wellington and Canterbury also experienced positive growth in all three periods. Only Southland and Taranaki went through population declines in all three periods. The net result for growth trends was a modest shift in the ranked order, as is seen in Table 3.

Table 3: Rank Order of Percentage Change and Percentage Change in Regional Population Numbers, over Three Quinquennia, 1986-1991, 1991-1996 and 1996-2001

Region	1986-1991		1991-1996		1996-2001	
	Change	Rank	Change	Rank	Change	Rank
Auckland	8.0	1	13.2	1	8.4	1
Bay of Plenty	7.4	2	10.0	3	6.7	2
Marlborough	5.2	3	9.3	4	3.0	4
Nelson-Tasman	4.3	4	11.0	2	6.0	3
Waikato	3.3	5	5.8	7	2.2	8
Northland	3.2	6	8.1	5	2.2	7
Wellington	2.0	7	3.4	9	2.3	6
Canterbury	1.9	8	6.8	6	2.9	5
Manawatu-Wanganui	1.1	9	1.8	13	-3.8	12
Otago	-0.6	10	4.3	8	-1.9	10
Hawke's Bay	-0.8	11	3.2	11	0.1	9
Taranaki	-1.2	12	-0.5	14	-3.5	11
Gisborne	-3.3	13	3.4	10	-4.0	13
Southland	-4.1	14	-2.9	15	-6.3	14
West Coast	-4.4	15	3.0	12	-6.8	15
New Zealand	**3.4**		**7.2**		**3.3**	

The Growth of Regional Populations, 2001-2016

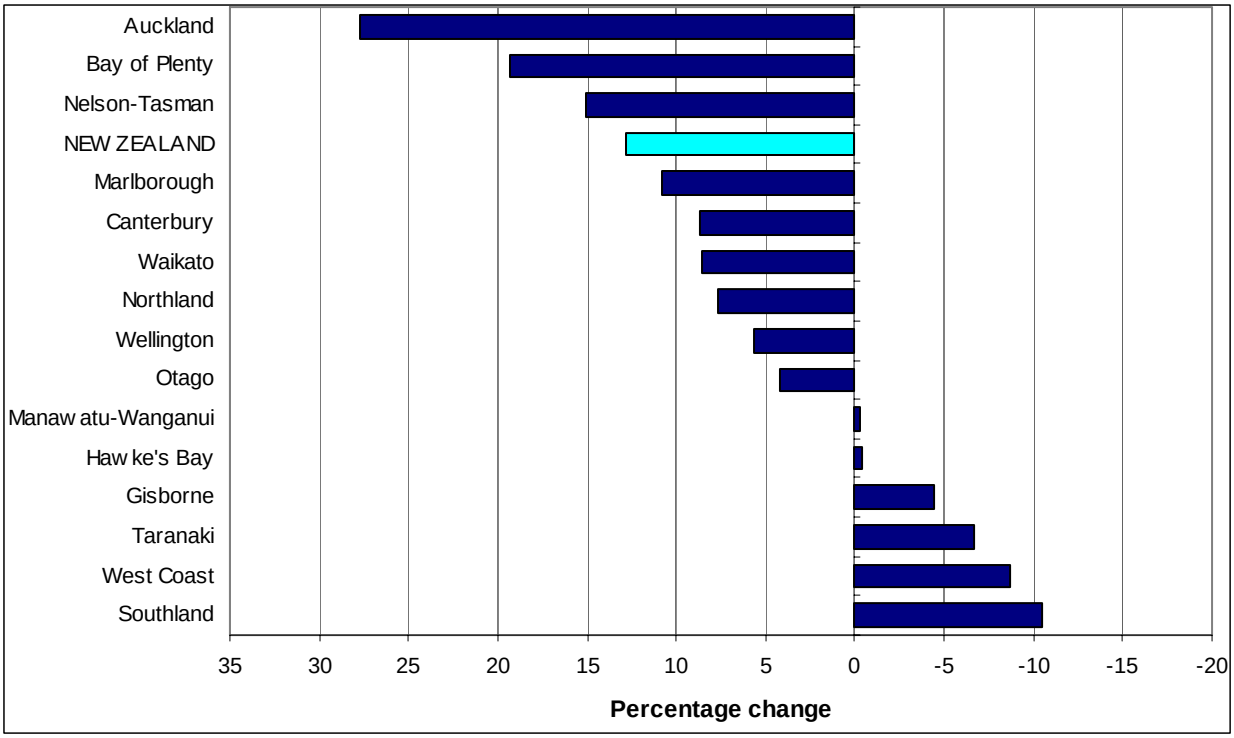
The previous section looked at what happened to the regional populations historically. Equally important is what is going to happen to them into the future. In the fifteen years following the 2001 census the New Zealand population is projected to increase by 13 per cent which is slightly lower than the increase experienced between 1986 and 2001 of 15 per cent.

When looking at the regional changes at all ages for the period 2001 to 2016, there are similarities with what occurred historically between 1986 and 2001 (compare Figures 1 and 2), albeit a little slower. In contrast, patterns of change by age, to be analysed in Pool et al. (forthcoming-f), will shift significantly. Two regions, Northland and Hawke's Bay, will drop

[6] In this paper the combined urban areas of Napier and Hastings are taken as one metropolitan area (Pool et al. forthcoming-e).

in rank order two places, in Hawke's Bay's case there will be a shift from positive growth to negative. Of the regions that will grow, the levels over the period 2001-2016 will fall below what they experienced in 1986-2001, the only exception being Otago.

Figure 2: Changes in Population Size, by Region, 2001-2016



Source: Statistics New Zealand, 2001 (based) medium series projections.

4. The Components of Growth: Fertility, Mortality and Migration

Populations change through people being born, people dying, and people moving in and out of the area under consideration. As noted earlier, these factors can also produce a momentum that affects overall growth levels, this will be further discussed a later discussion paper (Pool et al. forthcoming-f). This section examines some indicators of these three major sets of population dynamics for New Zealand's regions. Changes in each of these dynamics are very important, demographic factors will often be the driving force behind policy decisions (Brown 1989; Pool 2002a). One example is the continuing public debate surrounding the social and political consequences of the "ageing" New Zealand population (Boddington 2003).

4.1 Fertility

To analyse the contribution of fertility to growth, the best summary measure, one that is free of the effects of differences in the age-composition of the population, is the Total Fertility Rate (TFR) for a particular year. This is a synthetic index representing the average number of births a woman would have during her reproductive life if she were to be exposed to the fertility rates characteristic of various childbearing age groups in that year. The indices below are based on the average number of births in the three years around the respective censuses. As each region has a different age-structure (Pool et al. forthcoming-f), without a control for

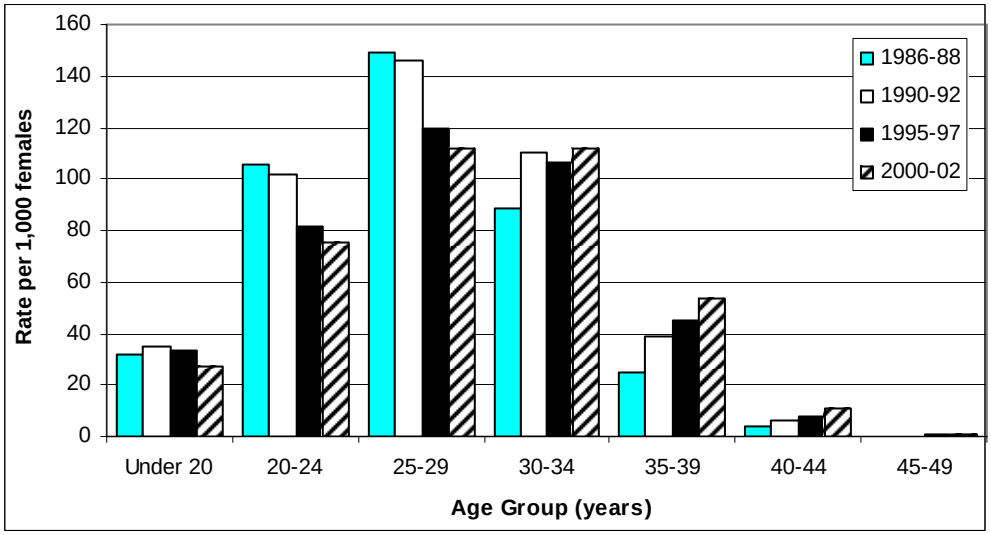
age-structural effects, some of the differences in numbers of births or crude rates could come from this factor rather than variations in fertility *per se*.

Nationally, New Zealand, along with France, the United States and Sweden (early 1990's), have been among the "higher" fertility developed countries (Pool and Sceats 2003). But within New Zealand there are now differences between the somewhat higher fertility of Māori and Pacific Islanders, and the lower fertility of Pakeha.

Over recent decades, the national TFR has undergone some significant swings: in 1981 during the "baby bust" following the "baby boom" the level had gone down to 2.0, but by the 1986-88 triennium it was at 2.02, almost back at replacement (2.1 births per woman), rallying just above replacement in 1990-92 in the Baby Blip, then declining to sub-replacement in the periods 1995-97 and 2000-02. This is shown in Table 4.

The 1980's "baby bust" was produced by a marked decrease in fertility at ages 20-24 and 25-29 years. The 1990s saw the force of reproduction shift into the early 30s age group, by 2002 it has become the single most important age group exceeding that at 25-29 years. The rise around 1990-92 was caused primarily by increases in the age-specific fertility rates of women 30 years and over, with slight changes in the under 30 age-specific rates (Figure 3). This is caused by the women who had delayed child birth in the 1980s, but who started to have children later in their reproductive span in the early 1990s. By 1995-97 and 2000-02 the rates below 30 years had dropped significantly, and at 30 years and over had increased markedly. In 2003-04 the rate and birth numbers increased slightly by comparison with the years immediately before them, but again it was an increase at 30 years and over that was the factor not increases at younger ages.

Figure 3: Age-Specific Fertility Rates for New Zealand, by Age Group, 1986-88 - 2000-2002



Source: Statistics New Zealand, Vital Statistics.

These changes in the age-specific rates nationally are generally reflected in what has occurred in the regions. Nevertheless their TFRs reveal some very interesting differences as shown in Table 4. Firstly, there is a long-standing north-south gradient in which parts of the South Island (Otago and Canterbury) have notably low TFRs. Their levels today look like the lower rates experienced in what are termed the "English-speaking" countries (Pool and Sceats

2003). Interestingly, these were the very same regions that led the fertility decline in the late nineteenth century (Pool and Tiong 1992). Differences between the rates for the highest and lowest regions have also increased over time, a spatial manifestation of the reproductive polarisation that is becoming more apparent in New Zealand (Dharmalingam et al. 2003).

Table 4: Total Fertility Rates (TFR) by Region, 1986-88 - 2000-02

Region	1986-88*	1990-92	1995-97	2000-02	Absolute Change
Northland	2.47	2.67	2.50	2.40	-0.07
Auckland	2.01	2.25	2.01	1.99	-0.02
Waikato	2.20	2.32	2.12	2.10	-0.10
Bay of Plenty	2.26	2.48	2.37	2.31	0.05
Gisborne	2.37	2.72	2.62	2.61	0.24
Hawke's Bay	2.21	2.44	2.32	2.30	0.09
Taranaki	2.22	2.30	2.05	2.09	-0.13
Manawatu-Wanganui	2.07	2.16	2.02	2.00	-0.07
Wellington	1.89	2.07	1.79	1.79	-0.10
West Coast	2.05	2.37	2.03	1.96	-0.09
Canterbury	1.77	1.88	1.70	1.70	-0.07
Otago	1.73	1.79	1.56	1.56	-0.17
Southland	2.09	2.13	1.97	2.07	-0.02
Nelson-Tasman	1.92	2.10	1.75	1.90	-0.02
Marlborough	2.04	2.14	2.03	1.88	-0.16
New Zealand	**2.02**	**2.19**	**1.97**	**1.96**	**-0.06**
Range	*0.74*	*0.93*	*1.06*	*1.05*	

Note: Births and fertility are based on the usual residence of mothers rather than on de facto domicle, the concept which had been used in the past. The number of births and the TFR for New Zealand includes births where the usual residence of mothers was not specified.

* These rates are estimated using the age distribution of mothers in local government regional data included in the original table published in *Demographic Trends 1989* and realigned to Regional Councils. The TFRs are based on de facto residence (this may particularly affect regions containing proportionately large tourist populations). The data used are for the March year data compared to the December year for the other years. This work was done by William Boddington of Statistics New Zealand.

Source: Statistics New Zealand, Vital Statistics.

Secondly, peripheral primary producing regions (including Southland, Taranaki, Manawatu-Wanganui, West Coast, Nelson-Tasman and Marlborough) and also Waikato have levels close to the New Zealand TFR. This is also true for Auckland, but its figure is produced by very different forms, and hides very significant sub-regional differences. The southern part of the Auckland urban area, which has large concentrations of Māori and Pacific Islanders, has TFR levels resembling some of the regions in the higher category nationally, with 2.5 births per women in 1999 (Pool 2002b), the central urban area which also has significant, but proportionately smaller, Māori and Pacific Island sub-populations, and northern sub-regions of Auckland metropolis have rates that are very low and similar to those for relatively low fertility populations in Western Europe (Pool 2002b; Pool and Sceats 2003)[7]. It has been argued elsewhere (Pool 2002a) that these Auckland sub-regions, which today are often lead areas for social trends in New Zealand, may provide a foretaste of what will be seen

[7] The TFR for Auckland City Territorial Authority was only 1.70 in 2000-02.

nationally in the future. The TFR for Wellington, which is relatively low, is the result of a similar balance, between very low rates in the inner city[8] and the higher level of the suburbs, particularly Porirua, where there are areas with a higher concentration of Māori and Pacific Island peoples.

In contrast, there are the regions of higher fertility of Northland, the Bay of Plenty, Gisborne and Hawke's Bay. These are all regions with significant numbers or proportions who are Māori.

Regional rankings remained more or less unchanged over time. Every region experienced increases between 1986-88 and 1990-92, most regions subsequently experienced declines by 1995-97 and then underwent little change until 2000-02. In the 1980s fertility had fallen below replacement in Auckland and in the Manawatu-Wanganui and for every single region south of it. All regions edged up around 1991, in the Baby Blip and passed replacement again in Auckland, Manawatu-Wanganui, West Coast, Southland and Marlborough. All regions that were below replacement in the 1980s have dropped back to that level again and often decline even further. Today, below replacement levels are seen in the Waikato, Taranaki, Manawatu-Wanganui and Southland, curiously each of these regions are areas in which dairying is concentrated and where, so it might be assumed, more conservative social attitudes, and thus higher fertility, would prevail. The northern rural regions, Northland, the Bay of Plenty and Gisborne, plus Hawke's Bay remain well above replacement, but even their rates have dropped since the Baby Blip. The result of all these changes is that by 2000-02 most but not all regions had lower fertility than they had in the Baby Bust which itself reaches low levels that were without historical precedent. Thus most of New Zealand was sharing in a shift in reproduction to levels never seen before (Pool et al. forthcoming-h).

Ethnicity

For Māori the results are looked at only for 2000-02 as there have been changes in definitions which contaminate the time series. Total Fertility Rates (TFR) around 1986 are published in Pool's book *Te Iwi Māori*, where Northland, Southern Auckland Urban Area and Gisborne were the areas having the highest rates. In 2000-02 the regions with the highest TFRs for Māori were Northland, the Bay of Plenty, Gisborne and Hawke's Bay as shown in Table 5. The lowest are in the South Island which is treated as one region because of small numbers in many areas. Also Wellington[9] is low as are some parts of Auckland[10]. Urban Southern Auckland, however had a rate ranking with the highest rural regions that are "Māori heartland", a result reminiscent of what had been seen in 1986. Pool explains this peculiar grouping in terms of the effect of "cultural density" (1991: Table 9.6 & 201-202). In 2000-02 Pacific Island people[11] had a national-level TFR of 2.95 with Auckland[12] having a rate of 3.14 and Wellington 2.44.

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[8] The TFR for Wellington City Territorial Authority was only 1.44 in 2000-2002.

[9] Wellington Central had a TFR for Māori in 2000-02 of 1.62, whereas the other urban areas of Wellington had TFRs between 2.44 and 2.49.

[10] Auckland Central and North Shore had TFRs for Māori of around 2.2, with Western Auckland having a TFR of 2.60 and Southern Auckland a TFR of 3.02 in 2000-02

[11] The data for Pacific Islanders are based on total responses, whereas the other data used in this paper are prioritised. A total response approach counts as Pacific Island people of Pacific Island identity who also specify they are Māori, so that a respondent/event is double-counted by being also attributed to Māori. Prioritisation adopts a hierarchical strategy that counts a respondents/events as Māori if they identify as Māori and some other ethnicity; Pacific Island if that and any other ethnicity except Māori; Asian as that plus

Table 5: Total Fertility Rate and Force of Early Reproduction, Māori Population, by Regions, 2000-02

Regions	Total Fertility Rate	Force of Early Reproduction[1]
Northland	2.88	43.0
Auckland	2.62	41.2
Waikato	2.63	41.2
Bay of Plenty	2.81	43.9
Gisborne	2.85	45.8
Hawke's Bay	2.85	43.3
Taranaki	2.46	45.4
Manawatu-Wanganui	2.60	45.8
Wellington	2.25	41.8
South Island	2.14	38.4
New Zealand	**2.58**	**42.1**
Range	*0.74*	*7.5*

(1) 5*(ASFR 15-19 + ASFR 20-24)/TFR*100
Source: Statistics New Zealand, Unpublished Vital Statistics.

Age-Specific Fertility Rates

Looking at two key ages of fertility, namely, 25-29 and 30-34 years, some interesting patterns emerge, these are illustrated in Table 6. Firstly, both for New Zealand as a whole and for every region, there has been a decline in the age-specific fertility rate for the 25-29 years age group, and a compensating increase at the 30-34 year age group. This trend is also reflected in the per cent of births for women at 30 years and over, with this increasing considerably, going from 27 to 49 per cent nationally (by 2002 it went above 50 per cent). By 2000-02 the percentage was over 50 per cent for Auckland, Wellington, Canterbury and Otago. The lowest percentages were in North Island regions, except Auckland and Wellington, and in Southland.

any other ethnicity except Māori and Pacific Island. Pakeha constitutes a residual category.

[12] The TFRs for Pacific Island were much higher than those for Māori across all four urban areas of Auckland, ranging from 2.63 in North Shore to 3.35 in South Auckland in 2000-02

Table 6: Age-Specific Fertility Rates per 1,000 Women at 25-29 and 30-34 Years, Percentage of Births at 30 Years and Over, by Region, 1986-88 and 2000-02

Region	25-29		30-34		% of births 30 years and over	
	1986-88*	2000-02	1986-88*	2000-02	1986-88*	2000-02
Northland	171	141	87	108	23	43
Auckland	142	107	96	117	30	52
Waikato	163	128	85	112	23	44
Bay of Plenty	163	132	84	112	23	42
Gisborne	151	140	89	117	23	39
Hawke's Bay	153	135	87	109	24	41
Taranaki	169	131	81	105	22	42
Manawatu-Wanganui	157	124	80	103	22	41
Wellington	135	93	94	110	31	55
West Coast	158	119	73	94	23	45
Canterbury	142	98	85	112	29	54
Otago	145	102	79	106	26	51
Southland	158	131	73	108	20	43
Nelson-Tasman	147	122	86	108	29	50
Marlborough	156	117	81	96	25	48
New Zealand	**149**	**112**	**88**	**112**	**27**	**49**
Range	*36*	*49*	*24*	*23*	*11*	*16*

* Refer to note in Table 3.

Source: Statistics New Zealand, Vital Statistics.

4.2 Force of Reproduction

The last section of the paper highlighted the question of broader age patterns, or where the force of reproduction falls. This is where, on average, in the reproductive life-cycle births occur, whether this has changed over time and whether there are spatial differences. The force of early reproduction, measures the influence of early childbearing on the overall fertility rate. This proportion decreased from 34 per cent in 1986-88 to 26 per cent in 2000-02, a reflection of changes in age-specific rates involving an accelerating shift to later childbearing (Ball 2000).

From Table 7 it is clear that across the earlier time periods there was a higher force amongst the regions of early reproduction except for those regions containing metropolitan centres, Auckland, Wellington, Canterbury and Otago[13]. By 2000-02 the force had dropped in every region, very significantly in some. At the same time the differential just noted was sustained. Through the entire period Canterbury and Otago have the lowest levels.

The greatest force of early reproduction is felt in regions with high proportions or numbers of Māori, but rates are also higher in some other strongly rural regions, such as Taranaki and Southland. Gisborne had the highest rate in 2000-02, followed by Northland, Hawke's Bay and the Bay of Plenty.

[13] Of the metropolitan regions, the Waikato has the lowest per cent of its population living in the major centre. This affects the region's rates.

Table 7: Force of Early Reproduction: TFR at 15-24 Years by Region, 1986-88 - 2000-02

Region	Force of early reproduction[1] (%)				
	1986-88*	1990-92	1995-97	2000-02	Percentage Point Change
Northland	42.2	39.3	40.1	35.7	-6.5
Auckland	31.9	29.8	26.7	24.3	-7.6
Waikato	37.6	39.9	32.5	29.3	-8.3
Bay of Plenty	39.5	38.9	38.9	35.2	-4.3
Gisborne	42.5	42.0	38.6	38.7	-3.8
Hawke's Bay	40.5	39.1	38.2	34.8	-5.7
Taranaki	37.8	35.1	34.5	32.7	-5.1
Manawatu-Wanganui	36.6	32.7	31.5	30.3	-6.3
Wellington	30.1	26.9	25.9	23.0	-7.1
West Coast	37.3	37.0	33.7	33.6	-3.7
Canterbury	29.0	25.8	22.7	20.5	-8.5
Otago	28.8	22.9	19.3	15.9	-12.9
Southland	39.7	35.4	34.2	30.8	-8.9
Nelson-Tasman	32.8	30.9	26.8	25.0	-7.8
Marlborough	36.4	32.9	31.7	29.3	-7.1
New Zealand	**34.1**	**31.1**	**29.1**	**26.3**	**-7.8**
Range	*13.7*	*19.1*	*20.8*	*22.9*	

(1) 5*(ASFR 15-19 + ASFR 20-24)/TFR*100

* Refer to note in Table 2.3.

Source: Statistics New Zealand, Vital Statistics.

There has been a marked increase in the range of values over time for force of early reproduction, again an indication of reproductive polarisation. This divergence is closely related to the level of change, regions with high rates in 2000-02 have typically changed little since 1986-88, approximately three to six percentage points below, while other regions have sometimes shifted very significantly, especially Otago.

The data for Auckland and Wellington are once again confounded by sub-regional differences noted earlier[14]. It is worth noting that these differentials stand for Auckland as well as its Māori population, and have for a couple of decades[15]. For example, a much lower force of early reproduction and TFR was seen for Māori in 1986 in the central and Northern sections of Auckland, yet rates were among the highest in the country in the Southern part of that urban area (Pool 1991).

The force of early reproduction of the total Maori population in 2000-02, shown in Table 5, was 42 per cent nationally compared to 26 per cent for the total population. There is some variation between the regions but the range is far less than that for the total population. The lowest is in the South Island and the highest is in Manawatu-Wanganui and Gisborne. But within the urban areas of Auckland and Wellington there is much greater variation with

[14] In 2000-02, Auckland City's Force of Early Reproduction was 19 per cent in 2000-02 while Wellington City's was a very low 12 per cent.

[15] See Pool (1991): Figure 9.2.

Wellington Central being 30 per cent, North Shore 33 per cent and Central Auckland being 37 per cent, whereas the other urban areas are above or close to the New Zealand average.

4.3 Cumulative and Completed Family Sizes

This analysis in fertility now adopts a different strategy, using another totally different source. At the 1981 and 1996 Censuses women were asked the number of children they had ever borne. Unfortunately this question was not asked in 1986, 1991 and 2001, but this is less of a problem than might be imagined as the resultant indices reflect fertility achieved in the past cumulated up to the given Census[16]. Results for the 1981 enumeration are used for the total population to compare with those of 1996, to give an indication of how trends have changed over time. In this section we have used this information to look at fertility (average number of children) and childlessness for the different regional councils in New Zealand.

As all data come from the same source, this also enables ethnic comparisons for any census date to be made without the problem faced by different numerators and denominators which cause difficulties when one attempts to make comparisons from registration data (Ministry of Health 2001)[17] . Of course, this does not eliminate the possibility that change over time might be an artefact of definitional change. The census question for fertility was asked in different ways in 1981 to 1996. In 1981 respondents were asked to "specify number of children born alive to you, including any who have since died, but do not include step-children or adopted children", while in 1996 the question was "How many babies have you given birth to? Count only who were born alive". In 1996 there were three boxes to fill in including none, number born alive, and object to answering this question, whereas in 1981 there was only one space. This possibly could have affected the way a person responded, with people in 1996 been given the option of not answering the question. The way the ethnic question was asked between 1981 and 1996 was also very different. In 1981 this was done by percentage of blood where in 1996 respondents just ticked the ethnic group(s) with which they identified.

These data permit a very different form of analysis from that based around vital rates. They give "stocks" rather than "flows" (vital rates), and they also allow analysis of fertility in relation to the wide range of possible co-variates available in census data. A recent study (Dharmalingam et al. 2003), has highlighted growing reproductive polarisation in New Zealand, particularly in reviewing childlessness at 30-34 years and notably in relation to job statuses (full-time, part-time, not in labour force, etc.). This is a trend already showing regional differences as we noted earlier in this paper. The present analysis cannot replicate at regional level a study with this amount of detail, but we can search for regional differentials, to see whether spatial polarisation occurs. In a separate analysis (Pool et al. forthcoming-a), we will also point to regional differences in a wide range of human capital factors. We hypothesise that there is a link between fertility polarisation and marked differentials spatially in human capital factors, and that the latter are among the determinants of the regional fertility differences. Ethnicity, which we do analyse here, will be the other major factor, along with an historic north-south gradient to which we referred earlier.

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[16] That said, there are indications in vitals data and in the New Zealand Family and Fertility Survey 2001 of significant shifts between 1996 and 2004, notably a further entrenchment of delayed childbearing and childlessness.

[17] In this analysis only data on those who specified how many children they had were used. The per cent not specified was 2.4 per cent in 1981 but had risen to 10.6 per cent in 1996.

Percentage Childless

For New Zealand the proportion of women listed as childless in the total population increased systematically between 1981 and 1996, as is shown in Table 8. It must be reiterated that these data are age standardised so this result is not a function of age-composition. This reflects changes in workforce participation and higher qualifications in the female population (Pool et al. forthcoming-b; Pool et al. forthcoming-c; Sceats 2003). These differences are not so much due to socio-economic factors, *per se*, as to workforce status. Full-time women workers aged 30-34 years are more likely to be childless than part-time workers or women who are unemployed, or not in the labour force. For professional, and managerial women the gap is even more extreme. This is a function of stresses and conflicts involved in work-life balances.

In terms of shifts in the age-structure, this change is, counterfactual as historically women at older reproductive ages would already have had children, but more recently women at younger ages were still to have children. In 1986, 36 per cent of the women at reproductive ages[18] were at the most fecundable ages of 20-29 years, but by 2001 this proportion ddecreased to only 30 per cent.

Table 8: Proportion of the Women Population Childless Age Standardised[1] by Ethnicity and Region, 1981 and 1996

Region	Total Women			1996 Ethnicity		
	1981	1996	Diff.	Pakeha	Māori	Diff.
Northland	23.2	25.7	2.5	28.6	21.1	7.5
Auckland	29.7	33.8	4.1	36.9	26.4	10.4
Waikato	23.5	27.8	4.3	29.5	22.7	6.8
Bay of Plenty	23.9	26.4	2.5	29.3	21.6	7.7
Gisborne	24.1	25.5	1.4	29.7	21.9	7.9
Hawke's Bay	25.2	27.2	2.0	29.4	21.8	7.6
Taranaki	24.0	27.0	3.0	28.0	22.3	5.6
Manawatu-Wanganui	25.8	28.9	3.1	30.3	23.1	7.3
Wellington	30.2	35.3	5.1	37.1	28.6	8.5
West Coast	24.9	26.5	1.6	27.1	20.3	6.8
Canterbury	29.2	33.4	4.2	33.9	29.0	4.9
Otago	28.9	33.3	4.4	33.5	28.1	5.4
Southland	24.4	27.6	3.2	28.5	20.9	7.5
Nelson-Tasman	27.6	31.0	3.4	31.3	26.2	5.1
Marlborough	24.7	28.4	3.7	29.2	22.0	7.1
New Zealand	**27.6**	**31.5**	**3.9**	**33.3**	**24.4**	**8.9**
Range	*7.0*	*9.8*	*3.7*	*10.0*	*8.7*	*5.5*

(1) Age Standardised to the Total Female Population in 1996 for New Zealand. Only those who specified number of children are included in denominator.

[18] Reproductive ages of 15-44 years.

In both 1981 and 1996, Wellington[19], Auckland[20], Canterbury and Otago had the highest age-standardised percentage of the female population enumerated as childless, as shown in Table 8. This is in part a reflection of the fact perhaps that in metropolitan rather than non-metropolitan areas women have higher levels of participation in full-time work (Pool et al. forthcoming-c). Other than Auckland and Wellington, all North Island regions had lower proportions of childless women than New Zealand as a whole. These regions have higher proportions of their population Māori, so that their overall result reflects the lower childless rates of Māori. The childless rate was particularly low in Northland and Gisborne.

At key reproductive ages between 20 and 34 years there has been a large change in the proportion of women who remain childless as shown in Table 9 between 1981 and 1996 with much higher per cents remaining so for both Pakeha and Māori.

Table 9: Percentage of Women who were Childless[1] by Age Group and Ethnicity, New Zealand, 1981 and 1996

Age Group (year)	Pakeha		Māori		Total	
	1981[2]	1996	1981[2]	1996	1981	1996
15-19	96	98	83	89	94	96
20-24	70	83	36	54	66	77
25-29	33	59	15	30	31	52
30-34	14	31	10	17	14	28
35-39	10	17	9	12	10	16
40-49	9	12	10	9	9	11

(1) Only those who specified number of children are included in denominator.
(2) Pakeha in 1981 is Pakeha Only and Māori is 50% or more Māori.

Auckland and Wellington stand out above every other region as having high proportions of their female populations reported as childless, especially at the 25 years and over age group (see Appendix Table 1). Canterbury and Otago also had high proportions at the 20-24 year age group; at 30 years and over they are high, but not as high as Auckland and Wellington.

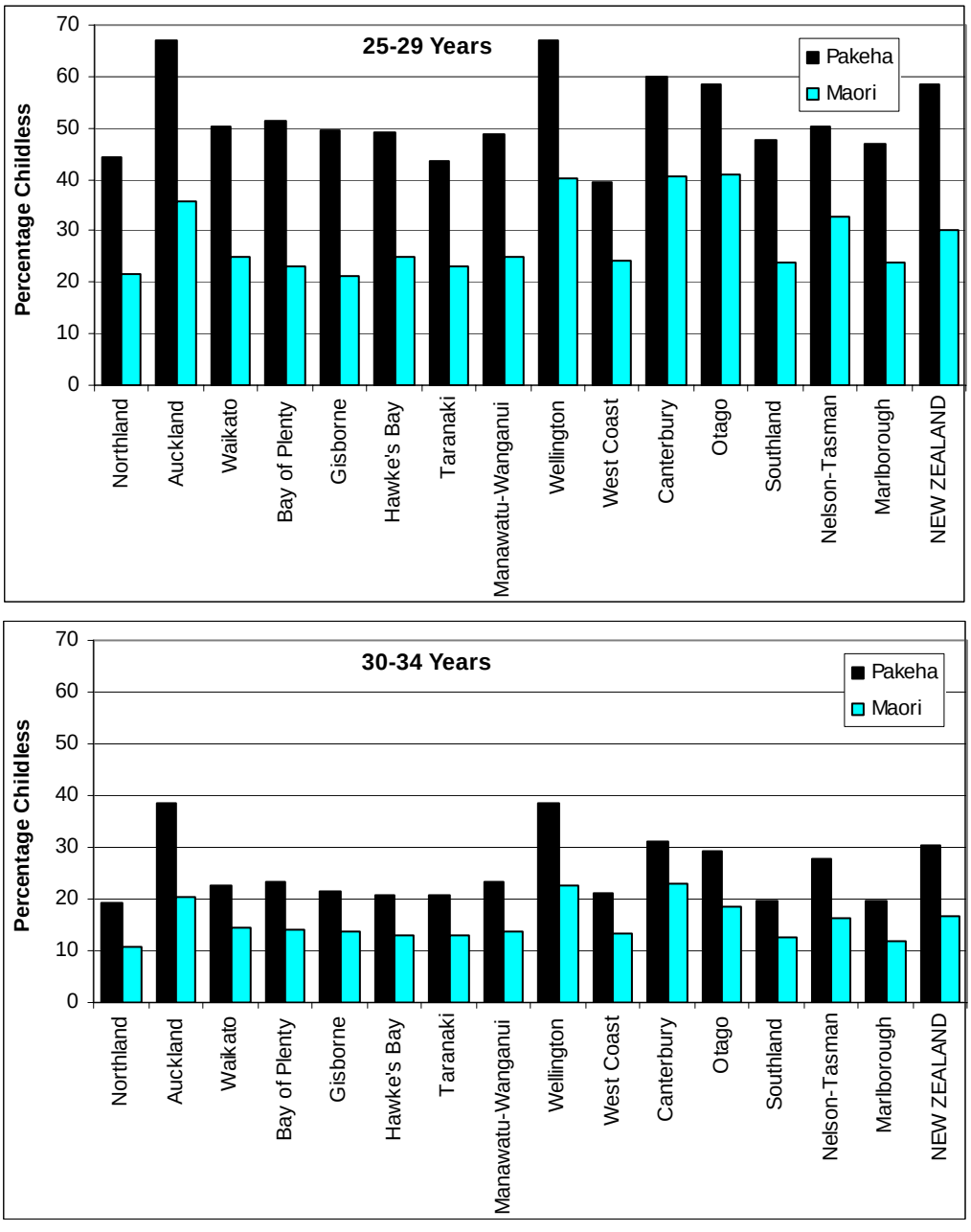
Figure 4 presents regional data on percentages childless at the 25-29 years and 30-34 years age groups for Māori and Pakeha in 1996. The Pakeha proportion of women childless at 30-34 years was very similar to the level at 25-29 years for Māori, reflecting a significant ethnic differential in the timing of childbearing. The only regions that deviated from this trend were in the South Island, where Māori childless rates were higher than elsewhere. For both Pakeha and the national total, at the 30-34 years age group there was a clear division among regions for proportions of childless women. All the North Island regions except Auckland and Wellington had low proportions, as did the West Coast, Southland and Marlborough. For Māori the percentages were particularly low for Northland for the entire 25-34 year age range and for Gisborne at 25-29 years. The percentages were high for the 25-34 year age group for Auckland, Wellington and Canterbury, and for Otago at 25-29 years.

The analysis so far has shown that there are marked patterns of regional polarisation in childlessness (also see Appendix Table 1). The ranges in 1996 at 25-29 and 30-34 years are

[19] In 1996, Wellington Central had 43 per cent childless whereas the other three urban areas in the region had a level around 29 per cent.
[20] In 1996, Central Auckland had 40 per cent childless, North Shore 35 per cent, Western Auckland 30 per cent and Southern Auckland 29 per cent.

highly significant where at age 30-34 the highest levels were double the lowest. More than one-third of all Wellington women were childless, but only one-sixth of those in Northland were. This differential is not only a Pakeha phenomenon, it is important to note that one-fifth of all Māori women aged 30-34 years in Auckland, Wellington and Canterbury are also childless, a level higher than for the total population of any region in 1981. At 35-39 years the differences are less, this is most likely a function of the lower ranges seen for the women now nearing the end of their reproductive span. In 1981 the range between the highest and lowest regions for 30-34 years had been only nine percentage points, but by 1996 the range was almost 19 percentage points. In this context, it is also important to recognise that childlessness is more prevalent in the demographically larger regions and that this has a substantial influence on national levels.

Figure 4: Percentage of Women Aged 25-29 and 30-34 Years who are Childless by Ethnicity and Region, 1996



Average Number of Children per Woman

For New Zealand in 1996 the average number of children per women was 1.9, for Pakeha it was 1.8, for Māori it was 2.6, for Pacific Island People 2.6 and for Asians only 1.8. The large difference between Māori and Pakeha can be partially attributed to the earlier childbearing of Māori, who have a higher number of children on average in all age groups (Table 10). For regions (Table 11) and nationally their reproductive patterns push up the overall average slightly. Over the period 1981 to 1996 there was a large reduction in the average number of children per women by age at all the quinquinnial age groups 15-29 years.

Table 10: Average Number of Children per Woman[1] by Ethnicity and Age Group, New Zealand, 1981 and 1996

Age Group (years)	Pakeha		Māori		Total	
	1981[2]	1996	1981[2]	1996	1981	1996
15-19	[0.05]	[0.03]	0.2	0.1	0.1	[0.05]
20-24	0.5	0.2	1.2	0.8	0.5	0.3
25-29	1.4	0.7	2.3	1.6	1.5	0.9
30-34	2.1	1.5	3.2	2.4	2.2	1.7
35-39	2.6	2.1	3.8	2.8	2.7	2.2
40-49	3.0	2.3	4.2	3.1	3.1	2.4
50+	2.6	2.8	4.1	3.9	2.7	2.9

(1) Only those who specified number of children are included in denominator.
(2) Pakeha in 1981 is Pakeha Only and Māori is 50% or more Māori.

Taking the overall average completed family size for the total population, only Auckland[21], Wellington[22], Canterbury and Nelson-Tasman had an average below the New Zealand level (Table 11). For the total population, the region with the highest average completed family size was Gisborne followed by Taranaki. The only two regions with figures below the New Zealand level for Pakeha were Auckland and Wellington. For Pakeha, the regions with the highest figures were Taranaki and Southland followed by Waikato, Gisborne, Manawatu-Wanganui and West Coast. Except in Auckland and Wellington, the average completed family size for Māori women in North Island regions was high, all the regions in the South Island had levels below the New Zealand level.

Once again, it is important to point out that there is some degree of polarisation. As the completed family size represents cumulative levels of fertility at the end of the reproductive span, this rate is more blunt than was the case for childlessness at say 25-29 and 30-34 years.

At the 30-34 year age group the average number of children was higher in 1981 and the rates then dropped between then and 1996 being 2.2 and 1.7 children per women respectively (see Appendix Table 2). Despite the decline the ranges between the regions went up from 0.5 to 0.8 respectively. This was true for all younger ages 20-34 years. The highest regions in 1996 were close to the national level for New Zealand in 1981. At older ages, in contrast, the levels in 1981 and 1996 were much closer, reflecting the fact that during the Baby Boom these differentials declined (Department of Statistics 1986).

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[21] There is variation within the four urban areas of Auckland with the lowest being 1.6 children per women in Central Auckland with Northern Auckland being 1.7, 1.9 in Western Auckland and 2.0 in South Auckland.

[22] There is significant variation within the four urban areas of Wellington varying from 1.5 children per women in Wellington Central to 2.2 in Porirua with Upper and Lower Hutt being 1.9.

Table 11: Average Number of Children for Woman Age Standardised[1] and Average Completed Family Size[2] by Ethnicity and Region, 1996

Region	Average Number of Children			Average Completed Family Size		
	Pakeha	Māori	Total	Pakeha	Māori	Total
Northland	2.0	2.8	2.2	2.4	3.2	2.6
Auckland	1.6	2.4	1.8	2.1	3.0	2.3
Waikato	2.0	2.8	2.1	2.5	3.3	2.6
Bay of Plenty[3]	1.9	2.8	2.1	2.4	3.3	2.6
Gisborne	2.0	2.8	2.3	2.5	3.2	2.8
Hawke's Bay	1.9	2.8	2.1	2.4	3.4	2.6
Taranaki	2.1	2.7	2.1	2.6	3.2	2.7
Manawatu-Wanganui	2.0	2.7	2.1	2.5	3.2	2.6
Wellington	1.7	2.4	1.8	2.2	2.9	2.3
West Coast	2.1	2.5	2.1	2.5	2.7	2.6
Canterbury	1.8	2.2	1.8	2.3	2.7	2.3
Otago	1.9	2.3	1.9	2.4	2.8	2.4
Southland	2.1	2.6	2.1	2.6	3.0	2.6
Nelson-Tasman	1.9	2.2	1.9	2.3	2.5	2.3
Marlborough	2.0	2.5	2.0	2.4	3.0	2.4
New Zealand	**1.8**	**2.6**	**1.9**	**2.3**	**3.1**	**2.4**
Range	*0.5*	*0.6*	*0.5*	*0.5*	*0.8*	*0.5*

(1) Age Standardised to the Total Female Population in 1996 for New Zealand. Only those who specified number of children are included in denominator.

(2) Average Number of children for females aged 40-49 years. Only those who specified number of children are included in denominator.

(3) Eastern Bay of Plenty had an average completed family size for the total of 2.9 children per women and Western Bay of Plenty had 2.5.

4.4 Mortality

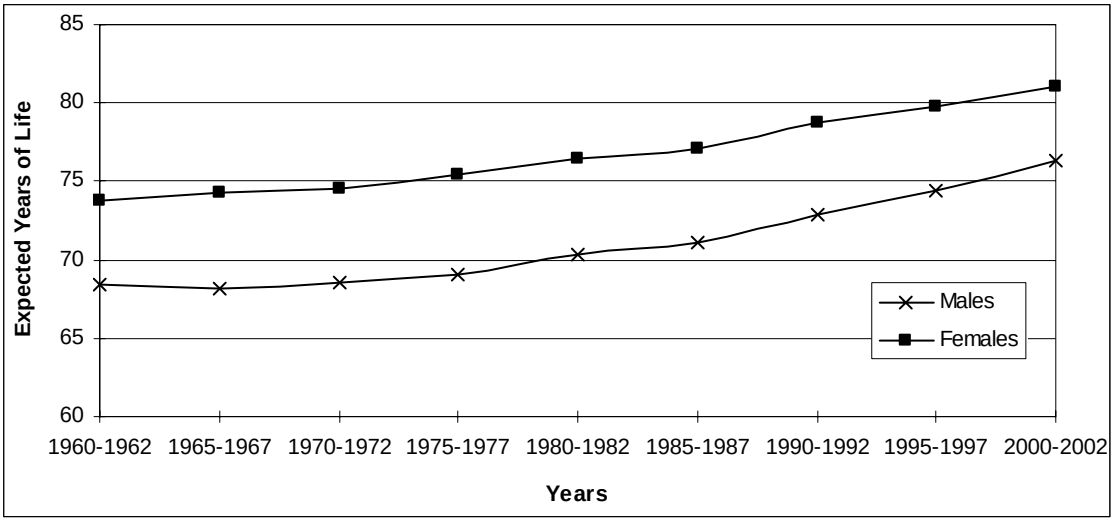
We turn now to the second aspect of population dynamics. In this section mortality trends are presented using abridged life tables. These are calculated using deaths averaged for a period of three years around each of the censuses of 1986, 1991, 1996 and 2001 and the usually resident population from the 1986, 1991, 1996 and 2001 Censuses of Population and Dwellings. The life tables were calculated in the Population Studies Centre using unit-record data obtained from New Zealand Health Information Service for 1986, 1991 and 1996 (Pool et al. forthcoming-i), and raw vital data from Statistics New Zealand for 2001. These results will differ a little from Statistics New Zealand life tables for the same regions as a slightly different methodology was used[23]. Māori life table data are presented only for 1996-2000 and then only for larger regions due to small numbers in some regions (Pool et al. forthcoming-i). The tables for the total population largely reflect the experiences of the New Zealand Pakeha population which has had a very different demographic transition from that of Māori (Pool 1991; Pool 1994).

For New Zealand as a whole life-expectation at birth has increased in the post-war period as is shown in Figure 5. This is generally in line with what is happening in other developed

[23] The data used here were purposely not graduated and smoothed before calculating the life tables. We would argue that some of these techniques may eliminate real patterns.

countries, and illustrates the final stages of an "epidemiologic transition". A factor of this transition over the last century or so has been an increase in the ages at which gains in survivorship have been taking place from childhood, to young adult to the middle and late working ages. Today these improvements are occurring increasingly at older ages (Pool 1994; Pool and Cheung 2003; Pool et al. forthcoming-i; Statistics New Zealand 1994).

Figure 5: Life-Expectation at Birth of Males and Females in New Zealand, 1960-2002



Source: Statistics New Zealand (2004), *New Zealand Life Tables 2000-02,* Statistics New Zealand, Wellington: Table 2.01.

The normal gap in life-expectation at birth between genders is seen in every region as is shown in Table 12, but there were differences in the sex-range. In the 2000-02 period, life-expectation at birth for males ranged from a low of 72.3 years in Gisborne to 77.0 years in Auckland[24]. For females, the range was slightly less with a low of 78.3 years, again in Gisborne, to a high of 81.6 years in Auckland. Gisborne is the most disadvantaged region, with life-expectancy at birth over one year lower for each gender than for the next worst region, Northland. Other regions which are lower than overall New Zealand levels by more than a year are Manawatu-Wanganui and Southland, and the West Coast for males only. In 2000-02, the regions which had higher levels than the overall New Zealand levels of expectancy for both males and females were Auckland, Wellington, Canterbury, Otago and Tasman/Nelson/Marlborough.

[24] The variations in the Auckland region for its Territorial Authorities in 2000-02 were significant, going from a high in North Shore City of 79.1 for males and 83.6 for females to a low in Papakura District of 76.2 for males and 79.8 for females. Other Territorial Authorities which were also low were Franklin District and Manakau (males). Rodney District also tended high. (Statistics New Zealand 2004: Table 4.01).

Table 12: Life-Expectation at Birth by Gender and Region, 1985-87 – 2000-02

Region	1985-87		1990-92		1995-97		2000-02	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**
Northland	70.4	76.5	71.6	78.1	72.4	78.1	73.7	79.6
Auckland	71.6	77.4	73.3	79.2	74.7	79.8	77.0	81.6
Waikato	70.6	77.3	72.0	78.0	74.1	79.7	75.6	80.6
Bay of Plenty[1]	70.7	76.3	72.2	77.8	72.7	78.9	75.1	80.2
Gisborne	69.9	76.1	71.2	76.4	70.2	75.9	72.3	78.3
Hawke's Bay	70.7	76.1	71.7	78.1	72.9	78.4	75.0	79.7
Taranaki	71.9	76.9	72.6	78.6	74.6	80.0	75.7	80.5
Manawatu-Wanganui	70.6	76.5	72.5	77.8	73.6	78.8	74.9	79.7
Wellington	71.3	77.2	72.7	78.6	74.5	79.5	76.4	81.2
West Coast	67.9	75.1	70.6	77.3	72.2	78.4	74.2	80.8
Canterbury	71.4	77.6	73.0	79.2	74.7	80.2	76.7	81.8
Otago	71.5	77.7	73.7	79.3	74.5	80.1	76.6	81.4
Southland	69.9	75.6	70.8	77.7	73.0	78.7	74.2	79.9
Tasman/Nelson/Marl	72.4	78.3	74.2	80.1	74.9	79.7	76.5	81.0
New Zealand	**71.2**	**77.1**	**72.7**	**78.6**	**74.1**	**79.5**	**76.0**	**80.9**
Range	*4.5*	*3.2*	*3.6*	*3.7*	*4.7*	*4.3*	*4.7*	*3.5*

(1) Within the Bay of Plenty there is a notable difference between Western Bay of Plenty and Eastern Bay of Plenty with Western Bay of Plenty having a life expectancy at birth for 1995-97 of 74.8 and 80.7 years for males and females respectively and Eastern Bay of Plenty 71.1 and 76.5 years respectively.

Note: The numbers are different to Statistics New Zealand official life tables (see footnote 23).

Sources: New Zealand Health Information Service, Mortality Data 1985-1997.
Statistics New Zealand, 1986-2001 Censuses of Population and Dwellings.
Statistics New Zealand, Vital Statistics 2000-02.

The fifteen-year period covered by Table 12 gives an indication of long-term trends in life-expectation at a sub-national level. As is true in most Western developed countries, for the total New Zealand population life-expectation at birth has increased over the fifteen-year period, in our case by 4.8 years for males and 3.8 years for females. The more rapid change for males compared to females, is also a newly emerging trend across a number of developed countries (Pool and Cheung 2002). Finally, the ranges shown here although small are similar to those experienced across many Western developed countries.

There were, however, differences in this trend with smaller changes, especially for males, in the regions in which Māori predominate[25]. In this regard an interesting contrast can be observed by comparing Gisborne and the West Coast. These regions both had low levels of life expectation at birth in 1985-87, but where levels of life expectancy for the West Coast had improved significantly over the fifteen-year period, for Gisborne levels only changed by two years. Notably, Gisborne had also been alone among regions in showing deterioration between 1990-92 and 1995-7 (see Table 12).

The next section turns to survivorship probabilities. Over the last 150 years New Zealand, along with other Western Developed Countries has also gone through a survivorship transition, starting first at younger ages and then moving up to older and older ages. The data

[25] Māori life expectation is discussed separately later in this section.

on survivorship shown below relates only to the most recent phase of this survivorship transition, by the 1980s most of the gains at younger ages had been made, leaving room for change only at older and older ages (Pool 1994; Pool and Cheung 2003).

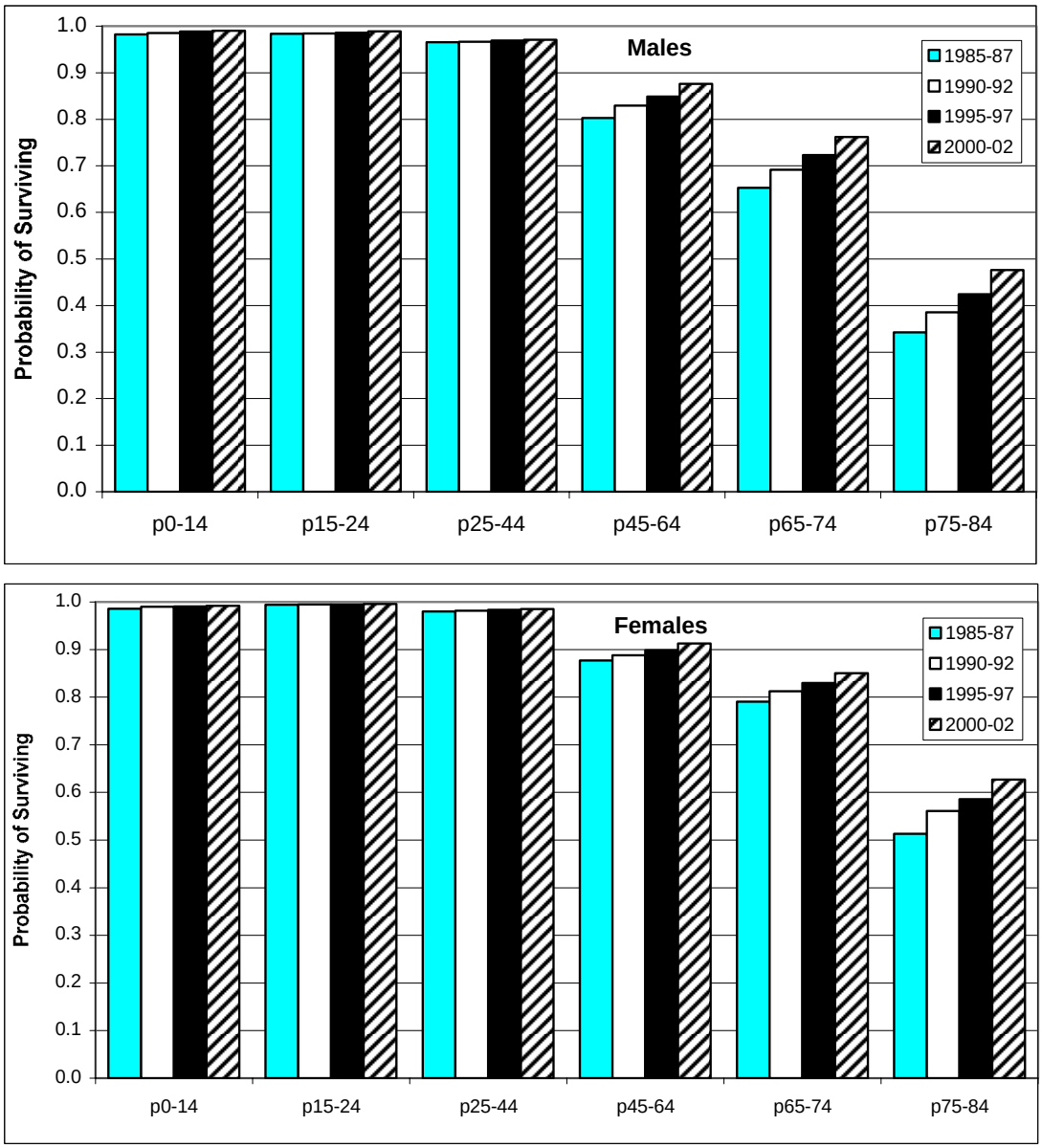
The male and female probabilities of surviving through functional age groups for each region are detailed in Appendix Table 3. The regions follow the national trends shown in Figure 6. This may, with minor exceptions, be more an artefact of random fluctuations than of real trends. Probabilities by age improve over time, and in some cases there were accelerated gains especially at ages 45-64 and 65-74 years from 1996 to 2001. Regional survivorship probabilities (px) vary by age and gender, but generally fit with what is expected with males lower than females and with decreases by age in the probability of surviving (Figure 6). Those for women more or less follow an inverted U-shaped curve with slightly lower probabilities at 0-14 years, higher at 15-24 years, and then lower thereafter. For men, with minor exceptions the probability at 0-14 years was higher than the probability at 15-24 years because of the higher accident mortality at youth ages. Between 1986 and 2001 there were increases in the probabilities of surviving with this being more marked at older ages, at younger ages there is little room for further gains.

Generally, southern and metropolitan regions have high survivorship probabilities by age. Compared with other regions Gisborne had notably lower rates at each age group for both genders (see Appendix Table 3). In contrast, South Island regions, except for the West Coast, tended to have higher probabilities of survivorship in each age group.

The early working age groups have not experienced major changes in survival probabilities over the fifteen year period, simply because, as we noted earlier, gains at these ages had already occurred in the past and thus any real improvements can only occur instead at older ages. Over the period 1986-2001 at the 45-64 years and 65-74 years age group, there were sizable improvements in the probability of surviving, especially for males. However, the survival of middle-aged Māori, especially Maori males, falls well below that of middle-aged Pakeha. Some regions in which Māori are concentrated show gains at 45-64 years, but there is a gap between the improvements in survivorship in these regions and New Zealand as a whole. For the Gisborne area, actual declines in survivorship occurred in the 25-44 years age group.

As Figure 6 indicates, it is from age 45 years and above that significant trends and differences become apparent. In contrast, survivorship at ages 0-44 years is almost, but not quite, 100 per cent, and inter-regional ranges are low (see Appendix Table 3). As the median age of death is now 75.5 years for males and 81.4 years for females in 2002, a failure to survive beyond "three score and ten years" can be taken to indicate "premature" mortality. Thus the survivorship probabilities for age groups 45-64 years and 65-74 years are looked at in more detail here.

Figure 6: Probability of Surviving by Age and Gender, New Zealand, 1985-87 and 2000-02



Sources: New Zealand Health Information Service, Mortality Data 1985-1997.
Statistics New Zealand, 1986-2001 Censuses of Population and Dwellings.
Statistics New Zealand, Vital Statistics 2000-02.

Currently, the probabilities of surviving age-ranges 45-64 and 65-74 years, given in Table 13, show some distinctive regional patterns. Gisborne has the lowest probability of surviving for both the age groups and genders in 2000-02. Northland and Southland also have lower probabilities of surviving, but not at the levels of Gisborne. Otago had the highest probability of surviving at 45-64 years, with Tasman/Nelson/Marlborough, Canterbury and Auckland also being higher. At 65-74 years Tasman/Nelson/Marlborough was highest for males, and Canterbury for females, though both were high for either gender. Auckland and Taranaki were also high for males.

Table 13: Probability of Surviving for 45-64 and 65-74 Years, by Gender and Region, 2000-02

Region	p45-64		p65-74	
	Males	Females	Males	Females
Northland	0.839	0.890	0.740	0.834
Auckland	0.887	0.921	0.777	0.855
Waikato	0.871	0.901	0.760	0.855
Bay of Plenty	0.864	0.901	0.765	0.858
Gisborne	0.833	0.855	0.687	0.822
Hawkes Bay	0.863	0.905	0.749	0.837
Taranaki	0.877	0.915	0.778	0.857
Manawatu Wanganui	0.866	0.904	0.737	0.830
Wellington	0.881	0.917	0.752	0.842
West Coast	0.855	0.921	0.745	0.823
Canterbury	0.886	0.920	0.775	0.869
Otago	0.888	0.926	0.767	0.841
Southland	0.859	0.896	0.718	0.819
Nelson-Marlborough	0.886	0.925	0.790	0.867
New Zealand	**0.877**	**0.913**	**0.762**	**0.851**
Range	*0.055*	*0.071*	*0.102*	*0.050*

Māori

As stated previously the rates for Māori are difficult to compute and analyse because of problems with small cell sizes. To counter these effects, in this section a five-year average is used and the data relate to larger regions only. This work is extracted from a study looking at health (Pool et al. forthcoming-i). Issues around comparability of definitions between different data sources and over time are also discussed there. Only the most recent period is shown here to provide a general indication of how Māori compare to the overall population.

When comparing the probability of surviving and life-expectancy at birth for Māori 1996-2000 as shown in Table 14 to the overall New Zealand rate for 2000-02, Maori levels in every region fall below the total New Zealand rate. The South Island does systematically better than the North Island regions especially Northland. But as Table 14 shows South Island Māori are still worse off than the total population of the South Island (which generally reflects Pakeha experiences).

The ranges between the regions are very marked for the data on life-expectancy at birth. This is somewhat surprising given that the South Island is counted as one region, a factor that will have dampened down extremes. Even looking at the range for the North Island regions, this is larger than that for the total population. The ranges for the probabilities of surviving over the age of 45 are much larger for the Māori population than for the total, but at younger ages the differences are less.

Table 14: Probability of Surviving and Life-Expectancy at Birth for the Māori Population by Gender and Region, 1996-2000

Region	Life-exp. at birth	Probability of Surviving					
		p0-14	p15-24	P25-44	p45-64	p65-74	p75-84
	Males						
Northland	63.1	0.973	0.972	0.931	0.597	0.521	0.231
Auckland	68.5	0.985	0.985	0.950	0.716	0.586	0.289
Waikato (excl. Taupo)	65.7	0.986	0.980	0.929	0.655	0.526	0.284
Bay of Plenty/Taupo	65.2	0.980	0.977	0.922	0.668	0.542	0.286
Hawke's Bay/Gisborne	65.4	0.985	0.979	0.913	0.649	0.566	0.265
Taranaki/Wanganui/Manawatu/ Wellington	68.1	0.986	0.986	0.951	0.700	0.569	0.288
South Island	74.0	0.989	0.988	0.965	0.777	0.694	0.436
New Zealand	**67.1**	**0.984**	**0.983**	**0.941**	**0.686**	**0.569**	**0.292**
Range	*10.9*	*0.016*	*0.016*	*0.052*	*0.180*	*0.173*	*0.206*
	Females						
Northland	68.9	0.979	0.987	0.958	0.724	0.600	0.374
Auckland	73.3	0.988	0.995	0.970	0.786	0.681	0.462
Waikato (excl. Taupo)	70.8	0.984	0.991	0.964	0.770	0.640	0.309
Bay of Plenty/Taupo	71.1	0.985	0.990	0.965	0.752	0.611	0.421
Hawke's Bay/Gisborne	70.9	0.985	0.994	0.964	0.749	0.639	0.382
Taranaki/Wanganui/Manawatu/ Wellington	72.8	0.988	0.993	0.973	0.777	0.665	0.419
South Island	77.8	0.991	0.995	0.980	0.861	0.766	0.645
New Zealand	**72.1**	**0.987**	**0.993**	**0.969**	**0.774**	**0.654**	**0.423**
Range	*8.9*	*0.012*	*0.008*	*0.021*	*0.137*	*0.167*	*0.336*

Source: (Pool et al. forthcoming-i).

4.5 Migration - Total Population

The third dynamic is mobility. There are two ways of measuring net[26] migratory movements using the five-yearly census as a data source. The first is to use the answers given to census questions on places of residence one and/or five years ago. This is a direct method that is very often employed, and has been employed in a companion study (Bedford et al. forthcoming). The advantage of that method is that it allows detailed analysis of the direction of flows and the characteristics of the migrant population. Its disadvantage is that, while it records inflows from both within New Zealand and overseas, it provides data on outflows only to other places in New Zealand, and thus gives no information on those people who have gone overseas.

The second method, the one used in this Paper is termed the "Census Survival Rate". This is an indirect method of measuring migration that takes account of changes in survivorship,

[26] This analysis relates to the net balance between inflows and outflows, over a five year period. It does not cover gross mobility that is all the comings and goings, nor intra-regional mobility. The work in this section built on earlier work done by J. Newell of MERA on a contract to the Population Studies Centre. Following the classical work by Lee et al. (1957), we have chosen the census-survival method over the life table survival method used by Newell (2002) as that technique does not self-correct, and, as it is normally based on official life tables that typically use smoothed data, it may introduce errors.

international and internal migration in both directions, and "self-corrects" for any significant reporting errors (Lee et al. 1957; Shryock et al. 1976). It is used here to show the impact of mobility or population size and structure. Although this is a useful index on the total net mobility of the population, it provides no data on the direction of flows, or information on gains/losses other than into or out of a region. Nor does it directly provide data on other characteristics of the migrant populations.

That said, it is a robust technique widely used in developing counties, where there are age reporting and other errors (Zachariah 1964). Similarly, Brosnan used this method on New Zealand historical data (Brosnan 1986; Pool 1966) and Pool (1966) on Māori rural-urban migration, while Lee and his colleagues, in a classical study (Lee et al. 1957), employed it on United States historical data, including those of lower reliability relating to African-Americans.

The Census Survival Rate uses national cohort data on ages x at year t and ages x+n at year t+n to provide a cohort survival rate. This national rate is applied to a given region to age-group x at time t, and yields an "expected" population aged x+n at time t+n for the given region. This is compared with the enumerated population x+n at time t+n and the difference is assumed to be due to in- or out-migrations from and to all sources/destinations. The assumption is made that any reporting errors inherent in national level data will also occur in the region (Lee et al. 1957). Thus, it is unnecessary to correct for errors in the population data because these errors are in effect "largely excluded from the estimates of net migration" (Shryock et al. 1976) (Appendix Table 4 describes in detail in table notes the methodology). The same logic applies to international migration: the national survival rate is affected by this.

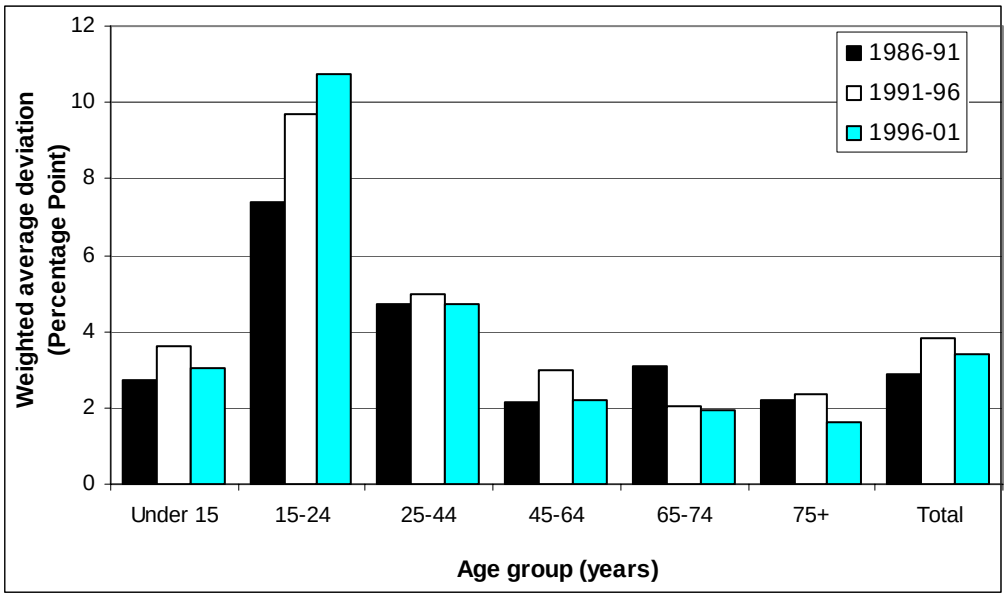
When interpreting the results from this method there are, however, three issues that one must bear in mind. First, ideally and especially in a country like New Zealand subject to appreciable levels of external migration the national census survival ratios should be for a "closed" population; Morrison et al. (2004: 506) suggest the "native" population. We could not easily apply that formula, nor would it be useful in New Zealand's case because the native-born population is itself extremely mobile. Secondly, it is assumed that survival rates are the same for each region as for the whole country. This issue was explored in the previous section of this chapter. While, as we showed, there are differences, fortunately they are not wide at key migration ages and thus they probably have little impact on results. The third assumption relates to errors in coverage at various ages. It is assumed that these errors are the same for each region as for the whole country. This is not considered a major issue: the 1996 Post-Enumeration Sample showed that census coverage is good, and did not point to marked levels of variance (Statistics New Zealand 1998).

Net migration is measured for the three time-periods 1986-91, 1991-96 and 1996-01. Variations between regions at the different age groups over the three time-periods will be investigated. For this, we employ a measure of regional variation around the national average called a weighted average deviation, following the Population Monitoring Group (1989)[27].

[27] This is calculated using the sum of the absolute deviations from New Zealand of the regions weighted according to the proportion of the population in the regions. Weighting according to population gives more weight for larger regions' deviations away from New Zealand. This weighted average deviation is then used to calculate how many deviations a region is away from New Zealand.

The age group with the largest variance was 15-24 years and these differences have gone up over time as is evident in Figure 7. Migration levels at this age group are double those at any other, as young people at this life-cycle stage leave school and home, making choices among other things of where they will go on to tertiary education and work. The age group which was the next most mobile was at 25-44 years. For all ages combined variance in the mobility of the population reached its peak in 1991-96.

Figure 7: Net Migration Weighted Average Deviation[1] (Percentage Point) for the Regions, by Age Groups, 1986-91, 1991-96 and 1996-01



(1) Sum of the absolute deviations from New Zealand of the regions weighted according to the proportion of the population of the region (Population Monitoring Group 1989).

Table 15 shows that there are five regions which had net inflows for the total population in all three periods: Auckland[28], the Bay of Plenty[29], Nelson-Tasman, Marlborough and Canterbury, with Auckland having consistently high increases across all three periods[30]. All the other regions suffered outflows during all the three periods. The three regions with the largest losses are Southland, Gisborne and the West Coast.

[28] Looking at net migration of the four urban areas of Auckland there are some small differences in the overall figure of five, eight and four percentage points difference between the highest and lowest areas for the three periods respectively. The North Shore had the highest net migration over all three periods with the other three urban areas having different ranks in each periods. By age Auckland Cental had substantially higher net migration than the other three regions in the 15-24 years age group and North Shore for the under 15 years age group.

[29] There are substantial differences within the Bay of Plenty region with Western Bay of Plenty having positive net migration of 10 per cent or more for the three periods, whereas Eastern Bay of Plenty had negative net migration levels of four to eight per cent. Generally the Eastern Bay of Plenty loses people in all age groups, whereas the Western Bay of Plenty gains people at all ages except 15-24 years.

[30] This was true for the Total population, but the Māori population had significant outflows 1986-91 in the period of restructuring, an issue to which we will return later (Pool et al. forthcoming-d; see also Pool and Honey 1998). There were low inflow rates 1991-96, and zero changes for Māori in 1996-2001.

Table 15: Net Migration All Ages Combined, as a Percentage of the Initial Population, by Region, 1986-91, 1991-96 and 1996-2001

Region	1986-91	1991-96	1996-2001
Northland	-1.9	-0.4	-1.7
Auckland	4.4	5.3	4.4
Waikato	-1.4	-2.5	-1.9
Bay of Plenty	2.7	1.9	2.9
Gisborne	-8.6	-5.8	-9.0
Hawke's Bay	-4.6	-4.1	-3.3
Taranaki	-5.2	-7.5	-6.3
Manawatu-Wanganui	-2.4	-5.3	-6.7
Wellington	-1.3	-3.8	-1.1
West Coast	-7.8	-4.3	-9.2
Canterbury	0.2	1.4	1.0
Otago	-1.8	-0.7	-2.8
Southland	-7.8	-9.9	-9.1
Nelson-Tasman	2.1	5.1	3.7
Marlborough	2.8	3.2	1.1

When looking at the regional patterns by age there are a number of interesting patterns. In Table 16 (see also Appendix Table 4), regions with significant gains and losses are identified. A first group of regions, the so-called "sunshine" regions of the Bay of Plenty, Nelson-Tasman and Marlborough, gained people at all age groups except 15-24 years, where instead there were significant losses. Among regions with retirement zones, Northland has a slightly different pattern, with gains at age groups 45 years and over, but losses at 15-24 years, resulting overall in no significant changes due to net migration in its population numbers.

Secondly, there are the regions that include a large metropolitan area: Auckland, Waikato, Hawke's Bay (Napier-Hastings), Wellington, Canterbury and Otago. Firstly, there is Auckland where there were significant gains in the number of people aged less than 45 years, producing a large overall migration inflow. Waikato and Canterbury showed no significant gains or losses at any age groups except 75 years and over, where in each case there were gains in one period. Otago in contrast, was much more varied with inflows at the 15-24 years of age, but outflows at 25-44 years, a function of students going there to study and then leaving after completion. Other age groups lost people, but the overall figure was slight. Wellington saw major outflows at all age groups 45 years and over, with losses also occurring at the under 15 and 25-44 years age groups, though these were not always significant. Across most age groups Hawke's Bay lost people, the only exception being 65 years and over for the period 1986-91.

Finally there are the other regions that are generally more rural. Of these, Gisborne, West Coast and Southland had significant outflows at most if not all age groups, over all three periods, with the losses being greatest for the 15-24 years age group. This general point also applies to Taranaki though only for those ages under 65 years. Manawatu-Wanganui showed losses at all age groups over the last two periods, with its largest outflow being at 25-44 years for reasons similar to those noted for Otago.

Table 16: Net Migration: Regions that Gained and Lost People[1], by Age Group and Region, 1986-91, 1991-96 and 1996-01

Region	Age group (years)						
	Under 15	15-24	25-44	45-64	65-74	75+	Total
	1986-91						
Northland	-	L	-	G	G	G	-
Auckland	G	G	G	-	-	-	G
Waikato	-	-	-	-	-	G	-
Bay of Plenty	-	L	-	G	G	G	-
Gisborne	L	L	L	L	L	L	L
Hawke's Bay	L	L	L	-	G	-	L
Taranaki	L	L	L	-	-	-	L
Manawatu-Wanganui	-	-	L	-	-	-	-
Wellington	-	-	-	L	L	L	-
West Coast	L	L	L	L	L	L	L
Canterbury	-	-	-	-	-	-	-
Otago	-	-	L	-	-	-	-
Southland	L	L	L	L	L	L	L
Nelson-Tasman	G	-	-	G	G	-	-
Marlborough	-	L	-	G	G	G	-
	1991-96						
Northland	-	L	-	G	G	-	-
Auckland	G	G	G	-	-	G	G
Waikato	-	-	-	-	-	-	-
Bay of Plenty	-	L	G	G	G	G	-
Gisborne	-	L	-	L	L	L	L
Hawke's Bay	-	L	-	-	-	-	L
Taranaki	L	L	L	L	-	-	L
Manawatu-Wanganui	L	-	L	L	-	L	L
Wellington	L	-	L	L	L	L	-
West Coast	-	L	-	-	L	L	L
Canterbury	-	-	-	-	-	-	-
Otago	-	G	L	-	-	-	-
Southland	L	L	L	L	L	L	L
Nelson-Tasman	G	-	G	G	-	-	G
Marlborough	G	L	G	G	G	-	-

(continues on next page)

Table 16: (continued)

Region	Age group (years)						
	Under 15	15-24	25-44	45-64	65-74	75+	Total
	1996-2001						
Northland	-	L	-	G	-	-	-
Auckland	G	G	G	-	-	-	G
Waikato	-	-	-	-	-	-	-
Bay of Plenty	-	L	G	G	G	G	-
Gisborne	L	L	L	L	L	L	L
Hawke's Bay	-	L	-	-	-	-	-
Taranaki	L	L	L	L	-	-	L
Manawatu-Wanganui	L	-	L	L	-	-	L
Wellington	-	-	-	L	L	L	-
West Coast	L	L	L	L	-	L	L
Canterbury	-	-	-	-	-	G	-
Otago	-	-	L	-	-	L	-
Southland	L	L	L	L	L	L	L
Nelson-Tasman	G	-	G	G	G	G	G
Marlborough	-	L	-	G	G	G	-

G – Gain, L – Loss

(1) G = those for which the net migration exceeded one weighted average deviation (see Figure 7) from New Zealand in a positive direction. L = those for which net migration exceeded one weighted average deviation from New Zealand in a negative direction.

Source: Appendix Table 4.

4.6 Migration - Māori Population[31]

The census survival ratio method has also been used to calculate Māori net migration trends. To repeat an earlier point the problems of consistency between censuses are largely eliminated with the census survival ratio method as it self-adjusts for inter-ethnic mobility differentials and shifts in definition[32] over time. It does assume that the inter-ethnic mobility[33] is uniform across the country, but there is no proof that inter-ethnic mobility is different among the regions. As reported above, this method has been used to analyse net migration of "White" and "African-American" ethnic groups in the United States of America between 1870 and 1950, when age reporting and enumeration of different ethnic groups, especially for African-American was imperfect (Lee et al. 1957).

It is again important to note that the numbers of Māori in some regions are small, especially for the South Island with the exception of Canterbury, so that the results need to be treated with caution[34], due to small changes in numbers potentially causing large percentage shifts. This analysis will therefore aggregate the group 65 years and over, as numbers are

[31] A long-term historical context for this is presented in Bedford and Pool (2004).

[32] A cross-check on the possible effect of these shifts was carried out by comparing two sets of estimations, one for the entire period 1986-96, and the other separately for 1986-91 and 1991-96 (there were separate definitional changes at the censuses of 1986, 1991 and 1996). The directions of the flow in the decennial period and even relative volumes were similar to those for the two quinquennial periods.

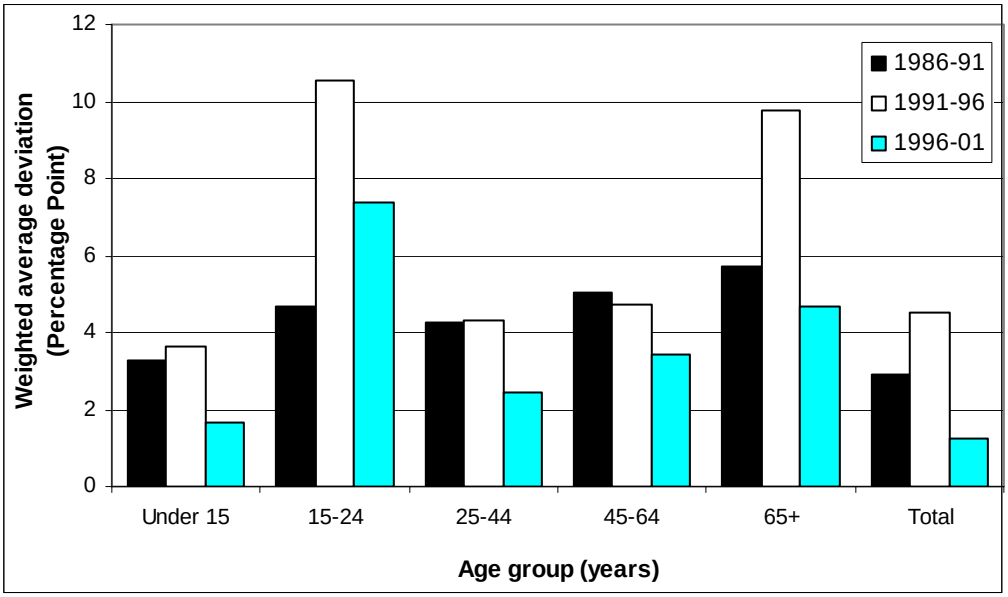
[33] "Category-jumping" between ethnic groups from one census to another.

[34] Pool (1966) had earlier stressed this point in relation to studying migration using Māori data, but numbers have grown very rapidly since that paper of his was written.

particularly small at these ages. This also dampens age-reporting error effects at those ages. With low per cents of the total over 65 years, this has minimal effect on aggregate results.

Māori rates of mobility differ from Pakeha and historically, with the notable exception of the great post-war urban influx, rates have been lower (Pool 1991; especially Poot 1984). These differences are still seen today. The two age groups with the largest variance for Māori are 15-24 years and 65 years and over, as graphed in Figure 8. It appears that between the 1991 and 1996 censuses that largest movement of the Māori population occurred. But beyond this there are other differences in the peak flows for Māori at the ages with the highest levels follow or accompany the restructuring of the late 1980's, early 1990's.

Figure 8: Net Migration, Māori Population, Weighted Average Deviation[1] for the Regions, by Age Groups, 1986-91, 1991-96 and 1996-01



(1) Sum of the absolute deviations from New Zealand of the regions weighted according to the proportion of the population of the region (Population Monitoring Group 1989).

The overall (all ages) net migration patterns for Māori in Table 17 are not as ordered as those for the total population (see also Appendix Table 5). Looking at the major patterns for the regions, Auckland and Waikato had no significant gains or losses in overall net migration, Northland saw gains for the period 1986-91, then loss in the 1991-2001 periods, while Otago had gains for the first two periods and a loss for the last. Gisborne, Hawke's Bay and Wellington lost Māori the first two periods 1986-91 and 1991-96, but there were gains in 1996-2001. Other important regions are somewhat more ordered, these were mainly gains for the Bay of Plenty and Canterbury, and mainly losses for Taranaki, Manawatu-Wanganui and Southland.

The patterns by age generally follow those for the overall Māori population. A major exception is the age group 15-24 years. Most regions without major tertiary education facilities lost people aged 15-24 years for all three periods. In the 25-64 year age groups Northland, the Bay of Plenty and Gisborne had inflows in the 1986-91 and 1996-2001 periods with Northland's and the Bay of Plenty's inflows being sizable, and Gisborne experiencing a sizable inflow in the last period (1996-2001). In the 1991-96 period Northland saw an inflow, while the Bay of Plenty showed little change, whereas Gisborne experienced a sizeable outflow.

Table 17: Net Migration, Māori Population: Regions that Gained and Lost People[1], by Age Group and Region, 1986-91, 1991-96 and 1996-01

Region	Age group (years)					
	Under 15	15-24	25-44	45-64	65+	Total
			1986-91			
Northland	G	-	G	G	G	G
Auckland	L	-	-	L	L	-
Waikato	-	-	-	-	-	-
Bay of Plenty	G	-	G	-	-	G
Gisborne	-	L	-	-	-	-
Hawke's Bay	-	L	-	-	-	L
Taranaki	-	L	L	-	-	L
Manawatu-Wanganui	-	-	-	-	-	-
Wellington	L	-	L	L	L	L
West Coast	G	L	L	G	-	-
Canterbury	-	G	-	-	L	-
Otago	G	G	L	-	L	G
Southland	-	L	-	-	-	L
Nelson-Tasman	G	G	G	G	L	G
Marlborough	G	-	G	G	-	G
			1991-96			
Northland	-	L	-	-	L	-
Auckland	-	-	-	-	-	-
Waikato	-	-	-	-	-	-
Bay of Plenty	-	-	-	-	-	-
Gisborne	L	L	L	L	L	L
Hawke's Bay	L	L	L	L	L	L
Taranaki	-	-	-	-	-	-
Manawatu-Wanganui	L	-	L	-	-	L
Wellington	L	-	-	L	-	-
West Coast	G	-	G	G	G	G
Canterbury	G	G	G	G	G	G
Otago	G	G	G	G	G	G
Southland	L	L	-	-	G	-
Nelson-Tasman	G	G	G	G	G	G
Marlborough	G	-	G	G	G	G

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Table 17: (continued)

Region	Age group (years)					
	Under 15	15-24	25-44	45-64	65+	Total
	1996-2001					
Northland	-	L	G	G	G	L
Auckland	L	G	-	L	L	-
Waikato	-	-	-	-	-	-
Bay of Plenty	-	-	G	G	-	-
Gisborne	-	L	G	G	-	-
Hawke's Bay	G	-	G	-	-	-
Taranaki	-	L	-	-	G	L
Manawatu-Wanganui	L	-	L	-	-	L
Wellington	-	-	-	-	-	G
West Coast	L	L	L	-	-	L
Canterbury	G	-	-	L	L	-
Otago	-	G	L	L	L	L
Southland	L	L	L	L	-	L
Nelson-Tasman	G	-	G	-	L	G
Marlborough	G	L	-	G	-	-

G – Gain, L – Loss

(1) G = those for which the net migration exceeded one weighted average deviation (see Figure 7) from New Zealand in a positive direction. L = those for which net migration exceeded one weighted average deviation from New Zealand in a negative direction.

Source: Appendix Table 5.

5. Components of Regional Growth

Earlier, this paper separately reviewed the different components of growth, the factors of natural increase, and international and internal migration, which contribute to changing overall population sizes and distributions. This last section of the paper comprises an accounting exercise in which the relative contributions of these different components are assessed producing annual rates reported in Table 18 (for numbers see Appendix Table 6). It is based on analyses of some of these factors explored in earlier sections of this paper, as well as employing some of the data on internal migration[35], the flows of which are to be covered in more detail elsewhere (Bedford et al. forthcoming).

[35] This section of the chapter is drawn from Pool et al. (2004). The net migration estimates used there and in this paper include both domestic and international inflows and outflows, while census data on residence five-years ago to be used elsewhere (Bedford et al. forthcoming) can be analysed only for inflows, domestic and international, and outflows within New Zealand. The method for this paper was as follows:

1. We subtracted from the net migration computed by the census survival method, the inflows and outflows to a given region to and from all New Zealand regions of origin and destination (data source: residence five years ago). The residual was seen as the net international migration.
2. From this figure for net international migration we subtracted the international inflows (residence overseas five years ago) to estimate the outflows to overseas destinations.

Table 18: Average Annual Rates of Regional Growth and their Components (per 1,000), 1986-91, 1991-96 and 1996-2001

Region	Population Growth[1]	Natural Increase			Migration		
		CBR	CDR	RNI	International	Internal	Total
	1986-1991						
Northland	6.4	18.9	8.0	10.9	-4.4	0.6	-3.8
Auckland	15.5	18.2	7.6	10.5	7.4	1.1	8.5
Waikato	6.5	18.2	7.3	10.9	-3.7	1.0	-2.7
Bay of Plenty	14.3	18.1	8.1	10.0	-3.3	8.6	5.3
Gisborne	-6.6	19.8	8.3	11.6	-2.7	-14.7	-17.4
Hawke's Bay	-1.6	17.7	8.7	9.0	-4.8	-4.5	-9.3
Taranaki	-2.5	17.4	8.1	9.3	-4.7	-5.7	-10.4
Manawatu-Wanganui	2.2	17.2	8.9	8.4	-4.1	-0.8	-4.9
Wellington	4.0	17.1	7.8	9.3	0.6	-3.2	-2.7
West Coast	-9.0	16.8	10.1	6.6	-4.3	-11.7	-16.0
Canterbury	3.7	14.4	9.0	5.5	-2.0	2.5	0.5
Otago	-1.1	14.1	9.0	5.0	-3.4	-0.3	-3.7
Southland	-8.4	16.5	8.5	8.0	-6.1	-9.8	-15.9
Nelson-Marlborough	9.1	14.8	8.4	6.4	-1.0	5.6	4.6
	1991-1996						
Northland	15.7	18.3	8.1	10.2	-0.6	-0.2	-0.8
Auckland	25.2	18.2	6.9	11.2	8.9	1.0	9.9
Waikato	11.3	17.5	6.9	10.6	-4.8	-0.2	-4.9
Bay of Plenty	19.2	17.5	8.1	9.5	-4.3	8.0	3.7
Gisborne	6.8	20.9	8.9	11.9	-4.6	-6.7	-11.3
Hawke's Bay	6.4	17.4	8.8	8.7	-4.2	-3.8	-8.0
Taranaki	-1.0	16.2	8.6	7.7	-7.8	-7.3	-15.0
Manawatu-Wanganui	3.5	16.7	8.6	8.1	-7.5	-3.1	-10.5
Wellington	6.8	16.7	7.2	9.6	-4.3	-3.2	-7.5
West Coast	5.9	16.2	9.3	6.9	-4.7	-3.8	-8.5
Canterbury	13.3	13.9	8.6	5.3	0.1	2.6	2.7
Otago	8.4	13.6	8.6	5.0	-2.9	1.5	-1.4
Southland	-5.8	15.5	8.5	7.0	-9.2	-10.9	-20.0
Nelson-Tasman	21.1	14.3	8.2	6.1	2.8	6.8	9.6
Marlborough	17.9	14.0	8.1	5.9	-0.5	6.6	6.1

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Table 18: (continued)

Region	Population Growth[1]	Natural Increase			Migration		
		CBR	CDR	RNI	International	Internal	Total
	1996-2001						
Northland	4.5	15.7	8.2	7.6	-2.4	-0.9	-3.3
Auckland	16.3	17.1	6.4	10.8	8.8	-0.4	8.4
Waikato	4.3	15.9	7.1	8.8	-4.7	0.8	-3.8
Bay of Plenty	13.1	16.4	8.1	8.3	-1.8	7.4	5.5
Gisborne	-8.0	17.8	8.9	8.9	-6.5	-11.8	-18.3
Hawke's Bay	0.2	15.7	8.6	7.0	-3.6	-3.0	-6.6
Taranaki	-7.1	14.3	8.0	6.3	-5.8	-7.0	-12.8
Manawatu-Wanganui	-7.7	15.0	8.5	6.6	-8.1	-5.5	-13.6
Wellington	4.7	15.4	6.9	8.5	-3.2	1.0	-2.1
West Coast	-14.0	13.3	9.2	4.1	-5.2	-13.8	-18.9
Canterbury	5.7	13.0	8.0	5.0	-1.6	3.7	2.0
Otago	-3.9	12.0	8.4	3.5	-7.0	1.2	-5.7
Southland	-12.9	13.8	8.3	5.5	-7.2	-11.5	-18.7
Nelson-Tasman	11.7	12.7	7.8	4.9	0.6	6.6	7.2
Marlborough	6.0	12.2	8.4	3.8	-0.7	2.9	2.2

CBR – Crude Birth Rate = Births/Population*1000
CDR – Crude Death Rate = Deaths/Population*1000
RNI – Rate of Natural Increase = Natural increase/Population*1000
(1) This rate is per 1,000 where the normal convention that growth is presented as a percentage.
Source: Appendix Table 6.

Auckland is the region with the largest population, so not unexpectedly it has experienced the greatest numerical changes (see Appendix Table 6). Indeed, in the most recent quinquennium much of New Zealand's population vitality was being driven, disproportionately, by this region. In the 1996-2001 period it had just over 30 per cent of the total population, but produced 34 per cent of the births, as against only 26 per cent of the deaths, a function in part of its younger age structure (Pool et al. forthcoming-f). It is also the only region with significant net international migration, in 1996-2001, with 54 per cent of the inflows but only 34 per cent of the outflows. Auckland was only one of two regions (the other was Nelson-Tasman) that had positive net international migration. Thus it can be argued that Auckland is the gateway to the country and is the only truly large city in New Zealand. Against this, however, the net internal migration level for Auackland is low, and in the period of 1996-2001, resulted in a loss. Moreover, the net internal migration streams in and out of this region were a disproportionately small fraction (19 per cent) of the national movement. Thus Auckland in a sense has a system of population dynamics that is relatively independent of the rest of New Zealand.

Moreover, Auckland is the only region which had an annual rate of natural increase that has not declined, over the period 1986-2001, and in fact it increased slightly (see Table 18). With decreases in both the crude death and birth rates its rate of natural increase remained relatively stable. In 1996-2001 the Auckland region had one of the highest crude birth rates even though, as we noted earlier, its total fertility rate was similar to the national level. This is because there is a concentration in the metropolis of people of reproductive ages, a result of the in-migration of young workers referred to earlier.

The data in Table 18 on patterns of natural increase and its components of births and deaths, show other definite patterns. There are clear differences between the rates of natural increase as well as crude birth rates between the North and South Islands. The rates in the North Island are higher than in the South. There is also a tendency for rates to be higher in the northern half of the North Island. Not only did rates of natural increase decline in all regions other than Auckland in the time period, but all regions had reductions in their crude birth rate. In contrast, crude death rates showed a different pattern with Auckland, Waikato and Wellington having low rates, mainly as a function of the age-composition, while other regions had higher rates sometimes because of age-compositional factors, sometimes because of their ethnic composition.

Other than Auckland, the regions which gained from international migration were few. Wellington saw in-flows in the period 1986-91, Canterbury 1991-96 and Nelson-Tasman for both 1991-96 and 1996-2001. But these gains were small in size and the rates were low compared to those of Auckland. In contrast, over the period many regions saw increases in internal migration with Northland, Auckland, Waikato, the Bay of Plenty, Canterbury, Nelson-Tasman and Marlborough experiencing this for the period 1986-91. But in 1996-2001 Northland and Auckland shifted to a decrease. In contrast, the Bay of Plenty saw high rates of inflow in every quinquenium, Canterbury, Nelson-Tasman and Marlborough had modest increases, and Otago and Wellington changed from outflow to inflows. In the period 1996-2001 internal migration to the Bay of Plenty, Canterbury and Marlborough were strong enough to offset international outflows, and thus gave them net migration gains from all sources. For Auckland (also Nelson-Tasman to a small degree) international migration counteracted its losses to other New Zealand regions.

In summary, this analysis shows that in every region natural increase is positive. In some regions it outruns the total migration effect. But it is the migration trends that produce the inter-quinquennia fluctuations in growth seen in column one of Table 18 – generally lower growth or decline between 1986 and 1991, an upsurge driven by migration in the period 1991-96 and then a deceleration in the period 1996-2001. In six regions, declines in this last quinquennium were generally more severe than those that had occurred in 1986-91. As the rates of natural increase also decelerated (but, as yet, are negative nowhere) migration, mostly internal outside Auckland, assumes a much more significant role.

6. Conclusion

In terms of the most centrally important demographic factors, growth and its component dynamics, New Zealand's regions are far from equal. Very few are growing relatively quickly, this is for two different reasons: either because of economic changes resulting from the concentration of industries and population in fewer and fewer metropolitan areas, increasingly in Auckland; or because of retirement migrations to sun-belt destinations. Most regions, however, are stagnating and some are declining. The significance of this increasing concentration in Auckland for all national demographic, social and economic dynamics cannot be overrated.

The causes of increase for metropolitan areas historically related to natural increase, but also to net in-migration both from elsewhere in New Zealand and from overseas, however, today and especially in Auckland overseas flows are a more critical factor. The younger age

structure of Auckland also ensures higher birth rates, even though fertility is low in some sub-regions of that metropolis. Mortality levels are also marginally lower.

The "sun-belt" regions have not only been subject to in-flows of retirees, but have also been subject to younger working age adults coming into service occupations, and bringing along with them passive migrant children. In the North Island these same regions are also affected by the dynamics of the significant Māori minorities found there. The better survivorship relative to their ages enjoyed by well-off retirees is mediated by the less favourable patterns suffered by Māori.

The remainder of New Zealand has seen a mix of fertility patterns, higher where Māori are concentrated, and significantly lower in the South Island. Similarly survivorship levels differ, generally higher towards the South but lower where Māori are concentrated. Out-migration at younger adult ages, sometimes marked, also typifies these regions. Within this grouping, peripheral location and higher proportions of Māori are likely to produce more marked deviations from the patterns seen in New Zealand as a whole. The survivorship levels, higher in the metropolis and in the South, lower in peripheral rural regions, are indications of health and social differentials that will be seen latter in this study.

This paper on population dynamics provides a set of results that fit with other demographic, social and economic trends. It relates closely to other factors in this study from which this paper is drawn. Few regions in New Zealand are growing, certainly not rapidly. Yet, paradoxically, the regions with slow growth or stagnation have positive levels of natural increase mainly occasioned by fertility rates that above national norms, and in spite of survivorship levels are below country-wide rates. These are the very regions subject to high levels of out-migration, in Gisborne, West Coast and Southland. In contrast, one can cite the case of Auckland with large inflows from international sources, but also because of two aspects of its population structure – the concentration there of people at prime reproductive ages and the high proportion of Pacific Islanders and Māori in the region, resulting in high rates of natural increase. This occurs in the face of low fertility rates overall especially in some of its sub-regions. This last trend is exacerbated by the fact that it is New Zealand's pre-eminent Asian city, a factor that dampens fertility levels because Asian fertility rates are low. Another dampening effect on growth is the domestic migration outflow. The net effect, is that Auckland grows by natural increase and migration, but more by the first factor than the latter.

Between Auckland at one extreme and Gisborne, for example, at the other extreme lie most New Zealand regions which, with the exception of the sun-belt zones grow by natural increase and internal migration. These regions are essentially stagnating. Wellington and Canterbury are a slightly different case as they have net internal inflows and healthy rates of natural increase (Canterbury less so) and, thus are growing, but not rapidly.

To summarise the population dynamics analysed in this paper produce three classes of regions. The first being Auckland, the sunbelt zones and perhaps Wellington and Canterbury these regions are doing well or at least getting by. A second class of regions is stagnating, and a third group is declining demographically.

There is yet another paradox: the difference between popular perception of demographic changes and reality. Many commentators cite migration as the singular factor driving positive population change. Yet in ***no*** New Zealand region, even Auckland that is a magnet

for international migration, is this true. Throughout all the regions in New Zealand natural increase is the first factor driving positive population change. In numerous regions, of course, migration trends offset positive natural increase and result in negative growth.

Crudely speaking New Zealand is trichotomising in terms of its population dynamics. This division between the "included", the "getting by" and the "excluded" is a theme which repeats itself in much of its political economy. Aspects of this are elaborated in other papers.

Appendix Table 1: Proportion of Women who are Childless[1] by Age Group, Ethnicity and Region, 1981 and 1996

Region	Age Group (years)						
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-49**	**50+**
	Pakeha 1996						
Northland	97.5	74.8	44.2	19.4	11.7	10.2	9.9
Auckland	98.1	87.9	67.1	38.4	21.7	14.2	13.0
Waikato	97.5	80.1	50.3	22.5	12.2	8.5	9.0
Bay of Plenty	96.9	74.9	51.5	23.4	12.3	8.3	9.6
Gisborne	96.8	79.2	49.5	21.4	12.1	7.8	11.5
Hawke's Bay	95.7	74.2	49.0	20.9	11.8	9.5	11.7
Taranaki	96.9	73.0	43.6	20.6	10.5	8.0	10.2
Manawatu-Wanganui	96.9	81.0	48.8	23.3	13.5	9.1	11.2
Wellington	98.1	87.0	67.1	38.4	21.7	14.4	13.8
West Coast	95.9	69.1	39.6	21.0	10.5	8.4	9.7
Canterbury	97.7	84.6	60.0	31.2	17.0	11.7	12.3
Otago	98.3	87.3	58.4	29.1	15.5	10.2	12.8
Southland	97.0	75.4	47.7	19.6	10.6	7.7	10.1
Nelson-Tasman	97.9	77.9	50.4	27.6	15.7	10.8	11.4
Marlborough	97.2	76.0	46.8	19.6	13.7	9.9	10.1
New Zealand	**97.6**	**83.4**	**58.6**	**30.4**	**16.8**	**11.5**	**11.8**
Range	*2.5*	*18.8*	*27.5*	*19.0*	*11.2*	*6.7*	*4.8*
	Māori 1996						
Northland	87.6	42.7	21.5	10.9	8.8	9.1	9.7
Auckland	88.8	57.5	35.8	20.6	14.9	10.7	10.6
Waikato	88.9	50.9	25.0	14.6	10.5	8.5	9.5
Bay of Plenty	86.4	44.9	23.0	14.1	10.2	7.7	9.0
Gisborne	87.1	41.9	21.4	13.6	12.7	9.2	10.6
Hawke's Bay	86.4	42.7	24.9	13.1	10.2	8.1	10.4
Taranaki	89.4	50.8	23.0	13.0	11.9	7.3	9.6
Manawatu-Wanganui	89.1	49.6	25.0	13.7	9.4	8.7	10.7
Wellington	89.9	61.2	40.1	22.6	14.3	10.5	13.4
West Coast	89.5	48.5	24.3	13.5	4.0	10.3	5.3
Canterbury	92.7	65.2	40.5	23.0	13.6	10.2	12.8
Otago	96.6	74.7	41.1	18.4	12.5	8.5	9.9
Southland	88.5	46.7	23.8	12.7	9.5	8.3	6.4
Nelson-Tasman	92.3	61.5	32.9	16.2	10.3	12.2	11.6
Marlborough	89.8	56.5	23.9	12.0	7.0	7.1	8.6
New Zealand	**88.9**	**53.5**	**30.2**	**16.8**	**11.9**	**9.3**	**10.4**
Range	*10.1*	*32.8*	*19.7*	*12.1*	*10.9*	*5.1*	*8.1*

(continues on next page)

Appendix Table 1: (continued)

Region	Age Group (years)						
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-49**	**50+**
	Total 1981[2]						
Northland	92.3	54.4	21.9	9.7	6.8	11.5	
Auckland	94.4	69.6	36.3	17.5	11.6	15.8	
Waikato	93.1	58.9	23.4	9.6	7.1	10.5	
Bay of Plenty	91.5	55.2	24.4	10.3	7.3	12.0	
Gisborne	91.3	55.9	23.3	12.0	7.0	12.3	
Hawke's Bay	92.5	56.3	24.5	11.3	8.3	14.1	
Taranaki	93.3	57.5	21.7	8.6	6.7	12.8	
Manawatu-Wanganui	93.5	63.4	26.4	10.3	8.7	13.6	
Wellington	94.9	70.6	37.5	17.5	12.1	16.1	
West Coast	93.9	58.7	23.3	11.8	9.0	13.0	
Canterbury	95.7	72.7	33.9	14.6	9.9	15.8	
Otago	96.2	72.5	30.0	12.6	8.9	16.9	
Southland	93.5	59.9	21.7	8.5	7.6	12.8	
Nelson-Tasman	95.6	67.3	30.4	13.6	7.3	15.0	
Marlborough	93.9	61.1	25.5	8.1	7.3	12.9	
New Zealand	**94.1**	**66.0**	**30.7**	**13.9**	**9.7**	**14.5**	
Range	*4.9*	*18.3*	*15.8*	*9.4*	*5.4*	*6.4*	
	Total 1996						
Northland	93.2	60.5	35.6	16.4	11.0	10.0	9.9
Auckland	96.0	80.2	57.2	32.9	19.2	13.0	12.6
Waikato	95.0	72.4	44.3	20.8	12.0	8.6	9.0
Bay of Plenty	92.4	62.8	41.6	20.5	11.9	8.3	9.6
Gisborne	91.3	58.0	34.9	17.7	12.5	8.4	11.2
Hawke's Bay	92.6	63.9	41.7	18.8	11.5	9.4	11.6
Taranaki	95.2	68.9	40.5	19.7	10.7	8.0	10.2
Manawatu-Wanganui	95.0	74.5	44.1	21.5	12.9	9.2	11.2
Wellington	96.5	81.9	61.7	35.4	20.5	13.7	13.6
West Coast	95.1	66.2	37.7	20.5	10.2	8.5	9.7
Canterbury	97.3	83.1	58.3	30.7	16.8	11.5	12.3
Otago	98.1	86.8	57.5	28.9	15.7	10.2	12.7
Southland	95.8	71.3	44.8	18.8	10.6	7.8	10.0
Nelson-Tasman	97.4	76.3	48.9	27.0	15.5	11.0	11.5
Marlborough	96.3	73.2	43.9	19.0	13.3	9.8	10.1
New Zealand	**95.7**	**77.3**	**52.4**	**27.9**	**16.0**	**11.1**	**11.7**
Range	*6.7*	*28.8*	*26.8*	*19.0*	*10.4*	*5.9*	*4.5*

(1) Only those who specified number of children are included in denominator.
(2) Only had age group 40 years and over.

Appendix Table 2: Average Number of Children per Women[1] by Age Group and Ethnicity and Region, 1981 and 1996

Region	Age Group (years)						
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-49**	**50+**
	Pakeha 1996						
Northland	[0.03]	0.4	1.1	1.9	2.3	2.4	3.0
Auckland	[0.02]	0.2	0.5	1.2	1.8	2.1	2.6
Waikato	[0.03]	0.3	0.9	1.8	2.3	2.5	3.0
Bay of Plenty	[0.03]	0.4	0.9	1.7	2.2	2.4	2.9
Gisborne	[0.04]	0.3	0.9	1.8	2.3	2.5	3.0
Hawke's Bay	[0.05]	0.4	0.9	1.8	2.3	2.4	2.9
Taranaki	[0.04]	0.4	1.1	1.9	2.4	2.6	3.1
Manawatu-Wanganui	[0.03]	0.3	0.9	1.8	2.3	2.5	3.0
Wellington	[0.02]	0.2	0.6	1.3	1.9	2.2	2.6
West Coast	[0.05]	0.5	1.1	1.8	2.3	2.5	3.2
Canterbury	[0.02]	0.2	0.7	1.5	2.0	2.3	2.8
Otago	[0.02]	0.2	0.7	1.6	2.1	2.4	2.9
Southland	[0.03]	0.4	1.0	1.9	2.4	2.6	3.1
Nelson-Tasman	[0.02]	0.3	0.9	1.6	2.1	2.3	2.9
Marlborough	[0.03]	0.4	1.0	1.9	2.2	2.4	3.0
New Zealand	**[0.03]**	**0.2**	**0.7**	**1.5**	**2.1**	**2.3**	**2.8**
Range	*[0.03]*	*0.3*	*0.6*	*0.7*	*0.6*	*0.5*	*0.6*
	Māori 1996						
Northland	0.1	1.0	2.0	2.7	3.1	3.2	4.1
Auckland	0.1	0.7	1.5	2.1	2.6	3.0	3.6
Waikato	0.1	0.8	1.8	2.6	2.9	3.3	4.0
Bay of Plenty	0.2	0.9	1.9	2.5	2.9	3.3	4.1
Gisborne	0.2	1.0	1.9	2.4	2.8	3.2	4.2
Hawke's Bay	0.2	1.0	1.9	2.6	3.0	3.4	3.9
Taranaki	0.1	0.8	1.8	2.5	2.8	3.2	4.0
Manawatu-Wanganui	0.1	0.8	1.8	2.4	2.9	3.2	3.9
Wellington	0.1	0.6	1.3	2.1	2.6	2.9	3.5
West Coast	0.1	0.8	1.8	2.5	3.0	2.7	3.7
Canterbury	0.1	0.5	1.2	2.0	2.5	2.7	3.3
Otago	[0.04]	0.4	1.2	2.1	2.4	2.8	3.6
Southland	0.1	0.9	1.8	2.4	2.8	3.0	3.7
Nelson-Tasman	0.1	0.6	1.4	2.3	2.5	2.5	3.2
Marlborough	0.1	0.7	1.6	2.4	2.7	3.0	3.7
New Zealand	**0.1**	**0.8**	**1.6**	**2.4**	**2.8**	**3.1**	**3.9**
Range	*0.1*	*0.6*	*0.8*	*0.7*	*0.7*	*0.8*	*1.0*

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Appendix Table 2: (continued)

Region	Age Group (years)						
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-49**	**50+**
	Total 1981[2]						
Northland	0.1	0.7	1.7	2.4	2.9	3.2	
Auckland	0.1	0.5	1.3	2.0	2.5	2.6	
Waikato	0.1	0.7	1.7	2.4	2.9	3.2	
Bay of Plenty	0.1	0.7	1.7	2.4	2.9	3.1	
Gisborne	0.1	0.7	1.7	2.5	3.1	3.3	
Hawke's Bay	0.1	0.7	1.7	2.4	2.8	2.9	
Taranaki	0.1	0.7	1.7	2.5	2.9	3.1	
Manawatu-Wanganui	0.1	0.6	1.6	2.4	2.8	3.0	
Wellington	0.1	0.5	1.3	2.1	2.5	2.6	
West Coast	0.1	0.7	1.6	2.3	2.8	3.1	
Canterbury	[0.05]	0.4	1.3	2.1	2.6	2.7	
Otago	[0.04]	0.4	1.4	2.2	2.7	2.7	
Southland	0.1	0.7	1.7	2.5	2.9	3.1	
Nelson-Tasman	0.1	0.5	1.4	2.1	2.7	2.8	
Marlborough	0.1	0.6	1.6	2.4	2.7	3.0	
New Zealand	**0.1**	**0.5**	**1.5**	**2.2**	**2.7**	**2.8**	
Range	0.1	0.3	0.5	0.5	0.6	0.7	
	Total 1996						
Northland	0.1	0.6	1.4	2.2	2.5	2.6	3.1
Auckland	[0.05]	0.3	0.8	1.5	2.0	2.3	2.7
Waikato	0.1	0.4	1.1	2.0	2.4	2.6	3.1
Bay of Plenty	0.1	0.6	1.2	1.9	2.4	2.6	3.1
Gisborne	0.1	0.7	1.4	2.1	2.5	2.8	3.3
Hawke's Bay	0.1	0.6	1.2	2.0	2.4	2.6	3.0
Taranaki	0.1	0.5	1.2	2.0	2.5	2.7	3.2
Manawatu-Wanganui	0.1	0.4	1.1	1.9	2.4	2.6	3.1
Wellington	[0.04]	0.3	0.7	1.4	2.0	2.3	2.7
West Coast	0.1	0.5	1.2	1.9	2.4	2.6	3.2
Canterbury	[0.03]	0.2	0.7	1.5	2.1	2.3	2.8
Otago	[0.02]	0.2	0.8	1.6	2.1	2.4	2.9
Southland	[0.05]	0.4	1.1	1.9	2.4	2.6	3.2
Nelson-Tasman	[0.03]	0.3	0.9	1.6	2.1	2.3	2.9
Marlborough	[0.04]	0.4	1.1	1.9	2.2	2.4	3.0
New Zealand	**[0.05]**	**0.3**	**0.9**	**1.7**	**2.2**	**2.4**	**2.9**
Range	*0.1*	*0.5*	*0.7*	*0.8*	*0.5*	*0.5*	*0.6*

(1) Only those who specified number of children are included in denominator.
(2) Only had age group 40 years and over.

Appendix Table 3: Probability of Surviving by Age, Gender and Region, 1985-87 – 2000-02

Region	Males				Females			
	1985-87	**1990-92**	**1995-97**	**2000-02**	**1985-87**	**1990-92**	**1995-97**	**2000-02**
	p0-14[1]							
Northland	0.980	0.985	0.985	0.990	0.985	0.991	0.988	0.992
Auckland	0.984	0.986	0.987	0.991	0.985	0.990	0.991	0.992
Waikato	0.981	0.984	0.988	0.990	0.989	0.987	0.987	0.992
Bay of Plenty	0.982	0.983	0.987	0.991	0.984	0.989	0.990	0.989
Gisborne	0.985	0.986	0.987	0.991	0.989	0.987	0.987	0.993
Hawkes Bay	0.982	0.985	0.985	0.989	0.985	0.989	0.987	0.991
Taranaki	0.986	0.984	0.988	0.985	0.989	0.991	0.988	0.990
Manawatu Wanganui	0.979	0.983	0.989	0.988	0.984	0.988	0.991	0.991
Wellington	0.981	0.984	0.990	0.992	0.987	0.990	0.993	0.995
West Coast	0.983	0.985	0.992	0.992	0.986	0.991	0.990	0.994
Canterbury	0.980	0.988	0.992	0.991	0.985	0.992	0.992	0.993
Otago	0.984	0.988	0.990	0.992	0.987	0.992	0.991	0.994
Southland	0.982	0.986	0.993	0.991	0.981	0.989	0.990	0.995
Nelson-Marlborough	0.985	0.988	0.990	0.991	0.989	0.993	0.993	0.989
New Zealand	**0.982**	**0.985**	**0.989**	**0.990**	**0.986**	**0.990**	**0.991**	**0.992**
Range	*0.007*	*0.005*	*0.008*	*0.007*	*0.009*	*0.007*	*0.006*	*0.006*
	p15-24[1]							
Northland	0.978	0.982	0.980	0.980	0.994	0.994	0.994	0.993
Auckland	0.984	0.987	0.988	0.991	0.994	0.995	0.995	0.997
Waikato	0.980	0.979	0.985	0.987	0.993	0.993	0.994	0.995
Bay of Plenty	0.977	0.980	0.979	0.985	0.993	0.993	0.993	0.993
Gisborne	0.982	0.982	0.976	0.986	0.993	0.994	0.991	0.999
Hawkes Bay	0.979	0.981	0.984	0.985	0.990	0.992	0.991	0.994
Taranaki	0.984	0.981	0.984	0.989	0.995	0.994	0.994	0.995
Manawatu Wanganui	0.982	0.983	0.986	0.989	0.994	0.994	0.992	0.995
Wellington	0.985	0.984	0.988	0.992	0.995	0.996	0.995	0.996
West Coast	0.975	0.981	0.980	0.980	0.994	0.997	0.993	1.000*
Canterbury	0.987	0.984	0.987	0.990	0.995	0.995	0.996	0.997
Otago	0.990	0.989	0.989	0.992	0.996	0.994	0.997	0.998
Southland	0.983	0.980	0.987	0.983	0.995	0.998	0.994	0.994
Nelson-Marlborough	0.985	0.986	0.986	0.988	0.995	0.994	0.995	0.995
New Zealand	**0.983**	**0.984**	**0.986**	**0.989**	**0.994**	**0.995**	**0.995**	**0.996**
Range	*0.015*	*0.010*	*0.013*	*0.013*	*0.006*	*0.006*	*0.006*	*0.007*

* no deaths for the three year period for West Coast females 15-24 years.

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Appendix Table 3: (continued)

Region	Males				Females			
	1985-87	**1990-92**	**1995-97**	**2000-02**	**1985-87**	**1990-92**	**1995-97**	**2000-02**
	p25-44[1]							
Northland	0.959	0.957	0.960	0.962	0.977	0.977	0.980	0.979
Auckland	0.966	0.965	0.972	0.975	0.980	0.982	0.983	0.986
Waikato	0.965	0.960	0.968	0.966	0.980	0.980	0.981	0.985
Bay of Plenty	0.958	0.960	0.952	0.961	0.975	0.978	0.979	0.981
Gisborne	0.958	0.961	0.945	0.949	0.979	0.968	0.972	0.972
Hawkes Bay	0.963	0.962	0.961	0.963	0.970	0.982	0.983	0.979
Taranaki	0.970	0.966	0.975	0.967	0.982	0.982	0.985	0.983
Manawatu Wanganui	0.969	0.969	0.967	0.969	0.978	0.977	0.982	0.978
Wellington	0.967	0.974	0.971	0.975	0.982	0.981	0.985	0.987
West Coast	0.948	0.964	0.952	0.964	0.986	0.989	0.987	0.981
Canterbury	0.967	0.968	0.972	0.975	0.983	0.984	0.986	0.987
Otago	0.967	0.974	0.973	0.971	0.983	0.990	0.983	0.988
Southland	0.963	0.962	0.973	0.973	0.978	0.983	0.989	0.987
Nelson-Marlborough	0.973	0.969	0.971	0.966	0.977	0.982	0.984	0.988
New Zealand	**0.966**	**0.966**	**0.969**	**0.971**	**0.980**	**0.981**	**0.983**	**0.985**
Range	*0.025*	*0.017*	*0.030*	*0.026*	*0.016*	*0.022*	*0.017*	*0.016*
	p45-64							
Northland	0.797	0.805	0.812	0.839	0.855	0.874	0.873	0.890
Auckland	0.808	0.835	0.857	0.887	0.880	0.888	0.900	0.921
Waikato	0.794	0.829	0.853	0.871	0.875	0.878	0.906	0.901
Bay of Plenty	0.796	0.819	0.826	0.864	0.869	0.875	0.888	0.901
Gisborne	0.777	0.798	0.776	0.833	0.827	0.851	0.841	0.855
Hawkes Bay	0.800	0.820	0.843	0.863	0.882	0.874	0.882	0.905
Taranaki	0.813	0.835	0.852	0.877	0.865	0.887	0.923	0.915
Manawatu Wanganui	0.795	0.836	0.844	0.866	0.871	0.885	0.889	0.904
Wellington	0.806	0.821	0.852	0.881	0.876	0.890	0.903	0.917
West Coast	0.745	0.788	0.834	0.855	0.853	0.869	0.899	0.921
Canterbury	0.812	0.836	0.861	0.886	0.888	0.908	0.911	0.920
Otago	0.802	0.842	0.854	0.888	0.891	0.898	0.904	0.926
Southland	0.772	0.805	0.819	0.859	0.857	0.879	0.885	0.896
Nelson-Marlborough	0.826	0.857	0.870	0.886	0.897	0.905	0.904	0.925
New Zealand	**0.803**	**0.830**	**0.849**	**0.877**	**0.877**	**0.888**	**0.899**	**0.913**
Range	*0.080*	*0.069*	*0.094*	*0.055*	*0.070*	*0.057*	*0.081*	*0.071*

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Appendix Table 3: (continued)

Region	Males				Females			
	1985-87	1990-92	1995-97	2000-02	1985-87	1990-92	1995-97	2000-02
	p65-74							
Northland	0.646	0.689	0.716	0.740	0.768	0.814	0.804	0.834
Auckland	0.671	0.714	0.735	0.777	0.804	0.825	0.834	0.855
Waikato	0.643	0.685	0.722	0.760	0.803	0.811	0.832	0.855
Bay of Plenty	0.669	0.719	0.738	0.765	0.775	0.809	0.831	0.858
Gisborne	0.604	0.655	0.645	0.687	0.795	0.771	0.781	0.822
Hawkes Bay	0.637	0.668	0.706	0.749	0.780	0.803	0.821	0.837
Taranaki	0.639	0.691	0.733	0.778	0.775	0.796	0.832	0.857
Manawatu Wanganui	0.640	0.676	0.716	0.737	0.774	0.793	0.809	0.830
Wellington	0.649	0.685	0.723	0.752	0.785	0.811	0.823	0.842
West Coast	0.602	0.640	0.689	0.745	0.727	0.760	0.802	0.823
Canterbury	0.661	0.680	0.722	0.775	0.798	0.815	0.851	0.869
Otago	0.626	0.678	0.716	0.767	0.789	0.820	0.829	0.841
Southland	0.637	0.637	0.673	0.718	0.762	0.788	0.803	0.819
Nelson-Marlborough	0.651	0.720	0.744	0.790	0.804	0.836	0.836	0.867
New Zealand	**0.653**	**0.691**	**0.723**	**0.762**	**0.791**	**0.813**	**0.830**	**0.851**
Range	*0.069*	*0.083*	*0.099*	*0.102*	*0.077*	*0.076*	*0.070*	*0.050*
	p75-84							
Northland	0.385	0.394	0.440	0.459	0.539	0.558	0.599	0.630
Auckland	0.352	0.406	0.442	0.498	0.519	0.580	0.592	0.646
Waikato	0.325	0.366	0.456	0.488	0.512	0.551	0.608	0.628
Bay of Plenty	0.353	0.392	0.430	0.472	0.513	0.560	0.599	0.639
Gisborne	0.297	0.376	0.433	0.383	0.492	0.589	0.560	0.579
Hawkes Bay	0.340	0.379	0.378	0.478	0.492	0.573	0.570	0.606
Taranaki	0.344	0.379	0.423	0.475	0.503	0.588	0.583	0.602
Manawatu Wanganui	0.330	0.359	0.385	0.449	0.509	0.548	0.583	0.601
Wellington	0.346	0.388	0.416	0.469	0.512	0.551	0.573	0.624
West Coast	0.275	0.360	0.319	0.470	0.436	0.529	0.525	0.616
Canterbury	0.336	0.381	0.429	0.484	0.519	0.543	0.576	0.639
Otago	0.349	0.388	0.399	0.446	0.502	0.550	0.597	0.615
Southland	0.289	0.304	0.397	0.409	0.490	0.527	0.569	0.576
Nelson-Marlborough	0.375	0.417	0.412	0.494	0.552	0.594	0.583	0.611
New Zealand	**0.342**	**0.385**	**0.424**	**0.476**	**0.513**	**0.561**	**0.586**	**0.627**
Range	*0.110*	*0.113*	*0.136*	*0.115*	*0.116*	*0.068*	*0.083*	*0.070*

(1) Very small number of deaths in the first three age groups meaning the results are unstable.

Sources: New Zealand Health Information Service, Mortality Data 1985-1997.
Statistics New Zealand, 1986-2001 Censuses of Population and Dwellings.
Statistics New Zealand, Vital Statistics 2000-02.

Appendix Table 4: Net Migration as a Percentage of the Initial Population, by Age Group and Region, 1986-91, 1991-96 and 1996-2001

Region	Age Group (years)						
	Under 15	15-24	25-44	45-64	65-74	75+	Total
	1986-91						
Northland	0.2	-18.0	-0.9	3.9	5.2	3.5	-1.9
Auckland	4.0	8.6	7.2	-0.7	-2.4	1.2	4.4
Waikato	-1.3	-4.5	-1.7	0.5	2.1	2.3	-1.4
Bay of Plenty	2.5	-9.3	4.3	8.5	9.8	6.1	2.7
Gisborne	-7.1	-17.8	-8.7	-3.9	-4.3	-4.4	-8.6
Hawke's Bay	-3.5	-15.3	-4.9	-0.2	3.4	1.2	-4.6
Taranaki	-4.0	-13.6	-6.1	-1.3	1.8	1.5	-5.2
Manawatu-Wanganui	-2.4	0.2	-6.9	0.1	1.1	-1.6	-2.4
Wellington	-2.2	4.8	-1.0	-4.9	-5.7	-4.0	-1.3
West Coast	-6.6	-17.7	-6.6	-2.7	-3.8	-14.4	-7.8
Canterbury	0.4	2.6	-2.1	1.3	0.7	-0.3	0.2
Otago	-2.6	7.1	-8.4	-0.4	-0.9	-2.1	-1.8
Southland	-5.5	-15.0	-8.1	-5.4	-4.2	-5.3	-7.8
Nelson-Tasman	3.5	-6.9	4.5	3.7	5.3	1.7	2.1
Marlborough	1.9	-8.4	3.3	11.0	6.0	4.2	2.8
	1991-96						
Northland	1.0	-24.8	4.3	6.7	3.2	1.4	-0.4
Auckland	4.8	10.5	6.0	1.9	1.1	2.5	5.3
Waikato	-2.0	-5.3	-3.0	-1.1	-1.6	1.2	-2.5
Bay of Plenty	1.5	-13.5	5.0	7.0	7.4	5.6	1.9
Gisborne	-3.6	-18.4	-2.5	-3.8	-6.7	-3.1	-5.8
Hawke's Bay	-2.6	-19.1	-0.8	-0.6	-1.4	-1.4	-4.1
Taranaki	-6.1	-21.4	-5.4	-5.1	-1.5	-1.7	-7.5
Manawatu-Wanganui	-5.0	-2.5	-9.7	-3.6	-1.3	-2.5	-5.3
Wellington	-4.6	1.2	-5.5	-5.2	-3.0	-2.8	-3.8
West Coast	-2.4	-16.3	-1.5	-0.8	-6.2	-8.4	-4.3
Canterbury	1.3	7.0	-0.4	0.7	0.2	-1.4	1.4
Otago	-1.8	13.0	-7.5	-1.9	-0.9	-2.0	-0.7
Southland	-7.9	-24.5	-7.2	-7.5	-5.7	-4.5	-9.9
Nelson-Tasman	7.3	-4.5	10.3	4.5	1.6	0.9	5.1
Marlborough	4.5	-12.9	7.6	6.7	4.8	2.1	3.2

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Appendix Table 4: (continued)

Region	Age Group (years)						
	Under 15	15-24	25-44	45-64	65-74	75+	Total
	1996-2001						
Northland	-1.4	-27.6	2.5	5.5	1.8	-0.1	-1.7
Auckland	3.4	11.7	5.7	0.1	-1.2	-0.1	4.4
Waikato	-1.4	-6.7	-2.4	0.5	0.7	-0.2	-1.9
Bay of Plenty	2.5	-12.6	5.9	6.6	7.0	5.6	2.9
Gisborne	-6.5	-24.0	-6.1	-6.7	-8.0	-8.2	-9.0
Hawke's Bay	-1.4	-17.6	-0.7	-1.6	-0.4	-0.6	-3.3
Taranaki	-4.1	-22.1	-5.4	-4.3	0.6	0.9	-6.3
Manawatu-Wanganui	-5.8	-8.4	-12.0	-2.2	-0.2	-0.8	-6.7
Wellington	-2.2	6.4	-1.3	-4.0	-3.7	-2.4	-1.1
West Coast	-9.1	-31.3	-6.1	-3.2	-0.4	-11.3	-9.2
Canterbury	1.7	3.7	-1.0	1.3	0.9	1.7	1.0
Otago	-2.9	9.9	-13.1	-0.3	-0.3	-2.5	-2.8
Southland	-7.0	-22.8	-7.6	-7.4	-5.0	-3.5	-9.1
Nelson-Tasman	6.4	-8.5	6.1	4.7	3.8	4.9	3.7
Marlborough	0.1	-17.0	1.3	9.2	6.0	4.7	1.1

A Census Survival Rate method is an indirect estimation of internal migration. It is the '…ratio of the population aged $x+n$ at the second census to that aged x at the first census, where the censuses are taken n years apart.' Thus,

$$s^n_x = \frac{P^{t+n}_{x+n,NZ}}{P^t_{x,NZ}}$$

Where t is the date of the first census', x is the age at the first census, s is census survival rate, P is population.

(Shryock and Siegel 1976:381).

These two ratios (based on the national population) are then applied to the population of each region from the first census to estimate the level of migration.

$$\text{Net } M_{x+n,i} = P^{t+n}_{x+n} - s^n_x * P^t_{x,i}$$

Where Net M=Net Migration, region i

This method can be used for all ages except for those who were born in the period between the two census years. In this instance, area specific child-women ratios from the second census were used. The formula is as follows:

$$\text{Net } M_{0\text{-}4,i} = \tfrac{1}{2} * (P^{t+n}_{0\text{-}4,i}/F^{t+n}_{15\text{-}44,i}) * \text{Net M } F_{15\text{-}44,i}$$

Where F=Females

This assumes that the area specific fertility rates are similar to the national rate. In a low fertility, low mortality country this assumption is reasonable for the population as a whole (this formula is for censuses 5 years apart).

Appendix Table 5: Net Migration for the Māori Population as a Percentage of the Initial (Māori) Population, by Age Group and Region, 1986-91, 1991-96 and 1996-2001

Region	Age Group (years)					
	Under 15	15-24	25-44	45-64	65+	Total
	1986-91					
Northland	9.8	-2.7	12.9	13.6	10.7	8.5
Auckland	-3.6	4.4	-2.5	-8.1	-7.7	-1.8
Waikato	0.0	-2.2	-1.2	1.7	0.1	-0.6
Bay of Plenty	5.1	-3.0	9.1	3.2	5.4	4.1
Gisborne	-1.2	-11.8	0.5	4.1	3.8	-2.2
Hawke's Bay	-2.3	-9.8	-3.1	-0.8	2.9	-3.8
Taranaki	0.1	-8.0	-4.6	-0.7	-5.0	-3.1
Manawatu-Wanganui	0.1	1.9	-0.8	0.1	1.8	0.3
Wellington	-5.4	3.5	-6.9	-7.5	-9.0	-3.9
West Coast	5.4	-7.2	-5.5	14.2	3.0	0.5
Canterbury	1.6	7.9	-0.2	3.4	-7.2	2.7
Otago	3.8	11.5	-4.5	-0.7	-19.4	2.9
Southland	-1.7	-8.3	-4.2	0.5	1.9	-3.5
Nelson-Tasman	7.3	8.4	6.7	5.8	-10.4	6.8
Marlborough	15.5	-0.3	15.7	14.7	1.6	11.5
	1991-96					
Northland	2.4	-22.7	1.3	2.2	-10.2	-3.1
Auckland	-1.8	8.2	-1.0	-1.3	4.4	0.9
Waikato	0.2	-2.7	-0.7	-1.6	-3.1	-0.9
Bay of Plenty	0.1	-8.9	0.1	-1.1	-2.4	-1.9
Gisborne	-6.2	-15.4	-8.9	-8.7	-16.5	-9.5
Hawke's Bay	-5.2	-14.8	-6.6	-5.5	-12.0	-7.8
Taranaki	0.3	-9.0	-2.4	-0.6	-7.4	-2.6
Manawatu-Wanganui	-4.5	-2.9	-8.4	-3.2	3.3	-4.9
Wellington	-4.1	4.9	-3.1	-7.3	-5.3	-2.1
West Coast	15.2	5.0	26.9	16.5	15.7	16.4
Canterbury	14.0	26.9	18.7	25.9	56.0	20.2
Otago	20.3	42.2	20.5	22.7	91.0	27.4
Southland	-4.6	-15.3	-0.6	3.0	25.2	-4.2
Nelson-Tasman	46.0	37.8	53.2	39.1	28.9	44.9
Marlborough	17.1	0.3	36.5	22.8	34.1	19.8

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Appendix Table 5: (continued)

Region	Age Group (years)					
	Under 15	**15-24**	**25-44**	**45-64**	**65+**	**Total**
	1996-2001					
Northland	-1.1	-19.6	4.2	5.1	4.7	-1.4
Auckland	-1.9	8.1	-0.9	-4.2	-7.2	0.0
Waikato	0.7	0.9	0.3	2.1	1.6	0.8
Bay of Plenty	1.5	-6.2	3.0	4.2	4.6	1.0
Gisborne	0.4	-7.7	3.4	6.6	4.5	0.9
Hawke's Bay	2.4	-5.5	3.9	-0.9	3.9	1.0
Taranaki	-0.6	-13.2	-2.2	0.5	5.6	-3.0
Manawatu-Wanganui	-2.4	-4.8	-4.5	1.0	1.7	-2.9
Wellington	0.7	7.4	1.0	-0.6	-4.4	1.9
West Coast	-6.8	-26.5	-10.6	-2.0	0.2	-10.4
Canterbury	3.6	6.5	-2.4	-5.8	-7.3	1.1
Otago	0.3	11.8	-14.5	-6.1	-11.5	-2.1
Southland	-2.9	-11.5	-4.9	-7.5	-2.1	-5.5
Nelson-Tasman	7.7	1.9	6.3	-2.7	-16.4	4.4
Marlborough	4.2	-11.7	-1.6	7.1	0.8	-0.1

Methodology under Appendix Table 4. Because of smaller numbers, inter-censal shifts in definition, and fertility differentials within the Māori population, the assumption here are less robust than those for the total

Appendix Table 6: Estimates of Levels and Components of Regional Growth (quinquennial numbers): A Balancing Equation, 1986-91, 1991-96 and 1996-2001

a) 1986-1991

Region	Population change			Natural Increase Component			Migration Component						
	1986	1991	Growth	Births[1]	Deaths	Natural Increase	International Migration			Internal Migration			Net Migration
							Inflows	Outflows[2]	Net[3]	Inflows	Outflows	Net	
Northland	122,832	126,786	3,954	11,790	4,974	6,816	3,561	6,295	-2,734	17,829	17,469	360	-2,374
Auckland	873,906	943,776	69,870	82,511	34,696	47,815	74,055	40,485	33,570	66,408	61,249	5,159	38,729
Waikato	320,466	331,026	10,560	29,662	11,828	17,834	10,515	16,534	-6,019	42,174	40,542	1,632	-4,387
Bay of Plenty	189,990	203,985	13,995	17,843	7,982	9,861	6,114	9,394	-3,280	31,980	23,517	8,463	5,183
Gisborne	45,759	44,265	-1,494	4,463	1,861	2,602	861	1,468	-607	4,482	7,797	-3,315	-3,922
Hawke's Bay	139,455	138,336	-1,119	12,300	6,058	6,242	3,531	6,843	-3,312	13,831	16,980	-3,149	-6,461
Taranaki	108,462	107,127	-1,335	9,379	4,353	5,026	2,751	5,289	-2,538	9,498	12,548	-3,050	-5,588
Manawatu-Wanganui	222,252	224,763	2,511	19,256	9,915	9,341	6,732	11,260	-4,528	29,991	30,900	-909	-5,437
Wellington	392,358	400,284	7,926	33,950	15,427	18,523	24,081	22,969	1,112	36,325	42,689	-6,364	-5,252
West Coast	33,021	31,563	-1,458	2,707	1,638	1,069	579	1,280	-701	4,313	6,203	-1,890	-2,591
Canterbury	430,113	438,171	8,058	31,340	19,474	11,866	14,796	19,213	-4,417	36,357	30,949	5,408	991
Otago	178,530	177,525	-1,005	12,512	8,032	4,480	5,547	8,598	-3,051	19,421	19,662	-241	-3,292
Southland	104,280	99,954	-4,326	8,411	4,322	4,089	1,515	4,633	-3,118	7,229	12,234	-5,005	-8,123
Nelson-Marlborough[4]	100,977	105,630	4,653	7,665	4,344	3,321	3,201	3,711	-510	15,177	12,276	2,901	2,391

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Appendix Table 6: (continued)

b) 1991-1996

Region	Population change			Natural Increase Component			Migration Component						
							International Migration			Internal Migration			Net
	1991	1996	Growth	Births[1]	Deaths	Natural Increase	Inflows	Outflows[2]	Net[3]	Inflows	Outflows	Net	Migration
Northland	126,786	137,052	10,266	12,063	5,354	6,709	4,992	5,420	-428	17,934	18,048	-114	-542
Auckland	943,776	1,068,645	124,869	91,379	34,953	56,426	107,577	62,571	45,006	64,971	59,958	5,013	50,019
Waikato	331,026	350,124	19,098	29,880	11,812	18,068	14,151	22,272	-8,121	42,633	42,912	-279	-8,400
Bay of Plenty	203,985	224,367	20,382	18,764	8,625	10,139	9,051	13,685	-4,634	33,213	24,666	8,547	3,913
Gisborne	44,265	45,786	1,521	4,695	2,007	2,688	1,140	2,172	-1,032	5,169	6,684	-1,515	-2,547
Hawke's Bay	138,336	142,788	4,452	12,252	6,171	6,081	4,512	7,495	-2,983	13,944	16,614	-2,670	-5,653
Taranaki	107,127	106,587	-540	8,666	4,575	4,091	3,411	7,554	-4,143	8,706	12,594	-3,888	-8,031
Manawatu-Wanganui	224,763	228,771	4,008	18,964	9,746	9,218	8,001	16,460	-8,459	27,969	31,428	-3,459	-11,918
Wellington	400,284	414,048	13,764	34,093	14,579	19,514	23,637	32,449	-8,812	34,530	41,070	-6,540	-15,352
West Coast	31,563	32,511	948	2,599	1,495	1,104	831	1,583	-752	4,809	5,421	-612	-1,364
Canterbury	438,171	468,042	29,871	31,545	19,547	11,998	25,275	25,044	231	37,188	31,386	5,802	6,033
Otago	177,525	185,082	7,557	12,330	7,759	4,571	8,811	11,435	-2,624	22,005	20,682	1,323	-1,301
Southland	99,954	97,101	-2,853	7,634	4,169	3,465	2,247	6,764	-4,517	7,506	12,852	-5,346	-9,863
Nelson-Tasman	70,485	78,249	7,764	5,317	3,044	2,273	3,747	2,689	1,058	10,947	8,424	2,523	3,581
Marlborough	35,145	38,397	3,252	2,575	1,483	1,092	1,116	1,200	-84	6,672	5,457	1,215	1,131

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Appendix Table 6: (continued)

c) 1996-2001

Region	Population change			Natural Increase Component			Migration Component						
	1996	2001	Growth	Births[1]	Deaths	Natural Increase	International Migration			Internal Migration			Net Migration
							Inflows	Outflows[2]	Net[3]	Inflows	Outflows	Net	
Northland	137,052	140,130	3,078	10,910	5,669	5,241	4,668	6,332	-1,664	17,481	18,102	-621	-2,285
Auckland	1,068,645	1,158,891	90,246	95,399	35,448	59,951	131,220	82,309	48,911	65,604	67,968	-2,364	46,547
Waikato	350,124	357,726	7,602	28,223	12,621	15,602	15,453	23,707	-8,254	44,043	42,576	1,467	-6,787
Bay of Plenty	224,367	239,415	15,048	18,981	9,384	9,597	9,600	11,740	-2,140	34,827	26,253	8,574	6,434
Gisborne	45,786	43,974	-1,812	4,004	2,003	2,001	1,032	2,483	-1,451	4,842	7,500	-2,658	-4,109
Hawke's Bay	142,788	142,947	159	11,195	6,171	5,024	5,094	7,691	-2,597	14,580	16,701	-2,121	-4,718
Taranaki	106,587	102,858	-3,729	7,497	4,207	3,290	2,823	5,870	-3,047	8,634	12,288	-3,654	-6,701
Manawatu-Wanganui	228,771	220,089	-8,682	16,871	9,506	7,365	7,263	16,327	-9,064	25,809	32,034	-6,225	-15,289
Wellington	414,048	423,768	9,720	32,246	14,506	17,740	26,244	32,866	-6,622	39,231	37,071	2,160	-4,462
West Coast	32,511	30,300	-2,211	2,086	1,445	641	690	1,506	-816	3,753	5,913	-2,160	-2,976
Canterbury	468,042	481,431	13,389	30,847	18,973	11,874	25,104	28,938	-3,834	38,907	30,219	8,688	4,854
Otago	185,082	181,542	-3,540	10,966	7,734	3,232	8,298	14,677	-6,379	21,747	20,637	1,110	-5,269
Southland	97,101	91,002	-6,099	6,493	3,917	2,576	1,818	5,207	-3,389	6,705	12,129	-5,424	-8,813
Nelson-Tasman	78,249	82,917	4,668	5,123	3,132	1,991	3,552	3,311	241	11,571	8,916	2,655	2,896
Marlborough	38,397	39,558	1,161	2,378	1,645	733	1,221	1,363	-142	6,735	6,162	573	431

Totals do not add up exactly as different sources of data were employed. It must be stressed that the data in this table are merely indicative estimates and not exact figures.

(1) For 1986-91 births have been estimated. Using the estimated total birth for 1986-88 (see note below table 2.3) and 1990-92 and multiplying by 5/6.

(2) Net overseas migration – Inflow from overseas (see footnote 35); note the order for the arithmetic manipulation given in footnote 35 is different from the order here where results are presented.

(3) Net migration – Net internal migration (see footnote 35).

(4) Did not have internal migration for Nelson-Tasman and Marlborough separately in 1986-1991.

Source: Modified from Pool et.al. (2004)

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ISBN: 1-877149-54-3