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Tracking Patterns of Tribal Identification in the New Zealand Census, 1991 to 2006

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MOANA RARERE †

Abstract

Despite the growing political and economic importance of iwi in New Zealand, little attention has been given to their changing demography. Using data from the New Zealand Census of Population and Dwellings, we analyse the growth trajectories of four iwi - Ngāi Tahu, Waikato, Ngāti Awa and Tūhoe - between 1991 and 2006. We find a great deal of variation in iwi growth between censuses and over the entire focal period. In most instances, iwi birth cohorts increased rather than decreased in size, and gains from "new" members were especially marked among children, the middle-aged and women. The findings confirm the importance of accounting for non-demographic factors when projecting and planning for future iwi population growth.

Over the past decade iwi (Māori tribes) have emerged as important regional and national economic stakeholders in New Zealand with considerable economic resources at their disposal (Nana, Stokes, & Molano, 2011; Te Puni Kōkiri/Ministry of Māori Development, 2011). As a result of settling historic grievances with the Crown, a growing number of iwi are now in a position to influence the economic, social and cultural well-being of their communities in ways that were previously unthinkable. Many iwi are engaged in a range of well-being oriented activities, from profit-making market enterprises to cultural advancement strategies, education initiatives and social service provision and delivery.

Post-settlement development has underscored the importance of having access to relevant and timely demographic information with which to inform internal decision-making relating to the use and distribution of

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resources (Walling, Small-Rodriguez, & Kukutai, 2009). Population projections are a valuable tool, but can be challenging to undertake for indigenous peoples because of the often unpredictable nature of indigenous population growth (Australian Bureau of Statistics, 2013; Eschbach, Supple, & Snipp, 1998; Guimond, 1999; Guimond, Kerr, & Beaujot, 2004; Passel, 1997). Nevertheless, the intergenerational focus of iwi development means that iwi can ill afford to ignore future population change. In a post-settlement context, iwi leaders will increasingly need to ask themselves two basic demographic questions: How fast are our populations likely to grow in the future (e.g. in five, 10 or 20 years time)? And, how many members are we likely to have?

Since 1991, the number and proportion of Māori reporting at least one iwi affiliation in the census has increased significantly. At the 1991 Census, 76.5 percent of Māori descendants recorded an affiliation to at least one iwi, and by 2006 this had increased to 83.4 percent. In absolute terms this represented an increase of more than one-third. However, while interesting, the aggregate patterns shown in Table 1 are likely to obscure a great deal of inter-iwi variation with respect to the timing and magnitude of growth.

Table 1: Number and proportion of Māori descent population reporting at least one iwi

	1991	1996	2001	2006
Iwi	370,476	426,321	454,479	512,325
NEI[1]	27,609	40,920	37,824	29,331
Don't know	113,193	112,563	111,810	102,363
Total Māori descent	511,278	579,714	604,110	643,977
Percent of stated[2]	76.5	79.1	80.3	83.4

Source: Statistics New Zealand, Census of Population and Dwellings

Notes: 1. NEI = Not Elsewhere Included; this category includes Refused to Answer, Response Unidentifiable, Response Outside Scope, and Not Stated.
2. Excludes Not Elsewhere Included as defined above.

In this paper we use data from the New Zealand Census of Population and Dwellings to analyse the observed growth and change between 1991 and 2006 of four iwi – Ngāi Tahu, Waikato, Ngāti Awa and Tūhoe. While a global analysis of the 100-plus iwi in the official Statistical Standard for Iwi (Statistics New Zealand, 2009) would be ideal, such an exercise is beyond the scope of this paper. In the 2006 Census, all four iwi ranked among the ten largest tribes, but varied significantly with respect to population size and composition, asset base, public profile and

settlement histories.[1] The timing and context of tribal settlements is a particularly important factor to consider because of its potential to influence patterns of identification (Walling et al., 2009).[2]

Drawing on a range of standard demographic techniques, we examine differences in the growth trajectories of each of the four iwi between 1991 and 2006. In particular, we assess how much of the growth in each intercensal period was due to the addition of "new" iwi members through individual changes in reported iwi identification – a process often referred to in the literature as "ethnic mobility". Studies of ethnic mobility emerged from the United States when population researchers observed that the large increase in the American Indian population between 1960 and 1990 was not solely due to natural increase and changes to census procedures, but also reflected an increased propensity to identify as indigenous (Eschbach, 1995; Eschbach et al., 1998; Nagel, 1996; Passel, 1997; Thornton, 1997).[3] In seeking to explain these shifts, a number of studies emphasised the importance of macro-political factors such as American Indian political activism and changes in government policy (Cornell & Hartmann, 1998; Nagel, 1995). Other studies linked changes in identification with micro-level factors such as higher levels of education, intermarriage and urban residence (Eschbach, 1995; Eschbach et al., 1998; Guimond, 1999; Guimond et al., 2004; Robitaille, Guimond, & Boucher, 2010).

While a number of national statistics agencies now routinely build in explicit assumptions relating to ethnic mobility in their indigenous population projections (see, for example, Australian Bureau of Statistics, 2013; Statistics New Zealand, 2010), these technical innovations have not yet been matched by a more sophisticated understanding of census-based inquiries into indigenous identity. Conventional demographic studies still tend to reify state-imposed statistical categories as objective descriptors of an underlying social reality, even though such categories may be incongruent with how indigenous peoples think about themselves (Andersen, 2008; Kukutai, 2011; Walter, 2005). When individuals change their responses to such categories, shifts can sometimes be erroneously interpreted as "evidence" of more substantive changes in individuals' identities, particularly when described in terms of "ethnic switching" or "ethnic drifting". This points to a larger problem with demographic studies of indigenous peoples, that is, the virtual absence of indigenous

perspectives and a lack of attention to historical context (Kukutai & Taylor, 2013). In New Zealand, this history has been shaped in crucial ways by colonial relationships which have impacted on census categories, and the context within which Māori identities are formed and expressed.

To date, several studies have examined changing patterns of ethnic identification in the New Zealand Census and in large-scale surveys (Brown & Gray, 2009; Callister, Didham, & Kivi, 2009; Carter, Hayward, Blakely, & Shaw, 2009; Coope & Piesse, 1997), but none have looked specifically at iwi. This paper makes a start at addressing this knowledge gap by exploring how changing patterns of identification may be contributing to the growth of iwi. While we do not attempt to provide a comprehensive explanation for the drivers of change, we do consider the timing of settlements as well as the core demographic variables of age and sex. To place census-based inquiries into iwi identity within a broader historical context, we begin with a brief overview of iwi data collection in New Zealand.

Background

Iwi data collection in the New Zealand Census

Iwi have a long history of being quantified and qualified through census-taking. Iwi registers were first compiled by missionaries in the 1840s, ostensibly to track the spread of Christianity. An unofficial Māori census undertaken between 1857 and 1858 included crude population counts for main iwi groupings, but it wasn't until 1874 that the first official Māori census was carried out. Kinship featured as the central organising concept in nineteenth-century Māori censuses and was expressed through a three-tiered typology of principal tribe (iwi), sub-tribe (hapū), and residence. The concept of a principal tribe appeared to have a much narrower meaning than the modern understanding of tribe; the list was relatively small and many of the so-called sub-tribes would today be recognised as autonomous tribes. Enumerator reports suggest a considerable degree of confusion prevailed, not only about which tribes were considered principals but also to which principals certain sub-tribes belonged. The ambiguities partly arose from treating tribes as timeless, discrete entities, at odds with the inherent dynamism of the Māori kinship system and the porous boundaries between whānau, hapū and iwi (Ballara, 1998).

Counting iwi was a time-consuming and difficult task and enumerators had limited resources at their disposal to cover large areas with dispersed populations. In the central North Island, some Māori communities simply disappeared between censuses while others reappeared in a new locality or in the same place but under a different tribal appellation (Kukutai, Pool, & Sceats, 2002). The inconsistencies reflected enumeration error as well as the complexity of local migration patterns which were influenced by changing tribal alliances and leadership, disease and conquest, as well as shifting economic arrangements. Much has been written about the tension between the collectivism of the traditional Māori usufruct system and state ambitions to individualise Māori landholdings (Ward, 1974), and these tensions were often remarked upon in census reports. The 1857/58 Māori census, conducted by the Waikato Resident Magistrate Francis Fenton (who would later preside over the Native Land Court), commented on the benefits that could be derived from Māori adopting a "fixity of residence". It is no surprise, then, that many iwi viewed census-taking with suspicion, perceiving it to be linked with taxation or conscription.[4]

From the turn of the twentieth century, iwi came more firmly under the aegis of state control and, stripped of much of their land, were perceived as less of a political and economic threat. After the 1901 Census, the collection of tribal data was abandoned altogether.

It was not until 1991, almost a century later, that the state again began to collect iwi data. In many ways, the return to iwi enumeration reflected the emergence of iwi organisations as state-recognised actors to received and distribute settlement monies and assume internal governance and policy-making functions (Walling et al., 2009). The Rūnanga Iwi Act (1990) embodied the Government's policy of devolving limited responsibility to Māori by conferring legal recognition to iwi authorities as Treaty partners and the preferred organisations to deliver social services to Māori. Although the Act was repealed a year later, the legacy of centralised iwi authorities remained (Barcham, 1998).

Changes in iwi identification

Despite this rich history, studies of iwi population dynamics are sparse. Lowe's (1989) study, based on data from 19th-century censuses and the 1951 electoral role, remains the most comprehensive study of tribal demography to date. His detailed analysis showed that, even in the 1870s, there was significant inter-iwi variation in terms of size, structure and growth potential. Pool (1991) also used 19th-century census data to examine iwi differences in growth and survivorship, but explicitly linked these differences to variation in the timing, magnitude and mechanism of iwi land loss through Crown purchase, raupatu (confiscation) and the Māori Land Court. This work formed the basis for a number of demographic reports, furnished as evidence for Waitangi Tribunal hearings, that documented and interpreted changes in iwi population health over time (e.g. Kukutai et al., 2002). Gould's (1996) study of socio-economic differences between iwi was the first to use contemporary census data to undertake systematic inter-iwi comparisons.

More recently, a case study by Walling et al. (2009) compared census-based indicators for Waikato iwi with those generated by the tribe's own register and found significant differences in population size and composition. Their study highlighted important departures in the concepts and processes employed to define iwi membership in official statistics versus tribal data sources. Whereas iwi affiliation in the census is based on self-identification (at least for adults), registers usually require some form of external recognition, typically by a kaumātua or elder. In such situations, the notion of belonging is explicitly tied to the acknowledgement of whakapapa.[5] Often interpreted as a synonym for genealogical connection or kinship, whakapapa refers in a more general sense to the layers of relationships that connect individuals to ancestors, to the living, and to the natural environment (Te Rito, 2007). Individual knowledge or willingness to identify as a group member is neither necessary nor sufficient for a whakapapa connection to exist. As Royal (1992, p. 21) notes, whakapapa is "an inescapable fact of human existence. Whether you know your parents or not, as a human you are the product of a group of people brought together in a number of antecedental events."

This sentiment resonates with the popular practice (anecdotally observed) of kaumātua and kuia registering their children and grandchildren on iwi registers to ensure that their whakapapa connection is acknowledged. Taken together, these studies draw attention to the historical origins of inter-iwi diversity, the linkages between demography, development and politics, and the disconnection between official notions of indigenous collective identity and those held within indigenous communities.

Methodology

The data used in this paper are drawn from the New Zealand Census of Population and Dwellings obtained from Statistics New Zealand either on their website or through custom data. Comparisons with tribal registration data are not possible as such data are the property of the individual iwi and are governed by strict privacy controls. Iwi data collected in the census are coded and reported on using the two-tier classification (rohe and iwi) used in the Statistical Standard for Iwi (Statistics New Zealand, 2009).[6] New iwi categories have been added over time and in its most recent iteration the Standard includes 128 iwi (excludes level-one regional categories) and eight residual-type categories. (For a more comprehensive analysis, see Rarere, 2012.) Iwi data are outputted using the total response method which means that individuals are counted in all of the groups with which they identify. As such, the sum of all iwi exceeds the sum of Māori descendants reporting an iwi affiliation.[8]

Both the wording and response categories of the iwi question in the census changed between 1991 and 2006. In 1991 the two-part question asked respondents of Māori descent if they knew their iwi and those ticking "yes" were prompted to write in the name of their *main* iwi. Those stating a main iwi could then indicate up to two other iwi with which they had strong ties (Statistics New Zealand, 1998). At the request of Māori stakeholders, the main iwi prompt was dropped in 1996 and the question simply asked if respondents knew the names of their iwi, with space to write in up to six iwi names and rohe. In 2001 the number of write-in spaces was reduced from six to five and a supplementary list of iwi from the classification standard was included in the help notes accompanying the census questionnaire. The question and format were retained in 2006.

Our analysis of iwi growth trajectories employs intercensal percentage change, average annual rate of growth (exponential), and cohort analyses. For the latter, we track changes in the size of five-year birth cohorts across the three intercensal periods covered by this study. In theory, indigenous populations such as Māori are "closed" to migration because there is no homeland outside of New Zealand that can provide a long-term source of augmentation. In reality, Māori have high levels of international mobility, although this invariably produces net losses in most years, particularly to Australia (Bedford, Didham, Ho, & Hugo, 2004; Kukutai & Pawar, 2013). Given this, iwi birth cohorts should decrease over time as a consequence of mortality and out-migration, and so any increase can thus be attributed to net increases through changing patterns of identification. Finally, we also use the cohort component method (Smith, Tayman, & Swanson, 2001) to compute the expected iwi population size by five-year age groups for 2006 and compare it with the observed figures. The expected population is computed by "surviving" the 1991 iwi base population and then adding expected births based on age-specific birth rates. The same method is applied for the following census years until an expected iwi population for 2006 is produced. An excess of observed over expected iwi members also points to gains through the addition of new affiliates.

Results

Growth and change overall

To provide a comparative context for the iwi case studies, Table 2 shows the intercensal growth for the aggregate iwi-identified population ("Iwi"), as well as the Māori ethnic group (MEG) (i.e. those who identified as Māori on their census form), those of Māori descent, and the total New Zealand population.

Of the four groups examined, the largest increase (38 percent) over the focal period and in two out of the three intercensal periods was among those who identified with at least one iwi. The exception was 1991 to 1996, where the biggest increase was for the Māori ethnic group. The increase in the MEG has elsewhere been attributed to a change in the 1996 ethnicity question that appeared to encourage multiple responses (Kukutai, 2001; Statistics New Zealand, n.d.). In fact, the wording for all three Māori

identity questions changed between 1991 and 1996, making it difficult to untangle the influence of instrumental changes and other factors that might promote a greater willingness to identify as Māori. Compared to the Māori subgroups, the total New Zealand population experienced much lower growth in all three intercensal periods.

Table 2: Number and intercensal change for iwi, Māori ethnic group, Māori descent group and total New Zealand, 1991–2006

Population	1991	1996	2001	2006
Iwi	370,476	426,231	454,479	512,325
MEG	434,847	523,371	526,281	565,329
Māori descent	511,278	579,714	604,110	643,977
New Zealand	3,373,926	3,618,300	3,737,277	4,027,947
	1991–1996	**1996–2001**	**2001–2006**	**1991–2006**
Iwi	15.0	**6.6**	**12.7**	**38.3**
MEG	**20.4**	0.6	7.4	30.0
Māori descent	13.4	4.2	6.6	26.0
New Zealand	7.2	3.3	7.8	19.4

Source: New Zealand Census of Population and Dwellings, various years

Growth and change among iwi

This section has a particular focus on whether the timing of Treaty settlements is correlated with an increase in iwi numbers in the census. Figure 1 plots the numerical size of the four specific iwi in each census year, and the year of settlement.

We focus first on the patterns for Waikato and Ngāi Tahu. Lead by charismatic, high-profile tribal leaders, both the Waikato-Tainui and Ngāi Tahu settlements attracted widespread media coverage in the lead-up to the signing of the deeds and in the years that followed. However, far from showing a systematic or clear pattern, the patterns are mixed. Ngāi Tahu experienced strong growth between 1991 and 2006, more than doubling in size from a baseline population of 20,304 to 49,185. Although the absolute increase was greatest in the two last intercensal periods (gains of 10,044 and 10,005, respectively), the largest proportionate increase occurred between 1991 and 1996 (43.5 percent). Ngāi Tahu also continued to experience significant growth in the decade following its settlement.

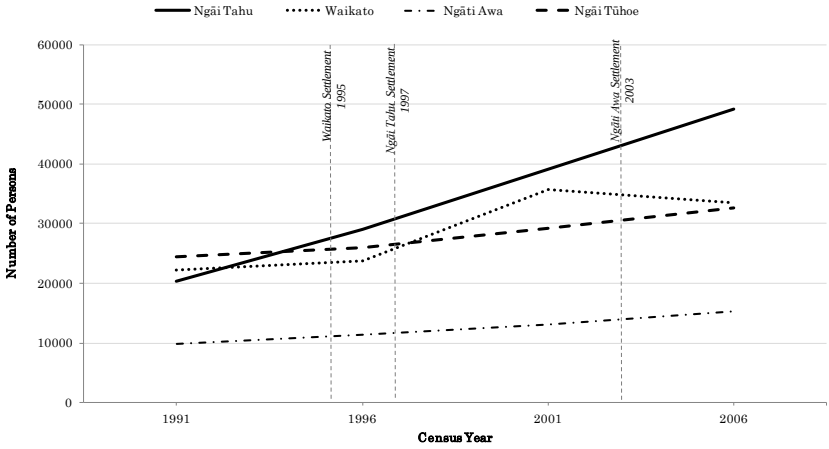
The pattern for Waikato iwi was far more volatile. Between 1991 and 1996, Waikato grew by only 7.1 percent and then increased by about 50 percent between 1996 and 2001. The number of people identifying as

Waikato then declined between 2001 and 2006. Making sense of these erratic patterns requires an understanding of both the settlement context and changes to the iwi classification system. Although the Deed of Settlement was signed in the name of Waikato-Tainui, the public profile of the iwi in the years preceding the settlement was simply the name Tainui, reflecting both the legacy of the Tainui Māori Trust Board (established under the Māori Trusts Board Act (1955)) and the connections between Waikato iwi and the larger Tainui waka confederation.[8] In 1991 and 1996 the iwi classification standard did not include the Tainui appellation; Tainui responses were likely to have been classified under some other category, most likely, "Waikato/King Country region – not further defined (NFD)" (Statistics New Zealand, 1993). In 1991 and 1996 the number of responses classified under that category was 15,399 and 18,711, respectively. In 2001 a change was made to the iwi classification standard that provided for the inclusion of waka categories, including Tainui, which were published as a supplementary iwi list in the notes section of the 2001 census. Between 1996 and 2001 there was a dramatic decline in the number of responses classified under the NFD category (from 18,711 to 1,650), which was partly offset by the increase in Tainui waka responses (12,591). The number of Waikato iwi responses also increased significantly in 2001. There is no obvious procedural explanation for why the number reporting Waikato iwi in the census declined in 2006 although it is important to note that the Waikato iwi register continued to grow over this period (Walling et al., 2009).

For Ngāti Awa the proportionate increase over the focal period (55.8 percent) was slightly higher than for Waikato but occurred in a more even manner, with the gain in any given intercensal period ranging between 15 and 17 percent. Compared to the post-settlement spikes observed for both Ngāi Tahu and Waikato, the Ngāti Awa settlement in 2003 did not appear to have a marked impact on patterns of identification in the 2006 census. The Ngāti Awa settlement received relatively little national media attention. In part this was because it was not novel – by the time the Deed was signed at least 20 direct negotiations had been reached with the Office of Treaty Settlements. Finally, of the four iwi shown in Figure 1, Ngāi Tūhoe experienced the smallest increase during the focal period, 33.2 percent, below the growth of the aggregate iwi

identified population (38.3 percent). Like Ngāti Awa, the intercensal growth was reasonably consistent, at between 15.4 and 17.0 percent.

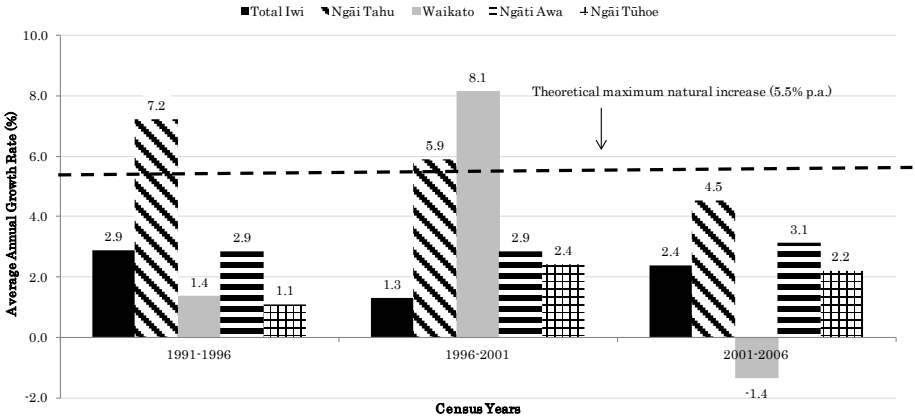
Figure 1: Number identified as Ngāi Tahu, Waikato, Ngāti Awa and Ngāi Tūhoe, 1991-2006



Source: Statistics New Zealand, Census of Population and Dwellings, various years.

While intercensal rates are a useful indicator of growth, average annual rates of growth are more useful, in that they allow for an explicit comparison with rates of natural increase. Figure 2 shows rates of growth within each intercensal period for the four iwi as well as for the total iwi-identified population. To provide a benchmark we also visualise the theorised maximum limit of growth (5.5 percent per annum) that could be achieved in a non-contracepting high-fertility population (for details, see Guimond et al., 2004). The growth rates for Ngāi Tahu in the first period, and for both Ngāi Tahu and Waikato in the second period, significantly exceeded the upper limit of growth that could be achieved by natural increase alone. Clearly these iwi growth rates were due to factors other than an excess of births over deaths. If we consider that, even in the least developed countries in the world, annual population growth rarely exceeds 3.5 percent (World Bank, 2012), then even the increases experienced by Ngāti Awa (2.9 – 3.1 percent) can be seen to be very substantial.

Figure 2: Average annual growth rates (exponential), Ngāi Tahu, Waikato, Ngāti Awa and Ngai Tūhoe, 1991–2006



Source: Statistics New Zealand, Census of Population and Dwellings, various years.

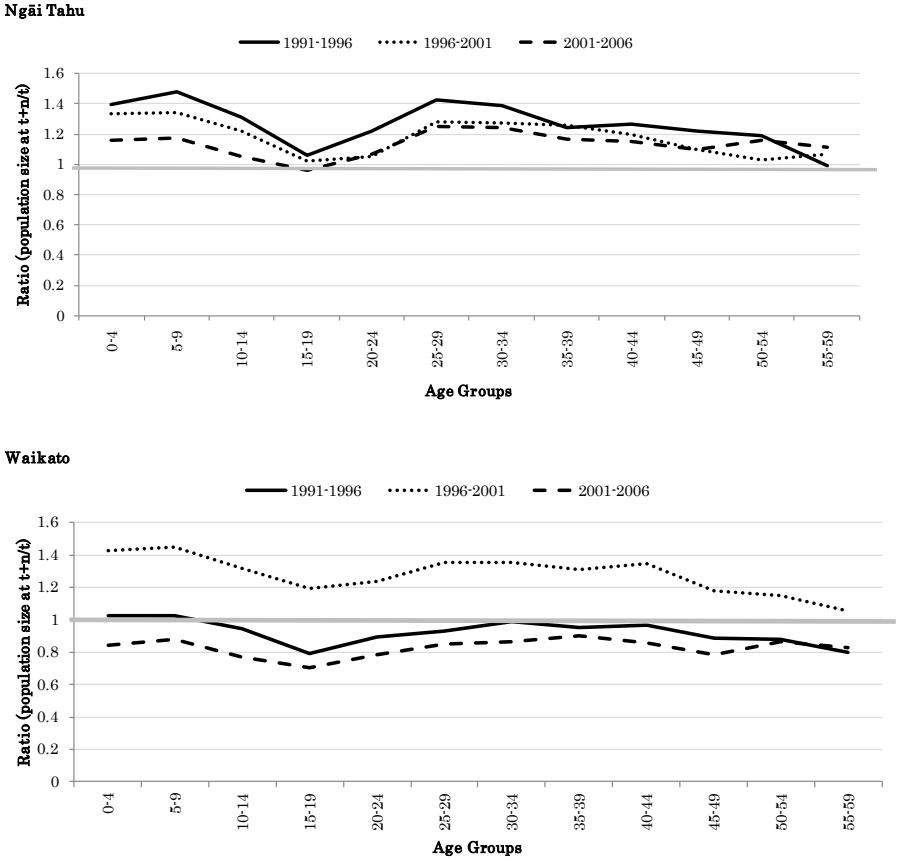
Notes: In theory, the maximum rate of natural increase is 5.5 percent per annum. However, the highest national rates of natural increase in the world are approximately 3.5 percent per annum (Guimond, 1999).

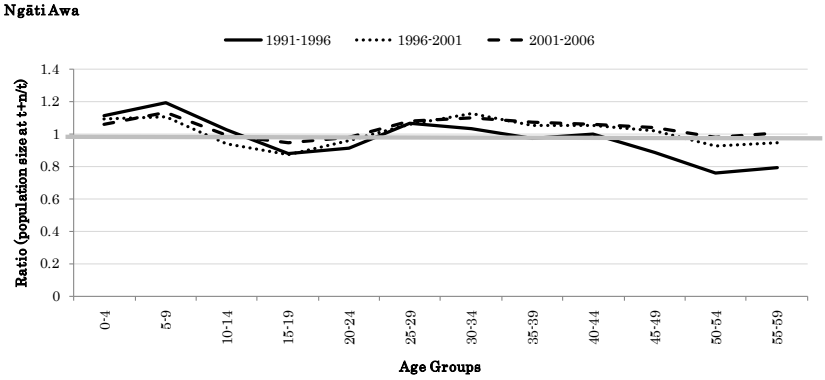
The preceding analysis confirms that individual changes in identification must account for at least part of the observed growth of our four iwi case studies. To what extent did these shifts occur uniformly across the different age groups? To answer this question we examine changes in the size of five-year age groups across the three intercensal periods. For ease of interpretation we use birth cohort ratios (age $x+n$, time $t+n$/ age x, time t) where ratios greater than one denote an increase in the size of a birth cohort over time and ratios less than one signal a decline. In theory birth cohorts should always decline over time through mortality. Even if we take account of migration, the number should decline as the flow of New Zealanders out of New Zealand consistently exceeds the number that return. The results are shown in Figure 3.

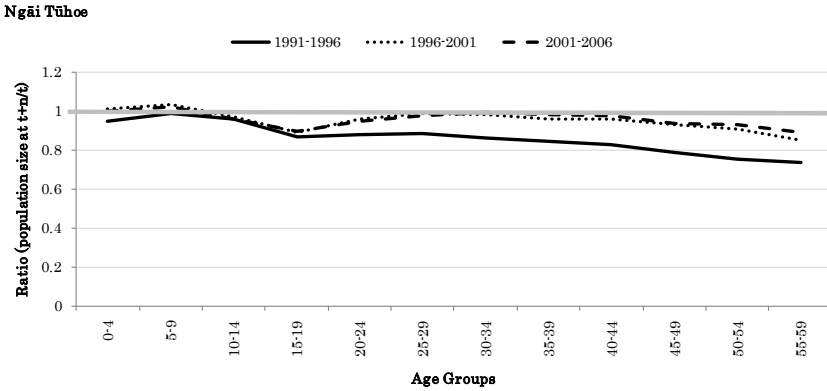
For Ngāi Tahu, we see that the ratios for all age groups in all periods exceeded one, with the exception of those aged 15-19 in 2001 (who were aged 20-24 in 2006). The ratios were highest at the youngest ages suggesting that the biggest shifts in identification were due to parents identifying their children as Ngāi Tahu (where they previously did not). Ratios were also relatively high at the younger adult ages, from 25 to 39 years. The graph for Ngāti Awa shows similar peaks at the younger and middle ages, albeit of a much smaller magnitude. It is interesting to note

that for all iwi the ratios were lowest at ages 15-19. This means that the number of 20-24 year olds at the end of the intercensal period was smaller than the number of 15-19 year olds at the beginning. This may be a reflection of a change from parental designation to self-identification associated perhaps with moving away from home for study or employment purposes. Tūhoe is unique in that, for all periods, the ratios were either at or below one, even at the younger ages. This suggests that ethnic mobility (which would show up as ratios > one) was a relatively insignificant contributor to population growth over the focal period and that natural increase was more important.

Figure 3: Ratio of birth cohort size by age group for Ngāi Tahu, Waikato, Ngāti Awa and Ngai Tūhoe, 1991-1996, 1996-2001 and 2001-2006





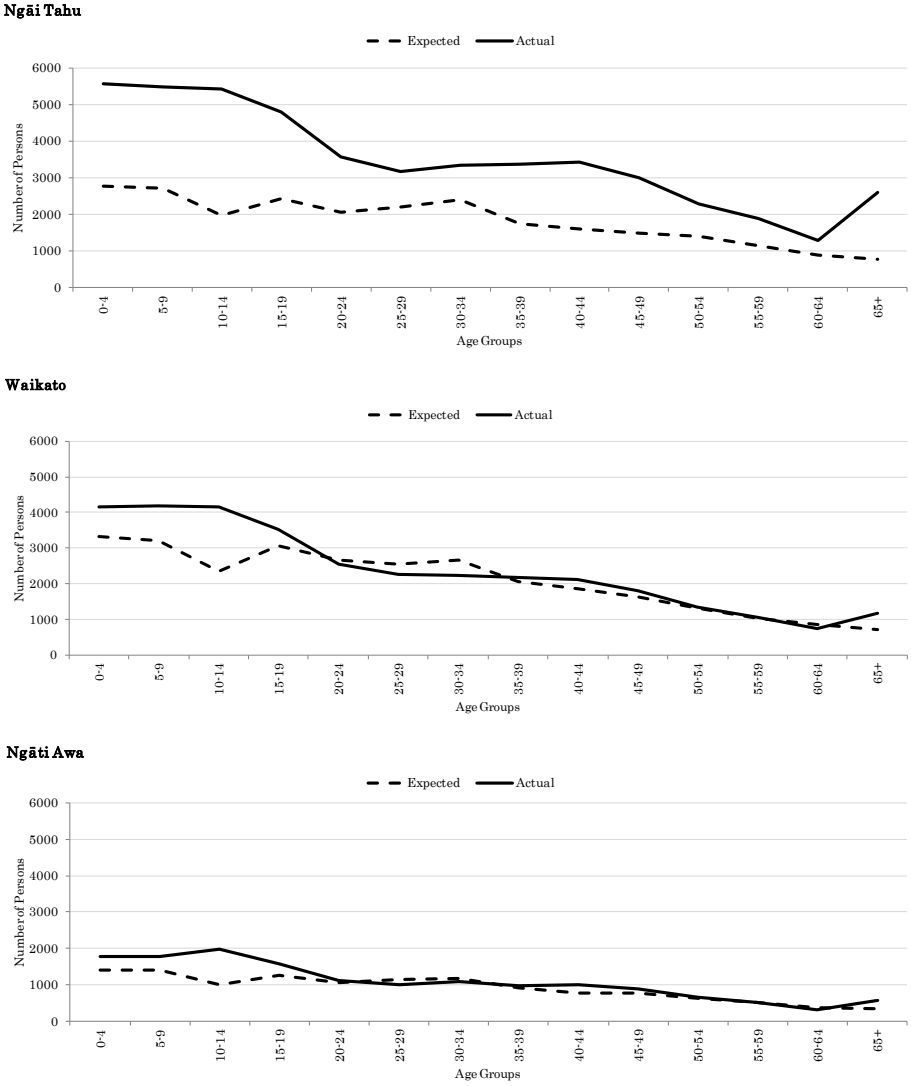


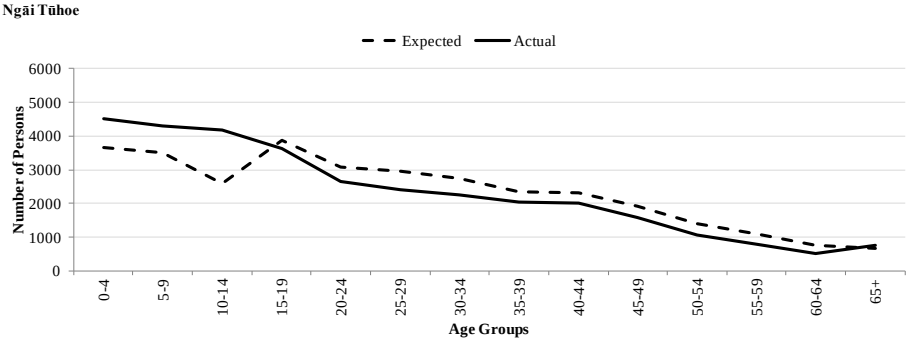
Source: Based on data from Statistics New Zealand Census of Population and Dwellings, various years. Notes: t = time; n = number of years

Survivorship Analysis

Building on the cohort analysis, Figures 4a to 4d show the expected and observed number in each five-year age group, for each iwi, in 2006. The expected numbers were arrived at using procedures described in the methods section. For Ngāi Tahu there were pronounced gaps between the expected and actual population at all ages and the differences were especially marked among children aged under 15 years where the observed number was almost double the expected. For Waikato iwi, the observed number of children also exceeded the expected number but the actual number of young adults (20-39 years) was slightly lower than expected. Ngāti Awa and Ngāi Tūhoe also had more children in 2006 than expected but, in the case of Tūhoe, the actual number was lower than the expected for all adult age groups. For Ngāti Awa, the actual number exceeded the expected with the exception of ages 25-34 years.

Figure 4: Expected and actual number by age groups, Ngāi Tahu, Waikato-Tainui, Ngati Awa and Ngāi Tuhoe, 2006





Source: Statistics New Zealand Census of Population and Dwellings 1991-2006 and Infoshare Māori Period Life Tables, various years

While the foregoing analyses show that changing patterns of identification have important age-related dimensions, we now turn our attention to the possible influences of gender. Table 3 shows the ratio of males to females for all four iwi plus the Māori Ethnic Group (MEG) over the entire focal period. In all instances we see a marked decline in sex ratios, indicating the increasing significance of women as drivers of iwi population growth. The shift is most marked for Ngāi Tahu where the ratio of men to women changed from 95 per 100 in 1991 to 86 per 100 in 2006. This cannot be attributed to what has been called the "missing men" phenomenon – men missing from official statistics due to under-enumeration, migration and other gender-linked factors (Callister & Lawton, 2011). If this were the case we would expect to see a similar decline in the sex ratios of the overall Māori ethnic group population and this is not the case. Of all four iwi, the shift towards a more female-dominated population was least apparent for Waikato-Tainui although the ratio was already well skewed towards women at the beginning of our focal period (89 men per 100 women in 1991 compared to 97 men per 100 women for the MEG).

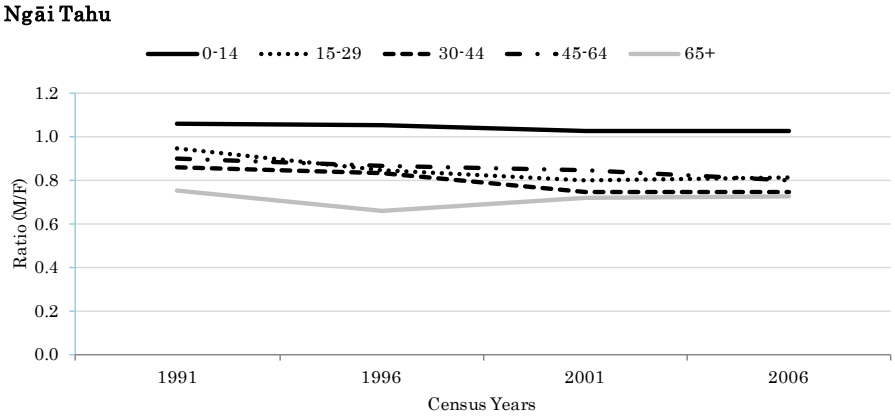
Table 3: Sex ratios, by iwi, 1991-2006

Population	1991	1996	2001	2006
Ngāi Tahu	0.95	0.90	0.86	0.86
Waikato-Tainui	0.89	0.90	0.88	0.86
Ngāti Awa	0.94	0.91	0.87	0.87
Ngāi Tūhoe	0.96	0.94	0.91	0.90
MEG	0.97	0.97	0.96	0.95

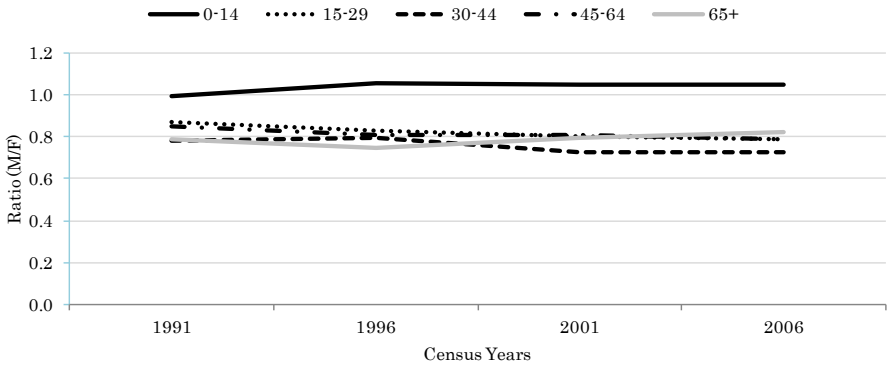
Source: Statistics New Zealand, New Zealand Census of Population and Dwellings

Finally, to ascertain whether the shift towards more female-dominated iwi profiles has occurred evenly across the different age groups Figure 4 shows age-specific sex ratios. What is immediately apparent is that, in all years and for all four iwi, the sex ratios among children are close to one. This suggests that parents do not make any gender distinctions when opting to identify their children with an iwi. Among older people the ratios are much lower, which is what we would expect given the lower survivorship probabilities of Māori men (versus Māori women), but the pattern is relatively stable. The ages at which most of the change has occurred is at the middle ages. Among Ngāti Awa, for example, the ratio of men to women aged 30-44 declined from 0.8 in 1991 to 0.7 by 2006. Indeed, declining masculinity ratios at these ages were observed for all iwi. Taken together, the analysis points to the importance of adult women, especially those in the middle-age groups, as agents of change in terms of iwi population growth.

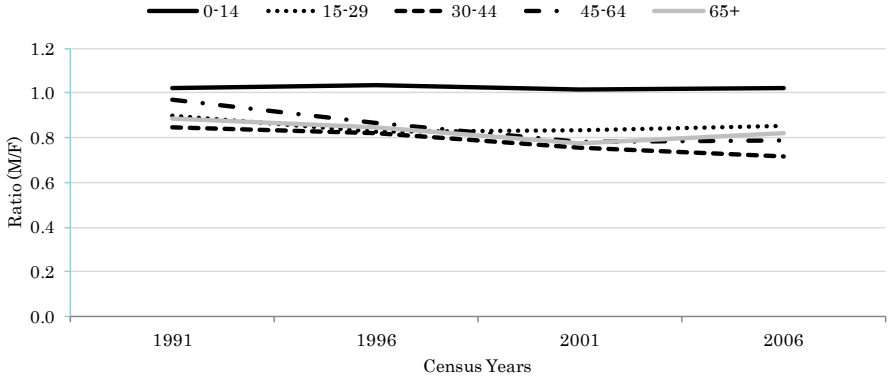
Figure 5: Age-specific sex ratios for Ngāi Tahu, Waikato-Tainui, Ngāti Awa and Ngāi Tūhoe iwi, 1991-2006



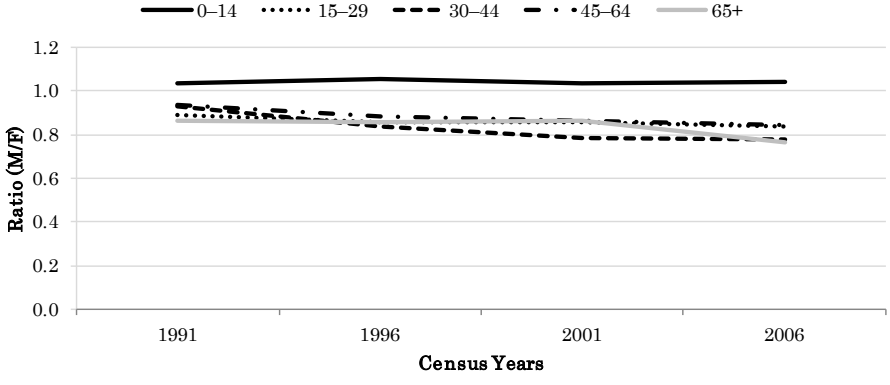
Waikato



Ngāti Awa



Ngāi Tūhoe



Source: Statistics New Zealand Census of Population and Dwellings, various years.

Conclusion

Motivated by the lack of attention given to iwi demography and the absence of indigenous perspectives in much of the ethnic mobility literature, this paper has sought to address a significant gap in the demographic literature. The main contribution has been to empirically identify key features of iwi population change in a period of major societal change in New Zealand. While our analysis shows that changing patterns of identification is clearly an important factor underlying the growth of iwi populations, its significance has varied over time and between iwi. Though partial, our analysis suggests that the increased propensity of Māori to identify with an iwi in the census cannot be solely attributed to changing incentive structures afforded through financial settlements. Rather, our analysis suggests that a range of factors are implicated, including instrumental changes in census and classification practices, changes in the broader socio-political environment, and individual-level demographic characteristics. In most instances, iwi cohorts increased rather than decreased in size and gains from "new" members were especially marked among children, the middle-aged and women. The findings confirm the importance of accounting for non-demographic factors when projecting and planning for future iwi population growth.

Finally, while these findings provide significant support for contemporary perspectives that highlight the fluid and contingent nature of ethnic identification, care needs to be taken in interpreting the substantive meanings associated with these shifts. That census-based findings may well depart significantly from the population patterns observed in tribal registers points to the shortcomings of relying solely on official data. A more comprehensive and critical approach that makes use of a range of sources and interpretive frameworks is likely to generate a more nuanced understanding of iwi population dynamics and the factors that underlie it.

Acknowledgement

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Notes

1 The 2013 census results for iwi were not available at the time of writing.

2 Waikato-Tainui were the first major iwi to bypass the Waitangi Tribunal process and achieve settlement with the Crown through direct negotiations. Signed in 1995, the Waikato-Tainui Deed of Settlement included a formal apology and financial redress for the confiscation (raupatu) of tribal lands in a $170 million deal that included cash and the return of State-owned land. A subsequent Deed of Settlement relating to the Waikato River was signed much later, in 2009.

The Ngāi Tahu Deed of Settlement, which was signed in 1998 but formalised as a Heads of Agreement in 1996, was also the result of direct negotiation with the Crown, and provided for cultural redress and a cash settlement of $170 million. Previously, Ngāi Tahu were involved in Tribunal hearings which resulted in a substantial three-volume report on their claims in 1991, followed by further reports on fisheries and ancillary claims in 1992 and 1995. The Ngāti Awa settlement, which was pursued through the Tribunal, was signed nearly a decade after the Waikato and Ngāi Tahu Deeds and provided for redress of about $42 million in land and cash.

Tūhoe were involved in Tribunal hearings and were also part of the so-called "Treelords" deal, signed in 2008, which provided for iwi and hapū (sub-tribe) forestry interests in the central North Island. The Tūhoe Deed of Settlement was signed in 2013 – well after the period covered by this analysis – and included a $170 million financial, commercial and cultural redress package.

3 Passel (1997), for example, found that almost half of the increase in the American Indian population observed between 1960 and 1990 was due to non-demographic factors including ethnic mobility.

4 "Rebel" tribes affiliated with the Kīngitanga (Māori King Movement) were recorded on several occasions as being especially un-cooperative.

5 Some iwi also allow for the registration of whangai (adopted) whanau members.

6 Note that this includes residual, unspecified and iwi categories.

7 Note the proportion reporting two or more iwi affiliations over time; cannot be computed for 1991.

8 Tainui is the name of the ancestral waka (canoe) from which Waikato and other iwi (Maniapoto, Raukawa and Hauraki) trace their descent. Tainui is also the name of a hapū in Whaingaroa (Raglan).

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Parents in New Zealand's Family Sponsorship Policy: A Preliminary Assessment of the Impact of the 2012 Policy Changes

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Abstract

In July 2012 a radically different system for selecting parents under New Zealand's policies relating to family sponsorship of immigrants came into operation. This paper assesses the impact of the new selection system on approvals for residence of parents from eight countries that together account for just over two-thirds of all parents admitted over the decade from July 2003 to June 2013. The policies that applied to admission of parents during that decade are reviewed, and have particular reference to the shift towards a stronger economic focus on the costs and benefits of a migration policy stream. The two-tier selection system creates two quite different sets of opportunities for family reunification amongst immigrants in New Zealandwhich are determined primarily by wealth of parents and sponsors. A possible long-term unintended consequence of these different sets of opportunities is the emergence of two classes of New Zealand citizens: those who will have an opportunity to have their parents living in New Zealand and those who will not have this opportunity for many years, if ever, because of the way the selection system works.

On 10 May 2012, the Minister of Immigration gave notice of a significant change in the capped family-sponsored migrant categories within the New Zealand Residence Programme (NZRP).[1] Minister Guy announced that the "parent, adult child and sibling" categories within the family-sponsored stream of residence policy would close and be replaced from 1 July 2012 with a new selection process for parents and a requirement for adult children and siblings to seek entry

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for residence under other streams, especially those for skilled and business migrants. No further applications for residence by parents, adult children and siblings were accepted between May and July 2012, although applications received to May continued to be processed.

In the year ended 30 June 2012, 5708 applications for residence under the policy applying to parents, adult children and siblings until May were approved. This was 479 more than the number approved in the year ended 30 June 2011 (5,229). The mix within the stream was also relatively consistent over the two years - 77 percent parents and 23 percent adult children and siblings in 2011, compared with 81 percent parents and 19 percent adult children and siblings in 2012.[2] The number of parents approved for residence (4601) in the year ended 30 June 2012 was the largest annual intake for any year during the preceding decade, even though the total number approved for the three capped categories (5708) was slightly less than the number approved in the year ended 30 June 2006 (5876).

During the year ended 30 June 2013 the number of parents (including grandparents) approved for residence declined by 16.5 percent – from the record high in 2012 to 3840. Of the 2012/13 total, slightly more than half (1991) had applied under the policy in place to May 2012; the balance (1849 or 48.2 percent) had been approved under the policy introduced on 1 July 2012. The numbers admitted under the adult child (127) and sibling (434) categories in the year ended 30 June 2013 were much lower than in the preceding year and were all applications that had been received by May 2012. As noted above, these two categories of adults no longer have a special place in New Zealand's immigration policy. The combined number of adult children and siblings admitted to 30 June 2013 (561) was just over half the number admitted in the previous June year (1107).

The net effect of these changes has been a decline by just under 30 percent in the number of approvals for residence by parents, adult children and siblings over the previous year – from 5708 down to 4401. This is the lowest number approved in these three categories during the previous decade, after the highest number for the decade was recorded in the year ended June 2012. The new selection system for parents is having the desired effect of reducing the number of parents admitted, although the share of all residence approvals in the capped parent, adult child and

sibling categories was marginally higher in 2012/13 (14.7 percent) than it had been in the previous year (14.1 percent) because of a fall in total approvals from 40,448 to 38,961. This was the lowest number of approvals for residence since the year ended 30 June 2004 when the 'Expression of Interest' (EOI) system of selection for skilled migrants was first introduced (Bedford et al. 2010). In the case of parents, however, their share of all residence approvals in the year 2012/13 (9.9 percent) was smaller than it had been in the preceding year (11.4 percent).

In this paper we undertake a preliminary analysis of the impact of the introduction of a new policy governing selection for residence of parents of migrants in New Zealand. The analysis will look at the numbers approved for entry from eight countries that have consistently provided more than 60 percent of the migrants approved for residence each year since the EOI selection system for skilled migrants came into operation in December 2003 (Bedford et al., 2010). These include three countries in Asia – the People's Republic of China (hereafter referred to as China), India, and the Republic of Korea (hereafter referred to as Korea) – the United Kingdom (UK), South Africa, and three Pacific Island countries – Fiji, Samoa and Tonga.

In the next section we outline the new two-tier system for parent approvals introduced in July 2012, which privileges the selection of migrants (or their sponsors) who have lifetime assets/resources to cover the costs of their residence in New Zealand. This is followed with some reflections on the impact of the new selection system on parents from different source countries joining their families in New Zealand with reference to trends during the decade 2003/04 to 2012/13.

The final section links the findings to debates in two wider contexts: a) futures for migrant families in welfare states with ageing populations, a topic that received attention at the International Metropolis Conference held in Finland between 9 and 13 September 2013[3] and b) futures for families from one of New Zealand's dominant sources of skilled migrants, China, which has a culture that has always placed great emphasis on filial piety and where a law has recently been passed requiring children to visit their parents each year.[4]

The Two-Tier Selection System for Migrants seeking Residence as Parents

On 1 July 2012 a new selection system for migrants seeking approval for residence in New Zealand under the capped parent category came into force. Modelled on the very successful two-stage system that was introduced for skilled-migrant selection in December 2003, people seeking entry under the parent category are required to submit an EOI before they make formal application to enter the country. EOIs must be submitted with reference to criteria applying to two tiers of entry: tier 1 (which always has priority and currently has a queue of applications awaiting assessment of around 18 months) and tier 2 (which has low priority and already has a waiting time for assessment estimated to be up to seven years).[5]

Unlike the system that applies to skilled migrants, where EOIs stay in the pool for a maximum of three months, in the case of the parent category EOIs can stay in the pool for an extended period of time. They are considered strictly in order of date of entry into the pool, and EOIs that meet the requirements of tier 1 will always be assessed before any of those submitted under tier 2 criteria. Applications that were submitted before 16 May 2012 under the previous parent category policy are selected after eligible tier 1 EOIs have been considered and before any tier 2 EOIs are assessed. The queue for these 'old policy' applications is estimated to be five years.

Once an EOI has been selected from the pool and checked by Immigration New Zealand staff, the submitter may be invited to lodge an application for residence. Those invited to apply have a maximum of four months to lodge an application after which the invitation lapses. At the time of application extensive documentation is required to validate the claims made in the EOI. Following verification of the claims made in the EOI, and depending on the applicant being able to demonstrate that they do meet the requirements of the parent category, the application may be approved in principle. Residence may be granted once the conditions applying to the financial support required for tiers 1 and 2, and any other conditions specified in the approval in principle, have been met.

In addition to the usual good health and good character requirements, those seeking residence under the parent category must

meet the requirements of one of the two tiers (see below) as well as having an adult child who is a New Zealand citizen or permanent resident and who is an eligible sponsor, a reasonable standard of English (defined further in the *Parent Category Guide*), and no dependent children. Sponsors have to have been resident in New Zealand for at least three years and must agree to support their parents for at least five years, including reimbursing the Ministry of Social Development for any benefit paid to their parents during this time (Cabinet Policy Committee, POL (07) 160, 21 May 2007, p. 4). It was agreed by Cabinet on 16 May 2011 that the sponsorship term would be extended to ten years once the Immigration Act (2009) is amended (Cabinet, CAB Min (11) 19/11, 16 May 2011, p. 2).

The key requirements for tiers 1 and 2 are as follows:

Tier 1: The applicant must meet <u>one</u> of the following requirements:

1) a guaranteed lifetime gross minimum income (in September 2013, NZ$27,203 per annum or $39,800 if a spouse or partner is included), or
2) bring at least NZ$500,000 of settlement funds to New Zealand, or
3) have a sponsoring child (or their partner) with a gross income of at least NZ$65,000 per annum or a combined gross income of NZ$90,000.

Tier 2: The applicant must meet <u>both</u> of the following requirements:

1) have a sponsoring adult child who meets a minimum gross income figure (NZ$33,675 in September 2013) and,
2) if the applicant has other adult children, they must be living lawfully and permanently resident outside the country the applicant comes from.

A major difference between tiers 1 and 2, and a significant departure from the 'centre of gravity' principle that has underpinned family reunification since the major review of immigration policy in August 1986 (Burke, 1986), is that parents seeking entry under tier 1 may have any number of adult children living in the country they are migrating from while those seeking entry under tier 2 cannot have any adult children living in the country in which the parent is living lawfully and permanently. In both cases the centre of gravity principle has been abandoned, but with very different meanings and consequences for parents seeking entry under the two tiers.

The situation that has applied since July 2012 has created two distinct classes of parents, compared with the previous policy where all parents seeking entry had to meet the same set of criteria (including a minimum income for sponsors from May 2007). Those who can afford to meet the much higher income/asset thresholds of tier 1 have priority over all other applications by parents, including those whose applications had been submitted under the policy that applied until May 2012. Those applying under tier 1 also do not have to meet any requirement relating to the residence of any other adult children they have had. On the other hand, those who apply under tier 2 have a lower priority than those applying under tier 1 or those in the queue under the previous policy, and they have to meet a completely different test with regard to any other adult children they may have.

For the first time in the history of New Zealand's family sponsorship policies, income/wealth of parents and/or sponsors has become the defining selection criterion. For the first time in the history of New Zealand citizenship two classes of immigrant families exist: those where parents have a reasonable chance of joining their immigrant adult children who have become New Zealand citizens (tier 1 applicants), and those where parents will have very little chance, if ever, of joining their immigrant adult children who have been New Zealand citizens for many years (tier 2 applicants). This significant differentiation in prospects for adult immigrants to have their parents join them at some stage as residents in New Zealand represents a major departure from the objective of family sponsorship policies articulated in the August 1986 immigration policy review. Between August 1986 and May 2007, the sole objective of family sponsorship immigration policy was "to strengthen families and communities" (Burke, 1986)

In his *Review of Family Sponsorship Policies* for Cabinet early in 2007, the Minister of Immigration (Hon. David Cunliffe) recommended, amongst other things, the addition of a further objective for family sponsorship policy, namely "to contribute to New Zealand's economic transformation and social development". He observed that: "While the [family] stream performs an important social role, it is critical that policies also be considered through an economic lens" (Cunliffe, 2007, p. 6). This "economic lens" was further defined and refined by the Minister of Immigration (Hon. Jonathan Coleman) in a paper (*Proposed Changes to*

Immigration Family Policies) for Cabinet's Domestic Policy Committee early in 2011 in which he proposed a refocusing of parent policy "to better support the attraction and retention of skilled migrants" (Coleman, 2011, p. 1). He went on to observe that "Parents sponsored by high-contributing sponsors, or who bring a guaranteed income or funds, will have high priority for New Zealand residence. They will also have more flexible eligibility criteria and reduced processing times" (Coleman, 2012, p. 1).

In May 2011 Cabinet approved the introduction, from July 2012, of the two-tier parent policy in order to enhance competitive advantage in attracting and retaining high-contributing migrants while at the same time increasing positive outcomes from non-economic-focused residence policies (CAB Min (11) 19/11, p. 1).

Until the major changes to family sponsorship policy, introduced by Cunliffe as part of his Immigration Change programme in May 2007, there had been no specific cap on the numbers of parents, adult children and siblings, although the overall family sponsorship stream had had a notional ceiling of 30 percent of all residence approvals during a given year since 2001. The creation of two sub-streams within the family-sponsorship stream in 2007 was a deliberate attempt to prioritise the entry of overseas-born partners and dependent children, especially of returning New Zealanders (Cunliffe, 2007, p. 8). The relatively low workforce participation of many adult children and siblings, by comparison with migrants admitted under the skilled migrants category, and the much higher levels of benefit dependency amongst the older parent-category-were documented in some detail in Cunliffe (2007).

The savings in health and superannuation costs anticipated by the changes introduced in 2007 were quite substantial. In the background paper prepared for the Cabinet Policy Committee in May 2007, it was estimated that "the net savings in benefit expenditure at current rates from the proposal to extend sponsors' support of parents from two to five years would be $16.163 million per annum" (Cabinet Policy Committee, POL (07) 160, p. 2). In a Department of Labour report to Minister Coleman entitled *A Comprehensive Overview of Family-Sponsored Migration* (09/87071, 30 September 2009, p. 8), it was argued, with reference to data on costs by age and gender in 2007/08, that

> Even when based on the lowest level of superannuation ($519.72 per fortnight) parent migrants can cost $100,000 each in superannuation

> over their lifetime. Combining this figure with potential health costs means each parent migrant can equate to around $200,000.

It was also noted that:

> New Zealand has social security agreements with many countries (in particular the United Kingdom and Ireland), which means that New Zealand does not carry the full costs associated with some migrants' superannuation. … Ministry of Social Development data indicate that overall around 10 percent of New Zealand pensions are offset by overseas contributions (Department of Labour, 2009, p. 8).

While it cannot be denied that health and welfare costs linked with immigration of older migrants have been rising in recent years, especially as increasing shares of older migrants come from countries that do not have comprehensive superannuation schemes and where there is no tradition of health insurance, the shift towards a more deliberate focus on the fiscal rather than the social benefits of family sponsorship in 2007 has entailed some significant trade-offs. The two most obvious ones are firstly a weakening of the foundation objective of family sponsorship to strengthen families and communities, and secondly a differentiation between groups of New Zealand citizens (locally born versus immigrant) in terms of opportunities for having parents living in the country. Both of these trade-offs have been exacerbated by the changes recommended by Coleman (2011) and implemented in July 2012.

In the next section we review some of the effects policy changes have had on numbers of parents approved for residence in New Zealand from different source countries with reference to the decade 1 July 2003 to 30 June 2013, the decade during which Immigration New Zealand pioneered the two-stage Expression of Interest/Invitation to Apply (EOI/ITA) system for applications for residence in the skilled-migrant category. Most of the parents who enter New Zealand are parents of migrants who gain permanent residence via the skilled-migrant category. Since the major policy changes in the mid-1980s, the sources of migrants have become much more diverse, with increasing proportions coming from countries that have no tradition of state-sponsored comprehensive superannuation or health/medical insurance (Spoonley and Bedford, 2012). This diversity in flows of migrants transitioning to residence in New Zealand via the skilled-migrant category has, inevitably, generated a growing diversity in the sources and welfare needs of parents – a trend that can only continue to become more prominent as migrants admitted

under the 'economic' stream advance in age and assume increasing responsibility for supporting their parents either in their home countries or, if their parents can get admitted as migrants via the parent category, in New Zealand.

Parents in the New Zealand Residence Programme, 2003/04 to 2012/13

Between July 2003 and June 2013, 444,071 people were approved for residence under New Zealand's Residence Programme (NZRP). Just over two-thirds (67.2 percent) of these approvals were for people from eight countries: China, India and Korea (24.7 percent), the UK and South Africa (29.4 percent) and Fiji, Samoa and Tonga (13 percent) (Table 1). Within this total, 148,068 people were admitted in the family sponsorship stream (33 percent of all residence approvals). In common with the total for residence approvals, just over two-thirds of the family-sponsored migrants were admitted from the eight countries, and these approvals accounted for 33 percent of all residence approvals from those eight countries.

Table 1: Approvals for residence by nationality and migrant stream/category, 1 July 2003–30 June 2013

Nationality	Total	Family			% approvals		% Residents approved
	Approvals	Sponsorship	PACS	Parents	Parents	% Parents approved	
Asia							
China	57,726	28,155	15,421	12,318	21.3	32.5	13.0
India	38,515	16,053	7703	5819	15.1	15.3	8.7
Korea	13,502	3012	893	627	4.6	1.7	3.0
Sub-total	109,743	47,220	24,017	18,764	17.1	49.5	24.7
% Asia 3	24.7	31.9	46.8	49.5	..	..	..
Pacific							
Fiji	27,403	10,989	5648	3300	12.0	8.7	6.2
Samoa	20,433	8649	1390	963	4.7	2.5	4.6
Tonga	10,019	4625	1577	1018	10.2	2.7	2.3
Sub-total	57,855	24,263	8615	5281	9.1	13.9	13.0
% Pacific 3	13.0	16.4	16.8	13.9	..	..	..
Other							
UK	94,366	22,371	6591	5707	6.0	15.0	21.3
Sth Africa	36,256	5184	2805	2226	6.1	5.9	8.2
Sub-total	130,622	27,555	9396	7933	6.1	20.9	29.4
% other 2	29.4	18.6	18.3	20.9	..	..	..
Total 8 countries	298,220	99,038	42,028	31,978	10.7	84.3	67.2
% residen approvals	100.0	33.2	14.1	10.7	..	..	..
Total all countries	444,071	148,068	51,313	37,919	8.5	100.0	100.0
% residen approvals	100.0	33.3	11.6	8.5	..	..	..
% from 8 countries	67.2	66.9	81.9	84.3	..	..	..

Data source:
Excel spreadsheet R1 Residence (accessed between 2007 and 2013) from http://www.immigration.govt.nz/migrant/general/generalinformation/statistics,
Note: PACS is Parent, adult child and sibling stream.

Of the 148,068 approvals in the family-sponsored stream, 51,313 (35 percent) were in the capped parent, adult child and sibling categories (PACS). In the case of the eight countries, the share of family-sponsored migrants in the capped sub-stream was higher (42 percent), and the eight countries accounted for 82 percent of the total parents, adult children and siblings admitted during the decade (Table 1). Of the 51,313 in the capped sub-stream of family-sponsored migrants, 37,919 (74 percent) were in the parent category (which also included grandparents). The great majority of these parents (84 percent) were from the eight countries, and they accounted for 76 percent of the total numbers of parents, adult children and siblings approved for residence from these countries during the decade.

In the case of migrants approved for residence from the three Asian and three Pacific countries their shares in the family-sponsored stream, the capped sub-stream of parent, adult child or sibling, and the parent category were all higher than their equivalent shares of residence approvals during the decade (Table 1). Just under 50 percent of the parent-category approvals had come from China, India and Korea compared with just under a quarter of the residence approvals. The share of parent approvals from the three Pacific countries (13.9 percent) was only marginally greater than their share of all residence approvals (13 percent), whereas the share of parent approvals from the UK and South Africa (20.9) was almost 10 percent lower than their share of residence approvals (29.4 percent) (Table 1).

There are major variations between countries in the percentage of residence approvals during the decade that were parents. Just over a fifth (21.3 percent) of all Chinese migrants approved for residence were parents, significantly higher than the percentages from the other two Asian sources listed in Table 1 (India, 15.1 percent and Korea 4.6 percent). There were also major differences in the shares of parents in migrants from the Pacific approved for residence: Fiji had the largest share (12 percent), followed by Tonga (10.2 percent) while parents from Samoa comprised only 4.7 percent of their residence approvals. Migrants approved for residence under the Samoan Quota (a category included in the international stream) reduced the significance of parent approvals in this case. The two most consistent parent shares over the decade as a whole were found in the residence approvals from the UK and South Africa – 6.0 and 6.1 percent respectively,

both well below the average of 10.7 percent for the eight countries and 8.5 percent for all sources of residents between July 2003 and June 2013.

Between 2003/04 and 2006/07 – the year in which the parent, adult child and sibling categories were capped, a minimum-income requirement for sponsors was introduced and the length of time a migrant sponsor would have to support their parents without access to benefits was increased – the average number of Chinese approved under the parent-category was 829 per annum (Table 2). During the following five years to June 2012, before the two-tier parent category selection system became operational, the average number of parents who were citizens of China approved per year increased significantly to 1463. In the 12 months to June 2013 it was even larger, at 1684, double the average number admitted in the period before the Cunliffe policy amendments (Table 2). No other country's parent-category intake experienced this pattern of growth during the decade (Table 2). The other two Asian countries both had marked decreases in numbers of parents approved once the cap and the income thresholds for sponsors came into effect during 2007.

Table 2: Average numbers of residence approvals in three policy periods, 2003/04 – 2012/13

Nationality	Pre-capped 03/04-06/07	Capped 07/08-11/12	Two-tier 2012/13	% change 04/07-08/12	% change 08/12-12/13
Asia					
China	829	1463	1684	76.5	15.1
India	693	541	344	-21.9	-36.4
Korea	83	54	25	-34.9	-53.7
Pacific					
Fiji	314	357	261	13.6	-26.8
Samoa	161	59	24	-63.0	-59.6
Tonga	181	54	24	-70.3	-55.4
Other					
UK	577	538	710	-6.7	32.0
South Africa	220	213	279	-3.2	30.9
Total 8 countries	3058	3279	3351	7.3	2.2
Total all countries	3682	3871	3840	5.1	-0.8

Data source: See Table 1.

The variability in impact of the policy changes that came into effect in 2007 and 2012 on migration of parents from different countries cannot be explored in detail here, but three interrelated factors have worked to favour entry of parents from some countries more than others. The first is the imposition of a minimum-income threshold for sponsors in 2007 and the requirement to support those they sponsored for five years rather than two – this favoured sponsors who had been approved for residence in New Zealand as skilled migrants. They had to have jobs reaching the minimum income threshold for sponsorship of parents in order to meet the skilled-migrant entry criteria. The main policy constraint inhibiting their ability to bring in parents subsequently was the 'centre of gravity' principle. That is, if they had more brothers and sisters living in the country in which their parents were usually resident, they could not satisfy a key requirement of policy relating to entry of parents. The situation changed in 2012 when this constraint was removed for those who could meet one of the asset/income thresholds for entry under tier 1.

The two groups in Table 2 who had the greatest difficulty meeting the minimum income threshold, the longer sponsorship period and the centre of gravity principle under the 2007 policy, and the asset/income thresholds required to meet tier 1 criteria from July 2012 were the citizens of Samoa and Tonga. Very small proportions of Samoans and Tongans are approved for residence in the skilled and business migrant stream. The great majority (more than 90 percent in most years) are admitted in the family sponsorship and international streams (Bedford, 2008). The Samoan Quota, which has been in operation since the late 1960s, and the Pacific Access Category (PAC) quota for Tongans, which was introduced in 2002, have been the major routes for migrants seeking work-related permanent residence in New Zealand from these two countries in recent years. Both the Quota and the PAC require those selected under their ballot systems to have confirmed offers of continuing employment that will generate annual incomes that meet or exceed a specified minimum threshold and ensure they can cover the costs of supporting those they sponsor without access to welfare benefits. Sustaining this work and income has often been a challenge for Pacific migrants and meeting the income threshold for sponsoring parents under the 2007 policy changes has not been easy.

An equally significant constraint facing many migrants from Samoa and Tonga has been meeting the centre of gravity principle because

of their preference for larger families. The changes that came into effect in July 2012 in the criteria for both tiers 1 and 2 did not favour parent migration from Samoa and Tonga. The asset/income thresholds in tier 1 were more challenging than those that applied under the 2007 policy, and the requirement under tier 2 that all of the parents' children were living offshore was much more difficult to meet in larger Polynesian families. The fact that this latter requirement did not apply under tier 1 did not assist Samoans and Tongans wishing to sponsor the migration of their parents to New Zealand – the higher asset/income thresholds were very difficult to meet in a migrant group that was heavily dependent on relatively low income jobs and welfare benefits. The other Pacific group in Table 2, Fijian citizens, were faced with similar issues relating to the centre of gravity principle, but because a much higher proportion had entered under the skilled and business-migrant categories, more of them were in a better position to meet the income threshold introduced in 2007 and the income/asset thresholds that apply for tier 1 entry.

A third factor that has had a variable impact on parent migration over the past decade, and which is much more difficult to quantify than the impacts of income/asset thresholds, sponsorship periods and the centre of gravity principle, is the variation in levels of interest amongst parents of migrants from different countries and cultures in moving to New Zealand to join their adult migrant children. While a duty of care for parents by their children is widespread across different cultures, there is no general model for how this will be achieved. In countries with comprehensive social welfare systems, it is common for universal pension schemes to supplement family support for older generations. In countries without such schemes and with significant shares of their populations deriving their livelihoods from primary production, larger families are often the norm and parents often prefer to remain active participants in their familiar cultural and physical settings rather than moving into very different settings in their old age.

In the case of the three Asian groups in Table 2, this factor undoubtedly has had some impact on the different patterns of parent migration for citizens of China, India and Korea. The strong tradition of filial piety amongst Chinese (Ho and Bedford, 2008; Liu, 2010; Li, 2011), coupled with the legacy of the one-child family policy, has meant that support for ageing parents often requires either frequent visits and support

from their migrant child, or the parents' moving to the country where their child is resident. The continued high proportion of Chinese parents admitted during the three periods shown in Table 2 is a reflection of these socio-cultural contextual factors. In the cases of the patterns of parent migration for citizens of India and Korea, two significant factors are the absence of the legacy of a one-child policy and a choice by many older Indians and Koreans to stay in their own societies, often with some support from resident children and their families. Although there has been no specific study of the demand for residence in New Zealand by parents from different countries, anecdotal evidence suggests that for many, access by parents to a visitor's visa in order to maintain physical contact with adult children and their families in New Zealand is more important than access to permanent residence per se. This was recognised by officials and the Minister of Immigration in the 2007 review of family-sponsorship policies and a new provision for multiple-entry visas for parents was introduced late in 2007.[6]

Citizens of Samoa and Tonga experienced the most pronounced declines in parent approvals for residence during the decade (Table 2). They were affected by the income thresholds for sponsors introduced in 2007 and would not have qualified for entry under tier 1 criteria after July 2012. Fijian citizens did not fare so badly, mainly because a significant number of migrants from Fiji since the military coups in 1987 have been Indians entering via the skilled and business-migrant stream, many of whom would have sought approval to bring their parents to New Zealand following further coups in 2000 and 2006.

The UK and South Africa had different patterns again. There were smaller numbers of parent arrivals on average per year from both countries after 2007 (Table 2). However, there was a recovery after the introduction of the two-tier policy – parents and sponsors from these countries were better placed to meet the income criteria in tier 1 and to benefit from the relaxation of the centre of gravity requirement for members of the migrant sponsor's immediate family, especially their brothers and sisters.

Approvals for Residence under the New Policy, 1 July 2012 – 30 June 2013

Of the eight nationality groups considered in this analysis, citizens of China have been least affected by the policy changes in terms of average numbers of approvals for entry each year. When the approvals under the policy introduced in July 2012 are considered separately, it can be seen that their share of all people approved for entry under tier 1 criteria (39.8 percent) is quite a bit smaller than their share of the approvals between 1 July 2012 and 30 June 2013 under the previous policy (47.5 percent) (Table 3). Shares of Indian and Korean parents approved under tier 1 also fell relative to those whose applications had been lodged under the previous policy. Fiji citizen parents showed a slight increase (7.0 percent) under tier 1 compared with previous policy approvals (6.6 percent) while those for Tonga and Samoa citizens fell (Table 3). The big winners under the new two-tiered parent selection system were citizens of the UK and South Africa – their shares of tier 1 approvals were markedly higher than their shares of parents approved under the previous policy. There were no approvals of tier 2 EOIs during the 12 months ended 30 June 2013 because of pressure on the capped parent category from tier 1 EOIs and the backlog of previous policy applications. This accounts for the absence of any approvals under the new policy criteria from Tongans during the 2012/13 year.

Table 3: Residence approvals for parents, new and previous policies, July 2012-June 2013

	Previous			% Previous		
Nationality	Tier 1	Policy	Total	% Tier 1	Policy	% total
Asia						
China	735	946	1681	39.8	47.5	43.8
India	75	269	344	4.1	13.5	9.0
Korea	6	19	25	0.3	1.0	0.7
Pacific						
Fiji	129	132	261	7.0	6.6	6.8
Samoa	10	14	24	0.5	0.7	0.6
Tonga	0	24	24	0.0	1.2	0.6
Other						
UK	492	218	710	26.6	10.9	18.5
South Africa	211	68	279	11.4	3.4	7.3
Total 8 countries	1658	1690	3348	89.7	84.9	87.2
Total all countries	1849	1991	3840	100.0	100.0	100.0

Data source: As for Table 1.

Statistics published on the selections from the parent category pool each quarter show that Chinese citizens consistently accounted for more than 40 percent of the total EOIs selected for preliminary verification to determine whether invitations to apply for residence would be issued. (Note that selection from the pool does not guarantee an invitation or a subsequent approval to enter for residence). The shares of EOIs selected for UK citizens fell from 28 percent in August 2012 to 12 percent in May and August 2013 (Table 4), the shares from South Africa on the five selection dates ranged between 10 and 11 percent, while those for Indians and Fijians rose in most years. Amongst the 'Others' category, which ranged from 11 to 17 percent across the selections, the Philippines, Russia and Malaysia featured consistently as sources of 1 to 3 percent of EOIs selected, with Canada, the USA and Korea appearing periodically at 1 percent.

Table 4: Quarterly selection statistics, parent category, August 2012- August 2013

Data relating to selection	Selection date					Total
	08/12	11/12	02/13	05/13	08/13	
Total EOIs	595	1669	962	1092	1026	5344
Total people included	1001	2763	1612	1830	1713	8919
% Principal applicants by nationality						
China	43	43	44	47	43	44
UK	28	16	13	12	12	16
Sth Africa	10	11	10	10	11	10
India	6	9	10	9	11	9
Fiji	2	5	6	7	7	5
Others	11	16	17	15	16	15

Data source: New Zealand Residence Policy Quarterly Selection Statistics, Parent Category.

The translation of EOIs to residence approvals during the 2012/13 year for principal applicants (PIs) who submitted applications from the countries shown in both Tables 3 and 4 was highest for UK, South African and Fijian citizens, and lowest for Chinese and Indian citizens (Table 5). In column 1 of Table 5, the numbers of PIs recorded in the Immigration New Zealand database for residence approvals during the year ended June 30 2013 are shown for the five nationalities for whom numbers of EOIs submitted during the year can be estimated from the quarterly returns on selections from the tier 1 pool during the year (August and November 2012, February and May 2013).[7] The estimates of EOIs submitted by PIs from the five countries that were selected from the pool are shown in column 2 of Table 5. The percentages of EOIs selected that translated into approvals during the 2012/13 year are shown in column 3 of Table 5.

Table 5: Translation of EOIs to approvals, July 2012-June 2013

Nationality	EOIs selected	Tier 1 approvals	% approved
China	1910	411	21.5
UK	690	302	43.8
South Africa	448	142	31.7
India	380	54	14.2
Fiji	230	85	37.0
Others	660	138	20.9
Total	4318	1132	26.2

Data source: See Tables 4 (EOI selected) and 1 (approvals)

When interpreting the percentages in Table 5, it should be kept in mind that there are several steps to be negotiated between the time an EOI is submitted and the time a residence approval is obtained. The first hurdle is getting an invitation to apply for residence – before this is sent the submitter of the EOI must verify that they remain interested in applying for residence via the parent category. Once the invitation has been sent the prospective applicant has four months to get a full proposal to Immigration New Zealand. When this application has been checked and the conditions of tier 1 entry have been met residence may be approved. The applicant will have 12 months to take up the residence offer.

Given the number of steps to be completed and the times allowed for processing the applications by immigration staff, as well as for responding by the applicant, a significant number of the EOIs selected between August 2012 and May 2013 would not have reached the approval stage by 30 June 2013. This accounts for the relatively low percentage of EOIs selected during the four draws between August 2012 and May 2013 being processed through to residence approval – just over a quarter (26 percent) of the selected EOIs had translated into residence approvals by 30 June 2013. Much higher percentages of approvals were found for the UK (44 percent), South Africa (32 percent) and Fiji (37 percent) than for China (22 percent) and India (14 percent) (Table 5). It was more difficult for applicants or their sponsors from the latter two countries to meet the assets/wealth threshold than many of those from the UK and South Africa. There could also have been reluctance on the part of some Chinese and Indian parents to make a firm decision to migrate to New Zealand – what had seemed to be a good idea at the time the EOI was lodged would have needed greater consideration once the invitation to apply was received.

As Table 6 shows, just under two-thirds (65.3 percent) of all principal applicants who were approved for residence under tier 1 were aged 60 years or more, a higher share than was found for the principal applicants approved under the old policy (57.5 percent). There were quite marked variations across the eight countries with regard to the share of their approvals for residence of PIs aged 60 years or more. Those aged 60 years or more made up less than 50 percent of the PIs from China and Fiji but more than 80 percent of those from the UK and South Africa. In some countries there were smaller proportions of parents aged 60 years or more selected under tier 1 than was the case for those selected under the old policy (e.g. China, Samoa and South Africa), while in others the reverse applied (e.g. India and the UK). The UK, South Africa and Fiji had larger numbers of parent PIs approved under tier 1 criteria than under the old policy, whereas China, India, Korea, Samoa and Tonga had smaller numbers approved (Tonga had no parents approved under tier 1 during the 2012/13 year).

Table 6: Age of principal applicant parents approved, July 2012–June 2013

Nationality	Total PI approved		% aged 60+	
	Tier 1	Old policy	Tier 1	Old policy
Asia				
China	411	504	38.2	40.9
India	54	143	83.3	61.5
Korea	4	12	75.0	75.0
Pacific				
Fiji	85	74	56.5	50.0
Samoa	6	9	66.7	77.8
Tonga	0	11	0.0	81.8
Others				
UK	302	134	90.4	90.3
South Africa	142	45	83.8	91.1
8 countries	1004	932	64.6	55.6
All countries	1132	1114	65.3	57.5

Data source: See Table 1

Discussion and Conclusions

It is clear from this analysis of the two-tier selection system that is in place for parents seeking to join their immigrant children in New Zealand that some shifts are occurring in the composition of those approved for residence under the parent category. Given that the new selection system has only been operating for 12 months, and also the lengthy gap between submission of an EOI and final approval of residence, it is impossible to be certain about transmission rates. Nevertheless, in the 2012/13 year a greater number of applicants from the UK and South Africa cleared the various stages required for approval than did those from the two large Asian sources of immigrants. The tier 1 selections also resulted in a higher proportion of parents aged 60 years or more being invited to apply for residence than was the case with applicants approved under the old policy, although this was not a consistent pattern across all countries, as shown in Table 6.

While it is too early to draw any definitive conclusions about the impact of the policy changes in May 2012 on migration in the parent category, the evidence from the first year of operation of the two-tier system does appear to support the concerns of leaders in New Zealand's Pacific communities that family reunification was going to become much more difficult for them under the new selection system. If it is going to take five years to clear the backlog of applications under the policy that was in force until May 2012 (and this is the estimate that Immigration New Zealand has published in its documentation on application for residence by parents) then it could be 2017 before any tier 2 EOIs are considered for selection. To date, all tier 1 EOIs submitted each quarter have been selected for consideration – they have first priority every quarter. The remaining places in the parent category have been filled by applications under the previous policy. Immigration New Zealand is very clear in its *Parent Category Guide* that the waiting time for consideration of tier 2 applications could be seven years (Immigration New Zealand, 2012, 4). This will inevitably create stress for migrant families and their parents who cannot meet the criteria for entry under tier 1.

Coping with demand for family reunification has become a major challenge for most Western democracies that have social welfare systems that provide for some support for older members of the population. The

cost of this support is met through a mix of tax-payer funded contributions and superannuation schemes linked with employment or investment in forms of insurance. As the share of older residents in the population increases as a result of structural and numerical ageing the welfare (including health care) costs rise. Addressing the fiscal challenges of population ageing is proving to be one of the most difficult and contentious areas of policy formulation in many welfare societies. A relatively easy target in this context is managing the flow of older people into the population through immigration policy. This is achieved by age limits on applications for entry as skilled migrants (55 years in New Zealand; 45 years in Australia) as well as restrictions on numbers of parents of migrants who can be admitted in any given year. Notwithstanding these restrictions, it is widely acknowledged in the same welfare societies that family care for older members remains the preferred route to ensuring well-being in ageing populations.

There is also extensive debate in several migrant source countries about the well-being of family members who are left behind when migrants leave to work and take up residence overseas. This is not the place for a review of this debate, but it can be noted in concluding this preliminary analysis of the recent New Zealand data on parent migration that on 1 July 2013 a legal amendment in China came into force that requires children to visit and keep in touch "often" with their ageing parents or face being sued (see note 4 below). While some Chinese living in New Zealand have dismissed this as a symbolic gesture rather than something Chinese resident overseas need to be concerned about, it is suggestive of the increasing concern, globally, about the well-being of older generations.

The less discussed, but very obvious implication of New Zealand's two-tier selection system for migrant parents is that it has the potential to create two classes of citizens in New Zealand: those who will be able to live in this country with their parents and those who will not be able to do so. The different criteria for selection under tier 1 and tier 2, especially as these relate to the residence of the siblings of the migrant who might wish to sponsor his or her parents for residence in New Zealand, will impact differentially on the major sources of migrants. The most negatively affected will be one of our largest immigrant populations and their descendants – those from our neighbouring Pacific countries. This is an ironic outcome given that migration from some Pacific countries has

always had a special and privileged place in New Zealand's immigration policy since the 1950s.

New Zealand has a distinctive place in the OECD countries in terms of the rights it affords migrants, especially the right to participate fully in civil society through voting in local body and national elections as soon as permanent residence status is obtained. It would be unfortunate if long-standing citizens, who have contributed many years of their labour to work for New Zealand-based employers and paid taxes accordingly, found themselves in a position where they could not meet the criteria for sponsoring ageing parents who needed their support in New Zealand during the latter years of their lives. After all, this is a privilege that all New Zealand-born citizens have irrespective of their assets and the numbers of brothers and sisters that they have.

Notes

1 The changes announced on 10 May 2012 were detailed in several releases that were accessed on the web on 12 May at:

- http://www.immigration.govt.nz/migrant/general/generalinformation/qanda/familycategorychanges.htm
- http://www.immigration.govt.nz/migrant/general/generalinformation/qanda/parentchanges.htm
- http://www.immigration.govt.nz/migrant/general/generalinformation/qanda/sibadchildchanges.htm

The policy changes are detailed in the Cabinet Domestic Policy Committee paper, "Changes to Immigration Policies", dated 9 May 2011, and in the Cabinet Minute (CAB Min (11) 19/11), dated 16 May 2011. The current version of the policy relating to the parent category that came into force on 1 July 2012 can be found on the Immigration New Zealand website (www.immigration.govt.nz), *Parent Category Guide*, document number INZ 1209.

2 Unless otherwise stated, the statistics on residence approvals for parents and other categories of migrants come from Excel spreadsheet R1 Residence ("People included on residence applications decided, by nationality and financial year of decision"), available at the Immigration New Zealand website.

http://www.immigration.govt.nz/migrant/general/generalinformation/statistics/ (accessed at various times between 2007 and 2013).

3 International Metropolis Conference, Tampere, Finland "The new mobility: managing growth, security and social justice", 9-13 September, 2013. Three workshops addressed issues confronting migrant families, specifically: 30 "Family migration: fulfilling the gap between law and social processes", 36 "Gender and family migration in Europe: legal, political and social dimensions", and 51 "Immigrant families, well-being and social justice: cross-national perspectives" (www.metropolis2013.fi).

4 On 1 July 2013 the Associated Press, in an article entitled "China to require children to visit ageing parents as elderly care poses a problem for nation", observed that some new wording in legislation relating to elderly Chinese had came into force. The amended legislation requires children to visit and keep in touch with elderly parents "often" or risk being sued. http://www.nydailynews.com/life-style/health/chinese-law-require-children-visit-elderly-parents-article-1.1386891 (accessed 4 July 2013)

5 Details of the application procedures for migrants seeking entry under the Parent Category are contained in Immigration New Zealand's (2012) Parent Category Guide, INZ 1207, which can be accessed at www.immigration.govt.nz. The current queues for EOIs in the tier 1, tier 2 and previous policy categories are summarised in a brief summary entitled "Parent of New Zealand resident or citizen" at www.immigration.govt.nz/migrant/stream/live/parent (accessed 29 May 2013).

6 In August 2007 a multiple-visit visa for parents and grandparents was agreed and the new policy came into effect in November 2007. This visa enables multiple visits to New Zealand over a three year period. On each visit the visa holder is permitted to stay a maximum of six months, with an aggregated maximum stay of 18 months during the three-year period of the visa. Applicants are required to undertake heath screening. (p. 2, 'Appendix A, in the Department of Labour's report to Minister Jonathan Coleman "A Comprehensive Overview of Family-Sponsored Migration", 30 Sept, 2009.

7 Immigration New Zealand's Quarterly Selection Statistics contain summary information on the total numbers of EOIs selection from the pool and the total number of people these EOIs cover (i.e. numbers of principle and secondary applicants). There is also a graphical representation of the top nine nationalities of the PIs submitting EOIs plus a residual category for all other nationalities. To derive an estimate of the actual numbers of PIs submitting EOIs from the countries listed in the graph the percentages are converted back to proportions and applied to the total number of EOIs submitted during the quarter. Each EOI represents a PI. The numbers of EOIs for each country are estimates as the percentages have been rounded up to whole numbers in the quarterly returns – the actual numbers are not published.

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The Generation Gap: Age and Well-being in New Zealand

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Abstract

This paper explores the way subjective well-being varies with age. It is motivated by the relatively high level of suicide among young adults in New Zealand compared to other new settler countries like Australia, Canada and the USA. Since the Second World War age specific suicide rates of the young have increased in many countries while those of the old have fallen. This generational switch in age-specific suicide rates is believed to reflect an underlying shift in the distribution of subjective well-being away from the young towards the old. The time series measures of well-being necessary to test such a proposition are unavailable, however we can compare the size of the generation gap in New Zealand to that prevailing in comparable countries. Evidence from two World Values Surveys offers empirical support for the presence of a wider gap in well-being between the younger and older age groups in New Zealand

Geoffrey Rose (1995) argued that there is a link between the way measures of health are distributed across the population and the thresholds used to define ill health. "The essential determinants of the health of society", he argued, "are to be found in its mass characteristics" and "the deviant minority can only be understood when seen in its societal context". Effective prevention, therefore, "requires changes which involve the population as a whole" (Rose, 1995, p. vii).

The need to see rare events like suicide in their social context is a major motivation for our positioning of age-specific suicide rates within the distribution of well-being across the population as a whole.[1] We believe, like Rose, that to separate suicide as something that only concerns people

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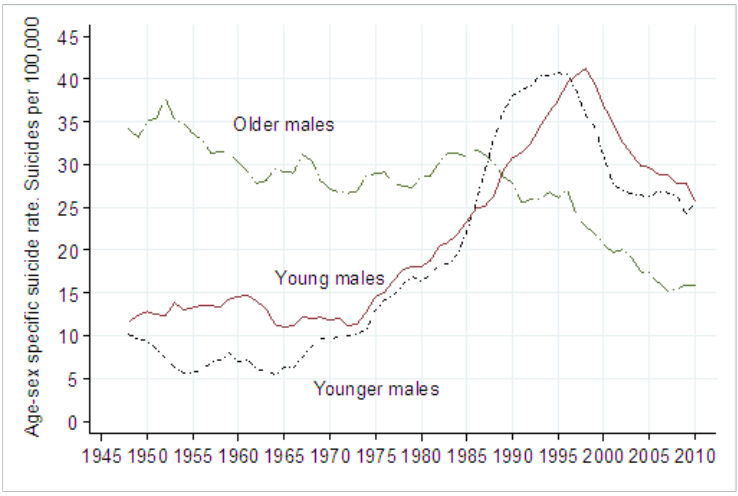
with mental illnesses is a mistake, since it stigmatises suicide as "their problem", not ours. For the same reason, there is a role for social scientists in interpreting contemporary patterns of suicide beyond the individual and the purely clinical.

The persistently high rates of suicide by the young stand in sharp contrast to those of the old, as observed in Britain (Gunnell, Middleton, Whitley, Dorling & Frankel, 2003), several European countries (Baudelot &Establet, 2008) and also New Zealand (Snider, 2011). Figure 1 tracks the New Zealand experience over the period 1948 to 2010.[2] Suicide rates of the older (male) population (as defined) have been declining throughout the post-war period, whereas those of young males have been rising since the 1970s, even acknowledging their more recent decline from an unusually high peak in the late 1990s.[3]

Figure 1. Age-specific suicide rates of younger (15–25), young (25–35) and older (60 plus) males in New Zealand, 1948–2010 (annual smoothed series)



Source: Annual Smoothed Series from Ministry of Health data collection

Under the circumstances depicted in Figure 1, we want to test whether young men as a whole exhibit lower levels of subjective well-being relative to the older generation.[4] Ideally, we would track the two groups using measures of well-being over time to see if they matched the suicide series; however, such a well-being series is not available over this period.[5] Since age-specific suicide rates of young adults in New Zealand are typically higher than those found in otherwise comparable countries, the

approach we have adopted is to compare the intergenerational difference in subjective well-being in New Zealand with those prevailing in Australia, Canada and the USA over the same period.

Subjective Well-being and Age

Subjective well-being is a broad category of phenomena that includes people's emotional responses, domain satisfactions, and global judgements of life satisfaction. The measure has become popular because it has also been shown to possess adequate psychometric properties, and exhibit good internal consistency and appropriate sensitivity to changing life circumstances (Diener, Eunkook, Lucas, & Smith, 1999, pp. 277-78). If modelled appropriately, responses to survey questions on subjective well-being can identify consistent correlations with respondent attributes such as gender, age, income (Blanchflower & Oswald, 2011; Kahneman & Krueger, 2006).[6]

Over the last 50 years, there has been an impressive growth in research into personal well-being within the social sciences (Diener et al., 1999). Early USA surveys undertaken in the 1950s through to the 1980s showed that it was possible to gauge a society's overall level of well-being as well as its well-being in specific domains of work, family life, housing and community (Bradburn & Caplovitz, 1965; Campbell, 1981; Campbell, Converse, & Rodgers, 1976; Gurin, Veroff, & Feld, 1960). Buoyed by insights from positive psychology and a now extensive literature on the economics of happiness, contemporary governments, both national and local, are beginning to realise they can now measure the level of subjective well-being of their populations with some confidence (Bok, 2010).

There are several distinct approaches to relating subjective well-being to chronological age, largely reflecting four different types of data: the cross section, cross section with controls, longitudinal, and cohort. The first (cross section) allows a description of the way that subjective well-being varies by age group at a point in time. The second (cross section with controls) involves analysing the same relationship after controlling for the influence of income, marital status and other life cycle events that are correlated with age. The third approach (longitudinal) involves tracing the same panel of individuals over time and recording their subjective well-being as they age.[7]

Proponents of the fourth approach argue that, even if the same relationship between well-being and age applies in both cross-sectional and longitudinal (panel) data, there may still be cohort (year of birth) effects present (Easterlin, 2010: p. 155). The accumulated evidence, however, suggests that cohort membership is relatively unimportant when it comes to explaining the relationship between subjective well-being and age. Yang's comprehensive work in the USA, for example, has demonstrated that while cohort effects can be detected in the context of the well-being age relationship, they are very small and the dominant effect remains cross sectional (Yang, 2008) .

All four approaches to studying how subjective well-being varies with age identify the same convex pattern over the age domain. "For most people, apparently, well-being declines slightly from their youth until they are about 40 and then improves very gradually until they reach their early 70s (assuming one controls for variations in health)." (Bok, 2010, p. 16).[8]

In order to realise the convex or U shape when people's subjective well-being is graphed against their age, it is necessary to control for intervening influences. As Easterlin notes,

> The U-shaped generalisation derives from the multivariate regression of happiness on age controlling for *a number of life circumstances that can vary systematically over the life cycle*. Hence, these studies are in effect asking, if one compares young, midlife, and older persons who are in the same circumstances with regard to income, employment, marital status, and health, how does their happiness differ? (Easterlin, 2010, p. 154) (our italics).[9]

While the U shape is now widely accepted as a stylised fact, the reasons advanced for *why* well-being changes with age are less well developed, certainly in the economics literature.[10] A great deal of theorising now addresses this relationship, but our own focus is confined to using the parameters governing the U shape across countries to test the thesis that New Zealand's generation gap in levels of subjective well-being is wider and therefore consistent with the country's wider gap in age-specific suicide rates.

In a telling discovery, Blanchflower and Oswald were unable to identify a U-shape relationship between well-being and age in New Zealand (Blanchflower & Oswald, 2008).[11] Among the set of all U shapes those authors fitted to the countries covered by the World Values Survey,

New Zealand sat as an outlier, exhibiting instead a positive linear relationship with age. While Blanchflower and Oswald paid no further attention to this particular exception, New Zealand's outlier status remains relevant for our thesis. Our first step, therefore, has been to return to the same World Values Survey they used. The following question is asked of respondents in all four countries:

> All things considered, how satisfied are you with your life as a whole these days? Using this card on which 1 means you are "completely dissatisfied" and 10 means you are "completely satisfied", where would you put your satisfaction with your life as a whole? (Question V22).[12]

The resulting distribution of responses across the ten categories of well-being is shown in Table 1. It reflects a skewed pattern that is remarkably common in most Western countries. The New Zealand results for 1998 returned a sample mean of 7.0 and a median of 8 from 1135 observations. Two-thirds of respondents returned scores of 7 or more.

Table 1. The distribution of responses to the life-satisfaction question: New Zealand, 1998

Satisfaction rating	Frequency	Percentage	Cumulative
1 (low)	16	1.41	1.41
2	7	0.62	2.03
3	32	2.82	4.85
4	27	2.38	7.22
5	94	8.28	15.51
6	75	6.61	22.11
7	162	14.27	36.39
8	282	24.85	61.23
9	199	17.53	78.77
10 (high)	241	21.23	100.00
Total	1,135	100.00	

Source: World Values Survey, Wave 1.

Note: The age of respondent is constrained to a lower bound of 18 years and an upper bound of 85, a restriction which removes less than 2 percent of the country sample.

To illustrate the way we undertake our international comparisons we compare New Zealand with Australia. Figure 2 shows how the mean well-being score rises irregularly with each five-year age group. Departures from a steady increase are marked at several ages, most notably among respondents in their 60s (which is unusually high in the New Zealand case

and unusually low in the Australian case).[13] Both countries exhibit a decline in well-being among respondents who enter their 80s.[14]

Figure 2. Mean and predicted standardised subjective well-being of men by age. New Zealand (1998) and Australia (1995)

Source: World Values Survey

In order to generate a higher-order summary of the relationship between the respondents well-being and their age, we estimate the following quadratic equation for each country:

$$(1) \qquad zS_i = \alpha + \beta\, Age_i + \gamma\, Age_i^2 + \varepsilon_i$$

where S is a cardinal measure of satisfaction recorded by the ith respondent bounded from 1= Very Dissatisfied to 10= Very Satisfied.[15] Since the focus of this study is on the way well-being varies with age, rather than the way average well-being varies between countries or over time, we remove the level effects by standardising. The z score (zS) results in a mean satisfaction of 0 and a standard deviation of 1.

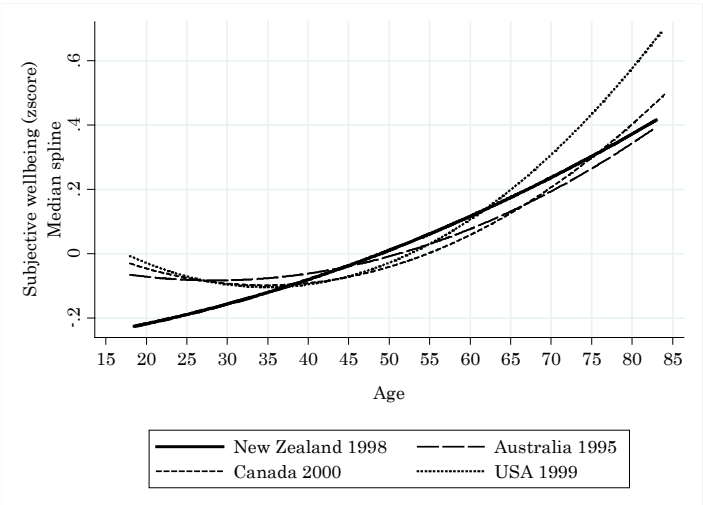
Finally, in order to limit the multicollinearity associated with the use of quadratics, age is entered in its centred form.[16] The estimated parameters from equation 1 are then used to predict the standard deviations from the average level of life satisfaction. These predictions are

smoothed by fitting median splines, which are then plotted as the two continuously upward sloping lines in Figure 2.[17]

Two salient points emerge from the fitted splines in Figure 2. The first is the more linear and steeper relationship between subjective well-being and age apparent in the New Zealand sample. Hence the young in Australia reported higher average levels of well-being relative to their middle and older age respondents than was the case in New Zealand.

We extend the comparison to include the two fitted curves from Figure 2 plus the fitted splines from Canada and the USA to create Figure 3. The results further confirm the unusual nature of the New Zealand case. Unlike the non-linear relationship assumed by the three larger countries, well-being in New Zealand rises approximately *linearly* with age, just as Blanchflower and Oswald originally observed (2008).

Figure 3. Predicted standardised subjective well-being of men by age: New Zealand (1998), Australia (1995), Canada (2000), and USA (1999)



Source: World Values Survey

One way of appreciating the differences in the fitted slopes of the four countries in Figure 3 is to compare their implied generation gaps – the difference between the predicted satisfaction of say, a 25-year-old with that of a 65-year-old. The results in Table 2 confirm the wider generation gap apparent in the New Zealand sample. In terms of the raw scores (S rather than *z*S), 25-year-old New Zealanders recorded an average satisfaction of 7.29, compared to the average of 8.05 reported by 65-year-olds in the same

year. This difference of 0.757 was more than double the gap apparent in Australia and Canada and noticeably greater than the USA's.

Table 2. Predicted levels of average satisfaction of men by age: New Zealand and comparison countries in the 1990s

	25 years	65 years	Difference
New Zealand (1998)	7.29	8.05	0.76
Australia (1995)	7.41	7.77	0.37
Canada (2000)	7.69	8.03	0.34
USA (1999)	7.50	8.02	0.49

Source: World Values Survey. Estimated from the equation under Figure 2.

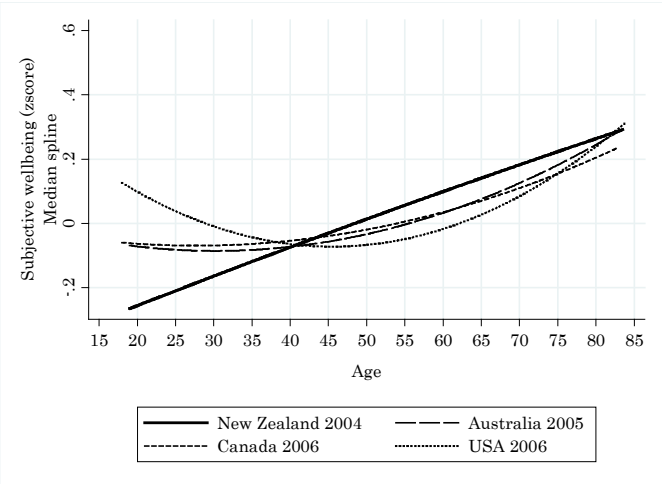
Note: These generation gaps are calculated using the post-estimation 'margins' command in Stata 12, which also yields standard errors around each estimate. These standard errors are available from the author on request.

In a subjective well-being scale that runs from 1 to 10, a gap of less than one may not seem high but the distribution of well-being scores is highly concentrated (as shown in Table 1). A visual comparison of the *z* scores corresponding to 25 and 65 year olds in Figure 3 shows the 25–65 generation gap in New Zealand at four standard deviations (-2 to 2) compared to only two (-1 to 1) in the Australian case. In other words, while older age groups were at least as satisfied with their life in New Zealand in the 1990s as they were elsewhere, the young certainly were not.

By reanalysing the World Values Survey data, we have been able to confirm the wider gap in well-being between the generations which Blanchflower and Oswald's original exploration implied. However, their own conclusions were based only on those surveys administered in the 1990s.[18] Since then, a further wave of the survey has been released and this allows us to test whether New Zealand's wider generational gap in subjective well-being was sustained into the 2000s.

The median-spline-based predictions from equation 1 estimated from the World Values Survey administered in the 2000s are shown in Figure 4. The graph shows quite clearly how the gap between young and old in New Zealand continued to exceed that of the other three countries a decade later.[19] By comparison, Australia and Canada retained their narrower difference between the old and young men which was apparent in the 1990s and in the USA the young appeared to return relatively higher rates of well-being.[20]

Figure 4. Predicted standardised subjective well-being of males by age: New Zealand (2004), Australia (2005), Canada (2006), and USA (2006)



Source: World Values Survey

Estimates of well-being at 25 and 65 years of age from the 2000 wave of the World Values Survey confirm the persistence of the wider gap between the generations in New Zealand (Table 3). The predicted versus average satisfaction between the two age groups yielded a difference of 0.65; this compares with figures of about half that gap in the other three countries.

Table 3. Predicted levels of average satisfaction by age: comparing age differences in New Zealand with other countries in the 2000s

	25 years	65 years	Difference
New Zealand (2004)	7.50	8.15	0.65
Australia (2005)	7.06	7.43	0.37
Canada (2006)	7.59	7.86	0.27
USA (2006)	7.21	7.28	0.07

Source: World Values Survey.

While expressing subjective well-being as a function of age does confirm that young people in New Zealand returned a relatively lower level of well-being than prevailed in the comparison countries, age itself acts as a proxy for many of those life events that can affect well-being (marriage, children, employment, etc.). One of the possible reasons for the above difference between the four countries could therefore be the way such life

events interact locally with age over the life course. Could these compositional differences be responsible for the much wider generation gap in well-being observed in New Zealand?

Do Controls Make a Difference?

Equation 2 adds a matrix of controls (X) to equation 1. These allow us to estimate the relative effect of gender, workforce status, marital status, employment, income and health on subjective well-being in each of the four countries over the two time periods. The dependent variable remains the standardised satisfaction with life, *z*S.

(2) $$zS_i = \alpha + \beta\, Age_i + \gamma\, Age_i^2 + \lambda\, X_i + \varepsilon_i$$

Table 4. Variables used as controls in regressing subjective well-being on age: New Zealand, 1998

Variable	Mean	Standard Deviation	Minimum	Maximum
Satisfaction	7.65	2.02	1	10
AgeNZ98	-1.27	15.60	-28.92	37.07
AgeNZ98sq	244.82	265.62	.006	1374.85
Male	.464	.498	0	1
Married	.707	.454	0	1
Ft employed	.488	.500	0	1
Unemployed	.081	.273	0	1
Income	5.97	2.76	1	10
Poor health	.195	.396	0	1

Source: World Values Survey

Note: Satisfaction with life (*Satisfaction*) is an ordinal variable, the centred measure of age *(ageNZ98)* and its square are covariates, *male, married,* fulltime employment *(Ft employed)* and unemployment (*Unemployed*) and poor health (*Poor health*) are dummy variables. *Income* is expressed in tenths, so 1 refers to an income in the bottom 10th and to an income in the top ten percent of the (gross) income distribution. Number of observations is 1020. Running income as a series of dummy variables reveals a fairly linear increase in satisfaction in both surveys in each country, a feature which further justifies the use of the single income variable above.

The descriptive statistics for new covariates as they apply to New Zealand in 1998 are shown in Table 4. The estimates are quite typical of those obtained for the other three countries. They remind us that males are in a slight minority in the sample. About 70 percent of respondents are married, nearly half are employed fulltime, and fewer than 10 percent are unemployed. The distribution-over-income deciles are slightly weighted

towards the higher incomes. Nearly 20 percent of respondents declared they were not in good health, that is, in fair, poor or very poor health.

Previous applications, such as found in Stone, Schwartz, Brokerick and Deaton (2010) and Frijters and Beatton (2012), show that the imposition of controls creates the U in the well-being by age curve because of their age-specific impacts. When factors that bolster well-being at particular ages, such as marriage and employment, are statistically controlled, well-being sags, thus deepening the U shape. At the same time, controlling for poor health, which otherwise lowers satisfaction with life, raises estimates of well-being at older ages. In the same way, controlling for unemployment removes one factor associated with lower levels of well-being of the young thus raising well-being at younger ages in the controlled regression.

The results of applying the uncontrolled and controlled regressions are given in Table 5 for the 1990s and 2000s, respectively. The coefficient of determination (R^2), the root mean square error (rmse) and the number of cases appear below the coefficients. Age effects are consistently significant in all eight models, but the relative influence of marriage and unemployment show notable variation.

Table 5. Regression of standardised satisfaction on age with controls in four countries, 1990s and 2000s.

1990s

	New Zealand		Australia	
	model1NZ98	**model2NZ98**	**model1A95**	**model2A95**
Agenz98	.00937***	.0122***		
Agenz98^2	.000007	.00036**		
AgeA95			.0049***	.00534***
Age A95^2			.00016*	.00057***
Age c00				
Age c00^2				
Ageu99				
Ageu99^2				
Male		-.0441		-.132**
Married		.144*		.44***
Ft employ.		.0605		.102
Unemploy.		-.221		(omitted)
Income		.0368**		.0281**
Pr health		-.902***		-.632***
Cons	-.0188	-.232*	-0.454	-.431***
R2_a	.0239	.19	.0119	.147
Rmse	.988	.901	.994	.904
N	1135	1020	1924	1735

Note: * p<0.05; ** p<0.01; *** p<0.001

1990s (cont'd)

	Canada		USA	
	model1c00	**model2c00**	**model1u99**	**model2u99**
Agenz98				
Agenz98^2				
AgeA95				
Age A95^2				
Age c00	.00533***	.00418**		
Age c00^2	.00024**	.00041***		
Ageu99			.00494*	.0035
Ageu99^2			.00034**	.00058***
Male		-.101*		-.0723
Married		.359***		.222***
Ft employ.		-.0753		.0549
Unemploy.		-.501***		.0978
Income		.0282**		.0625***
Pr health		-.557***		-.512***
Cons	-0.689*	-.257***	-.0858*	-.524***
R^2_a	.0165	.137	.0207	.111
Rmse	.992	.928	.99	.933
N	1898	1663	1199	1127

Note: * p<0.05; ** p<0.01; *** p<0.001

2000s

	New Zealand		Australia	
	model1NZ04	**model2nz04**	**model1A05**	**model2A05**
Agenz04	.00869***	.0172***		
Agenz04^2	.000005	.00054*		
ageA05			.00524***	.00917***
Age A05^2			.00013	.00038***
Age c06				
Age c06^2				
Ageu06				
Ageu06^2				
Male		-.0733		-.0371
Married		.609***		.337***
Ft employ		(omitted)		.0393
Unemploy		(omitted)		-.0119
Income		.0658**		.0418***
Pr health		-1.35***		-.817***
Cons	.00388	7.16***	-0.346	-.334***
R^2_a	.0172	.131	.00696	.182
Rmse	.991	1.67	.997	.897
N	895	779	1376	1253

Note: * p<0.05; ** p<0.01; *** p<0.001

2000s (cont'd)

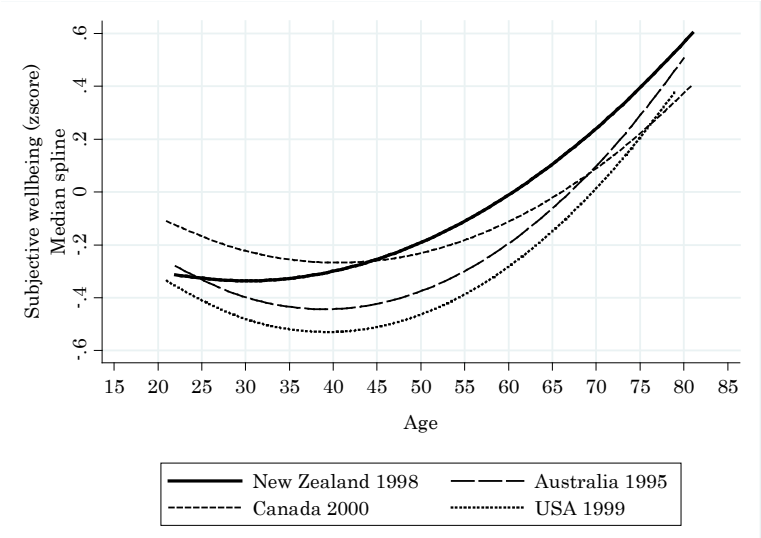
	Canada		USA	
	model1c06	**model2c06**	**model1u06**	**model2u06**
Agenz04				
Agenz04^2				
ageA05				
Age A05^2				
Age c06	.00402**	.00643***		
Age c06^2	.0001	.0003***		
Ageu06			.00101	.00107
Ageu06^2			.00026**	.00032**
Male		-.0988*		-.0317
Married		.371***		.192***
Ft employ		.0315		-.104
Unemploy		-.136		-.206
Income		-.0308***		.115***
Pr health		-.62***		-.745***
Cons	-.029	-.347***	-.0716	-.556***
R^2_a	.0052	.137	.00479	.175
Rmse	.997	.939	.998	.906
N	2085	1760	1225	1140

Note: * p<0.05; ** p<0.01; *** p<0.001
Source: World Values Survey

With two minor exceptions, the same models are estimated for each country and year and they produce consistent signs on each of the controls: males typically return lower levels of satisfaction with their lives than do females, and marriage and income raise well-being while poor health reduces it. With one exception, employment and unemployment fall short of being statistically significant, although the signs and magnitudes of effect are consistent with previous studies.[21]

Returning to the question at hand, does controlling for the population composition of the sample in each country and decade reduce any of the difference between New Zealand and comparison countries? The answer is no. A comparison of Figure 5 with Figure 3 shows that although the application of the controls does generate a U-shape in each country in the 1990s, it does little to reduce the inter-country differences in the way New Zealand compares.

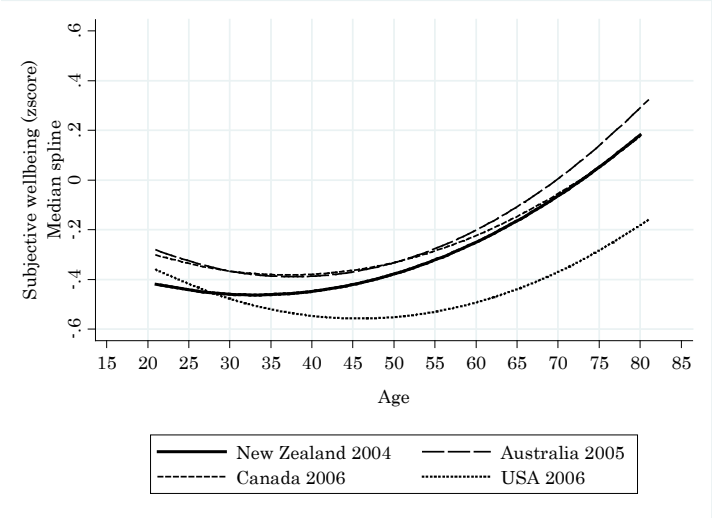
Figure 5. Predicted standardised subjective well-being by age in four countries after controlling for population composition, 1990s



Source: World Values Survey

The results of applying equation 2 to the 2000s are plotted in Figure 6. Three changes in the relationship between well-being and age are observable. Firstly, the standardised well-being distribution is less skewed towards positive well-being in the 2000s, moving the curves down the y-axis. Secondly, there is a slight flattening out of these well-being curves implying a reduction in the magnitude of the generation gap in all four countries. And in a third and related point, by the 2000s each of the curves had tilted downwards to the right, indicating that absolutely and relatively the main reduction in well-being occurred among the older age groups.

Figure 6. Predicted standardised subjective well-being by age in four countries after controlling for population composition, 2000s



Source: World Values Survey

In summary, controlling for the composition of the population widened the difference between the generation gap in New Zealand and the three other countries. This gap appeared to have diminished slightly in the 2000s, a result which is also consistent with the slight reduction apparent in the suicide rates in Figure 1 over approximately the same period.

Table 6. Predicted levels of average satisfaction by age based on the controlled regressions: New Zealand and comparison countries

	25 years	65 years	Difference
1990s			
New Zealand	7.14	8.13	0.99
Australia	7.40	7.81	0.41
Canada	7.38	7.79	0.41
USA	7.42	7.82	0.40
2000s			
New Zealand	7.49	8.18	0.69
Australia	7.35	7.75	0.40
Canada	7.36	7.77	0.41
USA	7.37	7.77	0.40

Source: World Values Survey

Discussion

Are the generational differences that are so marked in New Zealand's suicide statistics also reflected in their differences in their levels of subjective well-being?

The answer from the data at hand is yes. Not only do age differences in suicide and well-being tell a similar story in New Zealand but the same intergenerational differences stand out when New Zealand is compared to Australia, Canada and the USA. In both the 1990s and 2000s, there was a wider generation gap in the subjective well-being levels apparent in the New Zealand data than in the data from the three comparison countries.[22]

Our reanalysis of the World Values Survey country samples reported above reconfirmed the relatively linear pattern of well-being by age originally identified in the New Zealand sample by Blanchflower and Oswald for the 1990s. Our extension of this analysis, using the same surveys in the 2000s, showed New Zealand 25-year-olds were continuing to exhibit relatively lower levels of satisfaction with life than their 65-year-old contemporaries.

While these results are challenging and raise a number of questions about the nature of New Zealand society, the above examination remains quite exploratory and is limited in several respects.[23] New Zealand lacks the comprehensive longitudinal data sets required to demonstrate causal relationship between subjective well-being and suicide such as has been possible in Finland for example (Koivumaa-Honkanen et al., 2001). The local data has also made it difficult to establish the relative importance of external events such as unemployment (Beautrais, Joyce & Mulder, 1998), notwithstanding the evidence gleaned from linking suicide, along with other forms of mortality, back to census records of the deceased individuals (Blakely, 2002). Many of the same difficulties hinder attempts by New Zealand authorities on suicide to identify more precisely the role of wider social conditions on changes in the country's suicide rates (Ferguson, Blakely, Allan, & Collings., 2002; Maskill, McClellan, & Collings, 2005). A similar connection was also raised in Bray and Gunnell (2006).

When it comes to subjective well-being the generational differences identified in the World Values Survey also appear in the much larger New Zealand General Social Survey (see Statistics New Zealand, 2010). This

survey has been administrated biennially since 2008 by Statistics New Zealand and may prove to be a more robust source for future extensions of this work (Brown, Wolf, & Smith, 2010). Unfortunately, comparisons with similar surveys in Australia, Canada and the USA would still be hampered by the lack of harmonisation of both questions and definitions.

Another relatively unexplored source of well-being data in New Zealand is the New Zealand Health Survey, which has the advantage of also carrying a comprehensive set of questions on mental health, including suicide ideation. However, this survey lacks a question on subjective well-being per se. The more specific Quality of Life survey, undertaken every two years by Councils of New Zealand's largest urban areas, is another source which has been used to track geographic differences in subjective well-being across the country (Morrison, 2007; 2011), although it has yet to be applied to the intergenerational well-being question.

In summary, our search for a reason why New Zealand exhibits higher suicide rates among the young than countries that are comparable in many other respects has involved comparing their age-specific levels of subjective well-being. The evidence presented above points to a consistently wider gap in subjective well-being between the generations in New Zealand, a result consistent with the generational switch in the country's suicide rates.

Acknowledgements

This paper develops an argument initially proposed in the second author's Master of Science thesis (Snider, 2011). We wish to thank the two anonymous referees for comments on initial and subsequent submission of this paper. The central idea in the paper was presented by the first author at the National Institute for Demographic and Economic Analysis (NIDEA), University of Waikato, Hamilton on 10 October 2011. A more developed version was presented in Melbourne, at the Australian Population Association 16th Biennial Conference, 5–7 December 2012. Both were delivered under the title 'The generational switch in suicide and well-being'. The second author also delivered a paper under the same title at about the same time at the New Zealand Geographical Society Conference held in Napier, 3-4 December 2012. A more recent presentation was made to the New Zealand Population Association conference in June 2013. Comments received from participants at all four forums were greatly appreciated. Finally, we wish to acknowledge the manuscript preparation grant awarded to the second author by the Science Faculty, Victoria University of Wellington.

Notes

1 A strong case for positive temporal correlations between suicide rates and levels of subjective well-being has been made at the country level (Helliwell, 2007, Bray & Gunnell, 2006) as well as at the level of the individual using longitudinal data (Koivumaa-Honkanen et al., 2001).

2 New Zealand age-specific rates are high internationally in all younger age groups. For example they were the second highest in the 'youth' age group (15–25 years) for the period 2002 to 2006 at 27.6 per 100,000; this figure was exceeded only by Finland (33.1). Due retrieved from http://www.youthstats.myd.govt.nz/indicator/healthy/suicide/international.html. Note that due caution applies to all international comparisons because collection standards and reporting procedures vary by country.

3 Although we only plot male rates here, similar intergenerational differences can be found in the, albeit much lower, rates characteristic of female suicide.

4 For similar graphs depicting generational differences for European countries, see Baudelot & Establet (2008) and, more generally, the discussion by McCall (1991) and Preston (1984) as well as the thesis linking older New Zealanders with the "selfish" generation (Thomson, 1991)

5 Several surveys including the World Values Survey and the New Zealand General Social Survey do ask relevant well-being questions but only for the

more recent period (1998 and 2004 in the former, and biennially from 2008 in the latter). Correlations between these population-wide measures and more specific age-specific suicide rates may prove useful in future years.

6 Despite the widespread use of subjective measures of well-being, there is no single agreed measure. The main measures include life satisfaction (Cummins, 1999; Diener & Lucas, 2000) and happiness (Shin & Johnson, 1978) but some surveys now collect responses to questions on stress, worry, anger and sadness (Stone, Schwartz, Brokerick, & Deaton, 2010), eudaimonia (Clark & Senik, 2011; Huppert & So, 2011) as well as well-being indicators on specific domains such as work, family, leisure, etc. (Rojas, 2007). Although often referred to collectively as well-being measures (Bramston, Pretty, & Chipuer, 2002, pp. 261–262), each of these measures tap different dimensions of well-being. Most studies (outside positive psychology) simply use "life satisfaction", mainly because it captures the same sort of evaluations that people use to make decisions about their lives (Kahneman, Diener, & Schwarz, 1999) and because, to date, most of the major databases have included this as their main or only measure of well-being.

7 Temporal patterns traced from longitudinal surveys yield very similar results to the cross-sectional results. Evidence from 14 waves of the British Household Panel survey (1991–2004), for example, showed that subjective well-being follows a similar pattern over the life course as suggested by the cross-sectional evidence (Clark & Oswald, 2006). Similar findings come from the German Socio-Economic Panel Study (Baird, Lucas, & Bonnellan, 2010).

8 Although the notion that well-being rises with age may seem counter-intuitive in the face of the gradual decline in physical health (Stone et al., 2010, p. 9985), it is possible to cite a large number of references in support of the U shape; see Blanchflower and Oswald (2008, p. 1734), and Clark and Oswald (2006, p. 4), as well as the additions in Frijters and Beatton (2011, p. 4).

9 At this level of generalisation, the responses to the question on happiness and satisfaction with life are often used interchangeably even though they are not perfectly correlated.

10 Frijters and Beatton offer a sophisticated technical discussion of this relationship and associated literature (Frijters & Beaton, 2012).

11 A number of other countries also did not reveal subjective well-being as U-shape with age but almost all of these were developing countries (Blanchflower & Oswald., 2008, p. 1741). A reviewer suggested that a lower per capita income in New Zealand relative to the comparison countries may

therefore be part of the story. However, even if the minor differences in average income were relevant, it would not explain why or how the U shape was actually related to per capita income. That relationship was also not pursued by Blanchflower and Oswald.

12 Copies of the questionnaires are available from the World Values Survey website: http://www.worldvaluessurvey.org/

13 These fluctuations within narrow age ranges we attribute to the small sample sizes of around 1000 typical of the World Values Survey.

14 As Fischer's conference paper indicates, 30 economically well-developed countries from the World Values Survey actually follow a hyperbolic form, with life satisfaction reaching another local maximum around the age of 83, with a level identical to that of a 26-year-old and then falling from there (Fischer, 2009). Therefore, the quadratic form is more appropriate if the age distribution is truncated past 80 years old. Greater longevity will of course make such statistical adjustments less tenable in ageing economies.

15 Even though the dependent variable is an ordinal variable estimation of equation 1 is now regularly undertaken by ordinary least squares (OLS), for the assumption of cardinality makes little difference in practice and the OLS estimates considerably aid the interpretation of the coefficients (Ferrer-i-Carbonell, & Frijters, 2004; Kristoffersen, 2010).

16 Age and age are closely related,[2] and their separate effects cannot be estimated with nearly as much precision as when using either predictor alone; therefore, the age variable is "centred" before squaring (i.e. the mean is subtracted), creating a new variable centred on zero which is much less correlated with its own square values. The resulting regression has the same fit (the same R^2, overall F-test, predictions, etc.) as the uncentred version. By reducing multicollinearity, centering yields more precise coefficient estimates with lower standard errors (Hamilton, 2009, p. 226).

17 The software Stata's routine "mspline" chops a scatterplot into vertical bands, calculates bivariate medians for each, and then interpolates the median points using cubic splines. The term *spline* is derived from a flexible strip of metal commonly used by draftsmen to assist in drawing curved lines. Spline interpolation is now preferred over polynomial interpolation because the interpolation error can be made small even when using low-degree polynomials for the spline.

18 They were also based on a multivariate model which we replicate (approximately) later in this paper.

19 Average levels of well-being in both Australia and USA dropped over the decade, whereas well-being levels in Canada rose. Canada, whose

curvature was insignificant in the 1990s, approximated the New Zealand case more closely in this second wave. This decline in average subjective well-being has been documented in Australia since 2001 using the HILDA survey (Ambrey & Fleming, 2012).

20 This USA result is interesting given an earlier study covering the period 1973 through to 1992 based on comparing responses of those under and over 30 years of age in Europe and the USA (Blanchflower & Oswald, 2000). Their conclusions about the rising well-being of the young were based primarily on the falling proportion of young unmarried educated respondents, successively smaller proportions of whom reported low levels of satisfaction with life.

21 The reviewer on the second version of this paper asks whether the model is fully specified, questioning whether other potential variables such as the presence of children, financial indebtedness, location, etc. should be included. There are several issues here. Firstly whether such variables are collected (for each country) in the World Values Survey (WVS), and secondly, whether their addition to the four-country models affects the estimated intergenerational differences in subjective well-being. The influence of location is a conceptually and empirically difficult issue to assess, largely because strong selection effects sort people by location. Location for the majority of the mobile is therefore largely endogenous. Secondly, even if location was not endogenous, obtaining consistent locational areas across countries is thwart with difficulty. While internal regions are present in the World Values Survey files for New Zealand, the average count for the conventional "regions" is low, at less than 100. A third issue is the fact that when included in subjective well-being equations, area variables often register little effect (in part because areas are endogenous). For each of these reasons, location has not been included in the regressions. As for the other variables, a search of the WVS code book shows no question on financial indebtedness. The question on the number of children is asked in New Zealand, Australia and Canada but not in the USA. This variable rarely raises or lowers measures of global satisfaction in the literature. In our own experiments, dummy variables for 1, 2 and 3 or more children were included as regressors (against the base of no children). None of these "children" dummies had a statistically significant effect on the regressions reported in Table 5 and have been omitted in the final equations.

22 As such, our results echo similar concerns about the growing generation gap in well-being raised notably by Barber (2001) and earlier by Lester (1989). For a recent advocacy based on the same argument, see Fredli and Parsonage (2007).

23 Notwithstanding the value of being able to track the underlying well-being conditions across the age groups, the World Values Survey samples are relatively small and it is acknowledged that sourcing a representative sample of young people from telephone surveys is unlikely to yield fully representative samples, although there is reason to believe that similar problems prevailed in comparison countries as well.

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Demographic Change in New Zealand's Dairy Farming Industry: The need for a cohort perspective

NATALIE JACKSON *

Abstract

Despite a handful of studies identifying the opposite, there is an often-repeated proposition that the average age of New Zealand's dairy farmers is somewhat greater and increasing faster than for most other New Zealand industries. This paper argues that part of the misconception is methodological, related to the failure to take a cohort perspective. Declining numbers at younger ages are interpreted as reflecting reduced entry and low rates of retention per se, while increasing numbers and proportions at older ages are interpreted as stoic farmers remaining at their posts. However similar age-structural changes are evident for the total population, reflecting the movement of Baby Boom cohorts through the age structure. This paper uses a cohort perspective to show that New Zealand's older dairy industry workers (the majority of whom are dairy farmers and farm workers) are in fact somewhat less likely to remain in the industry than the average older worker, and that there is both recruitment and retention at younger and middle ages – albeit at lower numbers than in the past.

There is a general and often-repeated proposition that the average age of New Zealand's dairy farmers is somewhat greater and increasing faster than those employed in most other New Zealand industries, and that this mirrors the case in Australia (Amshoff & Reed, 2005) and further afield (ABI/Inform, 2000; Cole & Donovan, 2008; Penn, 2013). The perception is not without substance, in that the average age of New Zealand's dairy farmers has increased from just below 38 years in 1986 to just above 40 years in 2006, although it had also been just on 40 years in 1971 (Fairweather & Mulet-Marquis, 2009, p. 122). Nevertheless, in 2006 dairy farmers had the youngest average age and the smallest increase in average age of the four farming occupations in the Fairweather & Mulet-Marquis study.

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Part of the misconception is argued to reflect the uncritical use of industry rather than occupational data, the former including both on-farm and off-farm workers (Tipples & Wilson, 2005, p.41). Using occupational data, Wilson and Tipples (2008) do provide a comprehensive approximation of trends over time (1991-2006). However, even occupational data have a number of limitations, such as difficulties in interpreting the contribution of internal migration to farming age structures, because the census only captures present occupation, not that at the time of the previous census (Tipples & Wilson, 2005, p.42). Underlying change in both occupational and industrial classification also makes rigorous time-series analysis difficult (Fairweather & Mulet-Marquis 2009, p. 120). A further contributing factor can be the focus of the article or study itself. Studies that are concerned with, for example, stress among farmers (Firth, Williams, Herbison & McGee, 2007), as opposed to a socio-demographic profile (Wilson & Tipples, 2008), ask different questions of the data.

Asking different questions of industry data is the focus of this paper. As will be shown, dairy industry data imply an average age in 2006 of 40.9 years, up from 38.8 in 1996, very similar to that for the occupational data referred to above. They also show an almost identical increase in proportions aged 55 years or older, and reduction at younger ages. Total industry data also show similar trends in terms of ageing, because of the large "Baby Boom" cohorts working their way through the age structure. That is, the ageing of the farming industry may not be occurring only because of diminishing numbers of young entering it, low retention rates at younger ages, and/or older farmers remaining at their post (Tipples & Wilson, 2005, p.42; Fairweather & Mulet-Marquis, 2009, p. 122), but may also reflect underlying age-structure change. Subjecting the data to cohort analysis, in fact, shows that New Zealand's older dairy industry workers are somewhat less likely to remain in the industry than the average older worker, and that there is both recruitment and retention at younger and middle ages, albeit at lower numbers than in the past.

The information is important because the idea of a "hyper-ageing" dairy industry could well challenge another significant and long-held perception, that of New Zealand's farmers as highly innovative and entrepreneurial. This paper provides a brief overview of the changing demography, adding cohort analysis to the relatively limited New Zealand

literature on the topic, and concluding with the proposition that an important rejuvenation is occurring in the industry.

Data Source, Methods and Key Concepts

As indicated above, the trends referred to throughout this paper pertain to the dairy industry and not to farmers or farm workers per se. In 2001, only 75 percent of those employed in the dairy industry were actually on-farm dairy farmers or farm workers (Tipples & Wilson, 2005, p.41). However, the dairy industry also includes critically important allied occupations, such as Herd-Testing and Artificial Breeding, while specifically excluding those engaged in allied industries such as Dairy Product Manufacturing and Services to Agriculture. Allied occupations are equally a mainstay of the dairy industry, and while it would be preferable to undertake an occupation-based analysis that showed their separate impacts (author, forthcoming), word constraints preclude such an approach in this paper. Accordingly, this paper takes a middle road wherein the majority of the analysis is disaggregated by employment status – self-employed without employees, employers, and paid employees, and these cross-sectional data from three censuses (1996, 2001 and 2006) are converted to longitudinal data to examine cohorts as they have aged.

The study draws on two census-based data sources: number employed in the dairy cattle farming industry (ANZSIC96 V4.1 code A013) by age, sex and status in employment; and number employed in the dairy cattle farming industry by age and country of birth. In both cases the data have been aggregated by Statistics New Zealand to be internally consistent by the ANZSIC code at 3-digit level for the 1996, 2001, 2006 Censuses. The analysis is undertaken for total New Zealand only, while it should be noted that there is marked underlying regional variation (Wilson & Tipples, 2008) that our cohort database confirms.

Simple distributional statistics are supported by a cohort analysis to show the extent to which there has been attrition from or augmentation to each birth cohort employed in the industry across the 1996–2006 period. The analysis therefore uses 'open' cohorts to allow for movement into and out of each cohort. Gain to a cohort may occur because of immigration (either international or from another industry), or from new members entering the employed labour force or the specified employment status;

losses may reflect emigration to another country or industry, out of the employed labour force//employment status, or death. Using country of birth (COB) data, the cohort analysis is further developed to identify the extent to which any augmentation may reflect international migration gain (international loss cannot be ascertained as people living overseas at the time of the census do not fill in the form). However, it should be noted that our COB data cannot be definitive of migration gain, because they do not indicate length of residency – that is, some individuals born overseas may have arrived in New Zealand as children.

Three 'ageing indicators' are referred to. *Structural ageing* refers to the proportion of persons employed in the industry aged 55+ years, and *numerical ageing* to the absolute increase in numbers aged 55+ years. The *entry:exit ratio* (EE1) denotes the number of persons employed in the industry aged 15-24 years per person aged 55+ years.

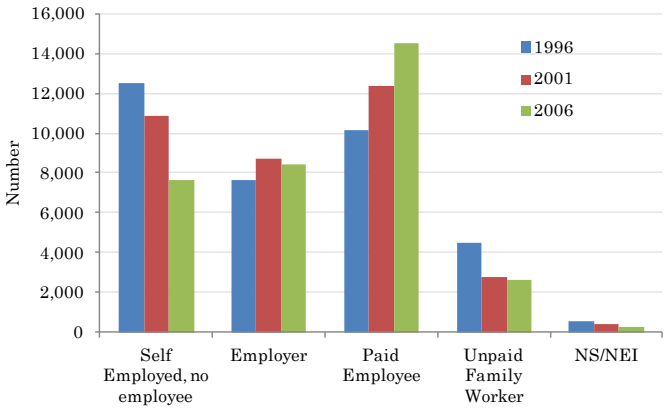
Key Trends

Between 1996 and 2006, the number employed in New Zealand's dairy industry declined by 5 percent, from 35,289 to 33,501. This resulted in the industry's decline from 8th to 16th largest industry at the 3-digit level (which enumerates 157 industries). By comparison, the total employed workforce increased by 18.1 percent, from 1.63 to 1.98 million. Although the majority of the decline in the dairy industry occurred between 2001 and 2006, the industry had fallen to 10th position by 2001, due to the ascendancy of two other industries (Marketing and Business Management, and Community Care).

A second significant shift occurred in the employment status of the industry (Figure 1). Between 1996 and 2006 there was a systematic decline in the number self-employed with no employees, and a concomitant increase in the number of paid employees (see also Wilson & Tipples (2008) for the period 1991-2006). In 1996, self-employed with no employees outnumbered paid employees by more than 2300, while by 2006, paid employees outnumbered the self-employed by almost 7000. The number of employers also increased, but only slightly, and declined fractionally between 2001 and 2006. These trends reflect widely observable changes in the industry, with the move to significantly larger operations and

accompanying amalgamation of smaller, typically adjoining farms across the period (e.g. Fairweather & Mulet-Marquis, 2009, p. 124).

Figure 1: Dairy cattle farming industry, number by employment status, 1996, 2001, 2006



Source: Jackson/Statistics NZ Customised Database, available from author.
Note: NS/NEI = Not specified; Not elsewhere included.

Ageing of the Industry

The proportion of those in the dairy industry aged 55 years or older increased between 1996 and 2006 by almost 31 percent, from 14.1 percent in 1996 to 18.5 in 2006 (Table 1). This increase is somewhat lower than for total New Zealand industry (60.3 percent), where the proportion aged 55 years or older in 2006 was almost identical to that for the dairy industry.

Table 1 also shows that both proportions are well and truly surpassed by those for the Grain, Sheep and Beef Cattle Farming industry, which had 25.1 percent aged 55 years or older in 1996, and 36.5 percent in 2006 (see also Penn, 2013).

Table 1: Percentage Aged 55 years or older, selected industries, 1996, 2001, 2006

	1996	2001	2006	Change 1996–2006 (%)
Dairy cattle farming	14.1	17.2	18.5	30.7
Grain, sheep, and beef cattle farming	25.1	30.4	36.5	45.4
Total Industry	**11.5**	**14.6**	**18.4**	**60.3**

Source: Jackson/Statistics NZ Customised Database, available from author

Table 2 gives similar data for each employment status in terms of average age. In 2006 the average age of those employed in the dairy industry was 40.9 years, against 47.8 years for the grain, sheep and beef industry, and 41.1 years for the total employed workforce. Between 1996 and 2006, the average age of dairy industry employers (the industry's oldest category) increased by the smallest margin overall (5.6 percent), while the average age of paid employees (the industry's youngest category) increased by the greatest margin (12.9 percent).

Table 2: Average age by employment status, selected industries, 1996, 2001, 2006

	Average Age (years)			Change 1996-2006	
				N (years)	%
Dairy cattle farming					
Self employed, no employee	41.9	44.7	46.2	4.2	10.1
Employer	44.5	46.2	47.0	2.5	5.6
Paid employee	29.8	31.8	33.6	3.8	12.9
Unpaid family worker	41.0	42.9	46.0	5.0	12.2
TOTAL	38.8	40.4	40.9	2.1	5.3
Grain, sheep and beef cattle farming					
Self employed, no employee	48.5	50.9	52.9	4.4	9.1
Employer	48.5	50.0	51.4	3.0	6.2
Paid employee	36.1	37.6	39.2	3.1	8.6
Unpaid family worker	45.0	47.7	50.5	5.5	12.2
TOTAL	44.0	46.1	47.8	3.9	8.8
Total (all-industry)					
Self employed, no employee	44.5	46.6	47.9	3.3	7.5
Employer	44.8	46.8	47.7	2.9	6.4
Paid employee	36.4	38.1	39.1	2.8	7.6
Unpaid family worker	43.1	44.9	47.0	3.9	9.0
TOTAL	38.2	40.0	41.1	2.9	7.5

Source: Jackson/Statistics NZ Customised Database, available from author.
Area of Usual Residence, Industry (ANZSIC96 V4.1) and Status in Employment by Age Group and Sex for the Employed Census Usually Resident Population Count Aged 15+ Years, 1996, 2001, 2006.
Notes: calculations have been rounded to nearest decimal point.

The lesser extent of structural ageing for the dairy industry is readily discernible from Figures 2 to 4, which compare the industry with its grain, sheep and beef cattle farming and total workforce 'all-industry' counterparts. The data clearly show that the dairy industry is not as 'old' or ageing as rapidly as is often portrayed.

Figure 2: Dairy cattle farming industry, age-sex structure by employment status 1996, 2001, 2006

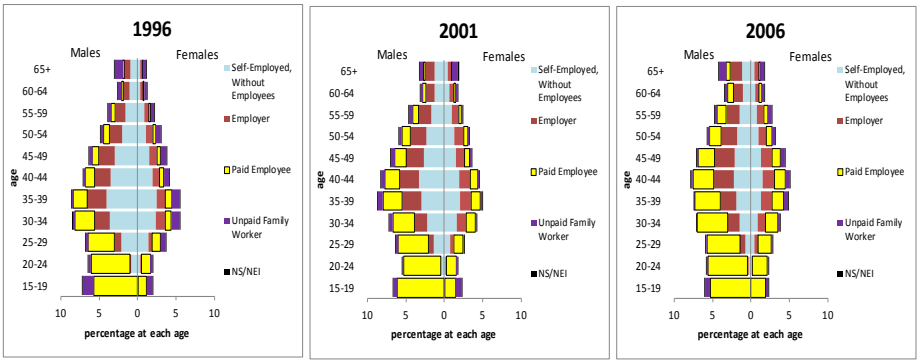


Figure 3: Grain, sheep, beef cattle farming industry, age-sex structure by employment status 1996, 2001, 2006

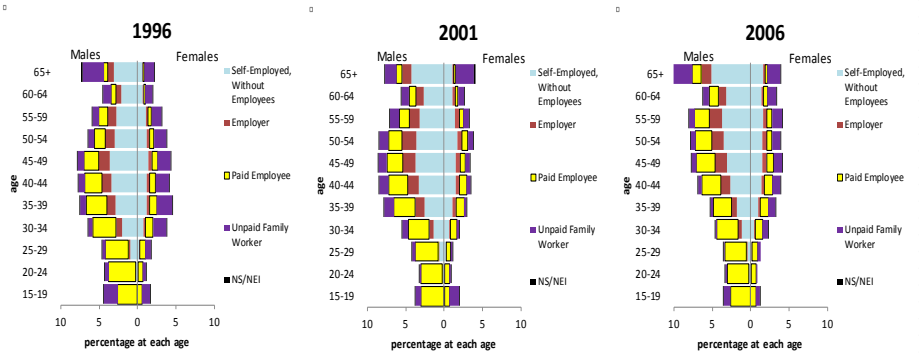


Figure 4: Total New Zealand industry, age-sex structure by employment status 1996, 2001, 2006

Source for all figures on this page: Jackson/Statistics NZ Customised Database, available from author

The underlying numbers aged 55 years or older also support the argument (Table 3). For the dairy industry, numbers aged 55 years or older increased by 24.1 percent between 1996 and 2006, while for the grain, sheep and beef industry they increased by 36 percent, and for total New Zealand industry, by 95.2 percent. This relatively lower *numerical* ageing for the dairy industry also points to greater levels of attrition at older ages.

Similarly, the ratio of people at labour force entry age (15–24 years) to those in the retirement zone (55 years or older) is higher for the dairy industry than for both comparators, and has not fallen as rapidly. For the dairy industry, the 'entry:exit ratio' has fallen from 13 entrants per 10 exits in 1996 to nine per 10 in 2006 (a 30 percent decline), while for grain, sheep and beef farmers it has fallen from five per 10 in 1996 to just two per 10 in 2006 (a 46.7 percent decline). By comparison, the ratio for total New Zealand employed industry has fallen from 16 per ten, to nine per ten (also 47.0 percent).

Table 3: Numbers aged 55 years or older; labour force entry:exit ratio 1996, 2002, 2006

	1996	2001	2006	Change 1996-2006 (%)
Numbers aged 55+ years				
Dairy cattle farming	4989	6018	6192	24.1
Grain, sheep, and beef cattle farming	10,368	11,133	14,097	36.0
Total Industry	**186,768**	**251,916**	**364,653**	**95.2**
Labour force entry: exit ratio (15–24: 55+ Years)				
Dairy cattle farming	1.3	0.9	0.9	-29.7
Grain, sheep, and beef cattle farming	0.5	0.3	0.2	-46.7
Total Industry	**1.6**	**1.1**	**0.9**	**-47.0**

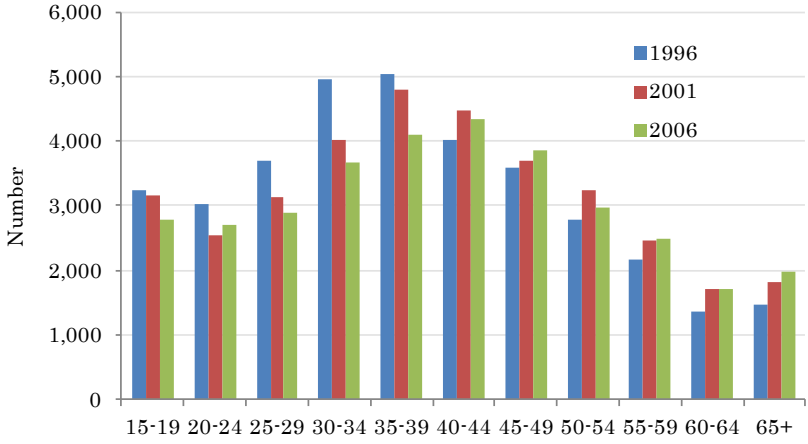
Source: Jackson/Statistics NZ Customised Database, available from author.

The perception that dairy farmers are much older than average could perhaps relate to a notion that farm employees are not 'farmers' in the same sense as those who are self-employed or employers. As indicated in Figure 1, at the 1996 Census, self-employed farmers with no employees accounted for more than 35 percent of those employed in the dairy farming industry. By 2006, that proportion had fallen to 23 percent, while paid employees had increased their share from 29 to 43 percent. However, the 'self-perception' argument is not supported by Table 2 (above), which shows

that in 2006, all those engaged in the dairy industry, whether self-employed, employer, or paid employee, were, on average, fractionally younger than their 'all-industry' counterparts, and significantly younger than their grain, sheep and beef farming counterparts.

Most importantly, the decline in numbers employed in the dairy industry occurred for all age groups below 40–44 years, while all age groups 45 years and older saw an increase – although the differences between 2001 and 2006 were only minor for some age groups (Figure 5). As is shown below, direct age-group analysis presents a misleading picture. By contrast, cohort analysis shows that older workers in the dairy industry have in fact *decreased* their employment as they have aged, while those at younger ages have increased theirs. That is, the apparent losses below the 40–44 age group and gains above that same group are at least in part *cohort effects*, reflecting underlying changes in cohort size.

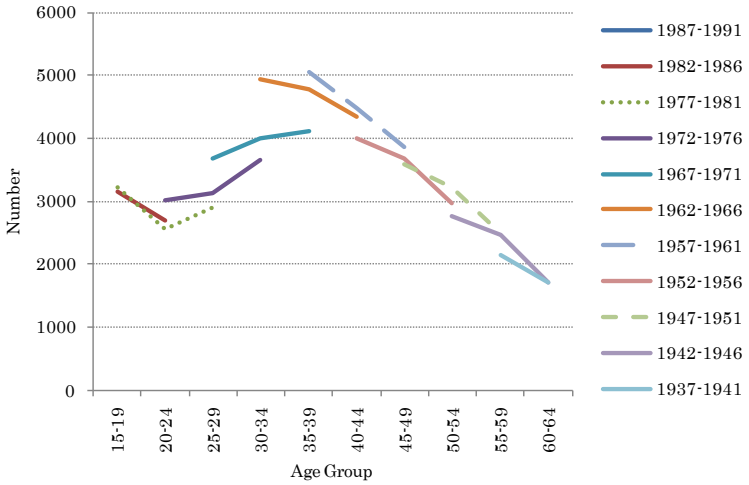
Figure 5: Dairy cattle farming industry by age (number), 1996, 2001, 2006



Source: Jackson/Statistics NZ Customised Database, available from author.

The same data are shown by birth cohort in Figure 6, for all cohorts for which there are three observations (1996, 2001 and 2006). For example, the cohort born between 1952 and 1956 was aged 40–44 years at the first observation (1996), 4549 years at the second observation (2001) and 50–54 years at the third observation (2006), and fell in number from just above 4000 to just below 3000, a decline of 26 percent (Appendix A).

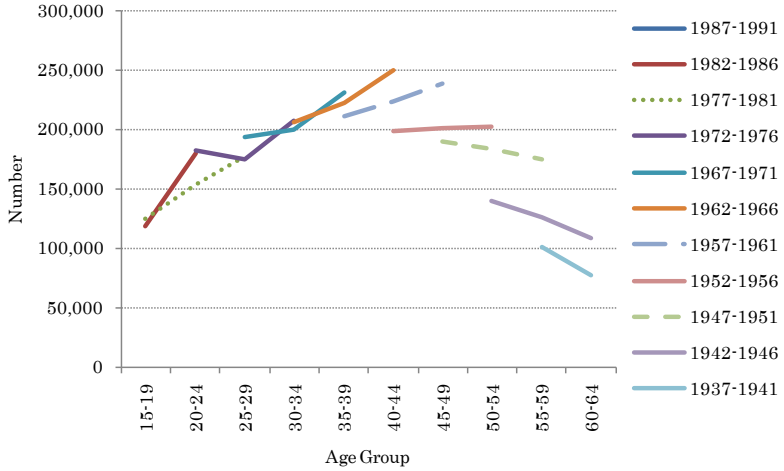
Figure 6: Dairy cattle farming industry by birth cohort and age (number), 1996–2006



Source: Jackson/Statistics NZ Customised Database, available from author

Figure 7 repeats the exercise for the total New Zealand industry (all-industry), where it can be seen that the cohort born between 1952 and 1956 increased in size from just below 200,000 to just above – an increase of 2.0 percent (Table 4 and Appendix B). The oldest all-industry cohort for which there are three data observations, those born between 1942 and 1946 and aged 60–64 years in 2006, declined in size by 22.5 percent, while for the dairy industry the respective decline was 38.0 percent. Figures 6 and 7 clearly show that there is greater attrition at older ages for New Zealand's dairy farming workers than in the general workforce.

Figure 7: Total New Zealand industry by birth cohort and age (number), 1996-2006

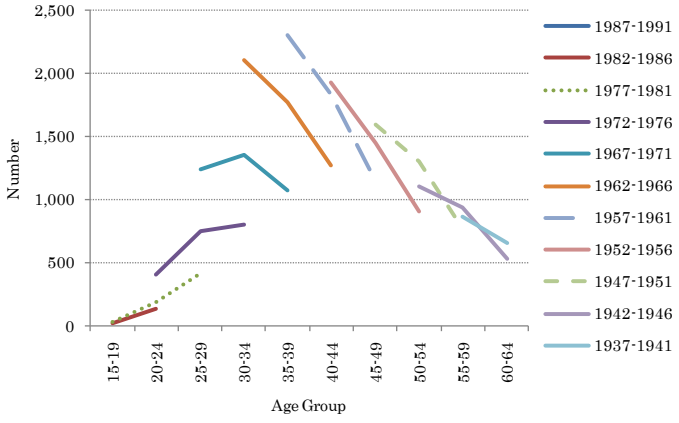


Source: Jackson/Statistics NZ Customised Database, available from author

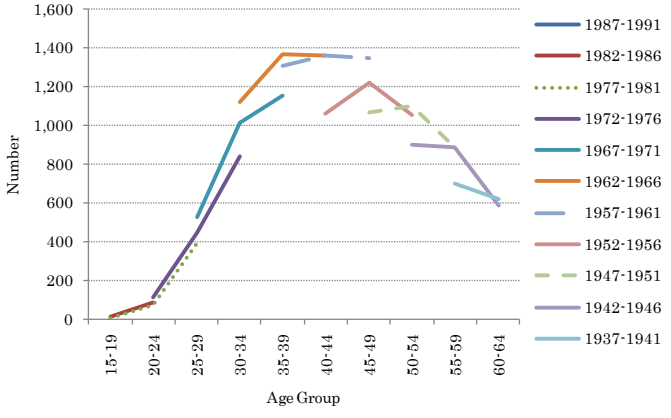
The extent to which the trends differ by employment status is given in Figure 8 (for dairy farming) and Table 4 (for both dairy farming and total New Zealand industry). In panel 8a of Figure 8 we see that for dairy industry workers who are self-employed without employees, all cohorts born between 1967 and 1971 and earlier halved in size, while the cohort born between 1962 and 1966 declined by 40 percent. By contrast, all but the oldest of their all-industry counterparts, increased. The self-employed without employees dairy farming cohort born between 1957 and 1961, for example, declined by 50.0 percent, while its all-industry counterpart grew by 25.0 percent. These data suggest that the decline in this employment status (refer Figure 1) is not caused by young self-employed people failing to enter or remain in the dairy industry (although it is clear that they are doing so in smaller numbers than previously), but by their older counterparts either departing the industry and/or becoming employers, as would particularly seem to be the case for the cohorts born between 1962 and 1966 and 1967 and 1971 (panel 8b).

Figure 8: Dairy cattle farming industry by birth cohort, age and selected employment status (number), 1996-2006

8B: Dairy cattle farming: Self-employed and without employees



8B: Dairy cattle farming: Employers



Source: Jackson/Statistics NZ Customised Database, available from author

Table 4: Change (%) in size of birth cohorts between 1996 and 2006, dairy farming industry and total New Zealand industry by employment status

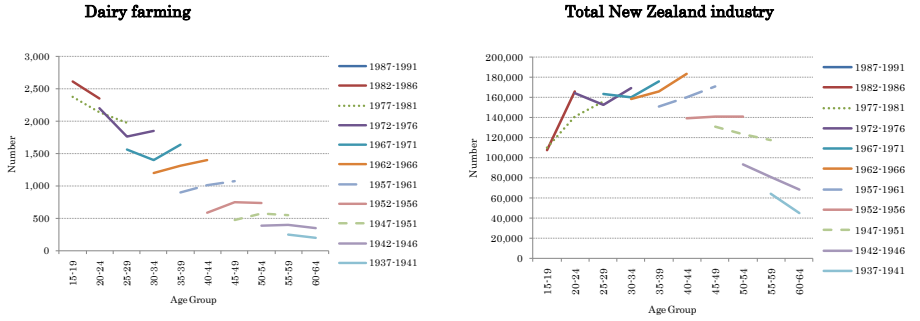
Cohort born	All dairy farmers	Self-employed, no employees	Employer	Paid employee
1987—1991	…	…	…	…
1982–1986	…	…	…	…
1977–1981	-10.4	1280.0	4266.7	-16.8
1972–1976	21.5	97.8	659.5	-16.0
1967–1971	11.5	-13.6	118.8	4.8
1962–1966	-12.2	-39.7	21.7	17.3
1957–1961	-23.4	-49.9	3.2	19.3
1952–1956	-26.0	-52.8	-0.6	26.0
1947–1951	-30.3	-51.6	-16.9	14.4
1942–1946	-38.2	-52.2	-35.0	-7.8
1937–1941	…	…	…	…
1932–1936	…	…	…	…
	Total New Zealand industry	**Self-employed, no employees**	**Employer**	**Paid employee**
1987–1991	…	…	…	…
1982–1986	…	…	…	…
1977–1981	42.7	248.6	1108.3	42.2
1972–1976	13.6	105.3	625.5	2.7
1967–1971	19.3	49.6	201.1	7.7
1962–1966	20.9	24.6	68.9	15.8
1957–1961	13.4	15.3	23.6	12.9
1952–1956	2.0	10.4	4.3	1.3
1947–1951	-7.9	-1.6	-13.4	-9.9
1942–1946	-22.5	0.0	-34.2	-26.5
1937–1941	…	…	…	…
1932–1936	…	…	…	…

Source: Jackson/Statistics NZ Customised Database, available from author

Panel 8b of Figure 8 also shows a major increase in cohort size for the younger dairy industry employer cohorts born 1977–81, 1972–76, and 1967–71, and smaller but equally important increases for those born 1957–61 and 1962–66. The cohort born between 1977 and 1981 shows a particularly impressive increase, by a factor of 44, compared to a factor of 12 for its all-industry counterpart (Appendices A and B). Aside from an increasing propensity to become an employer as one grows older, this picture could also be indicative of succession; that is, older 'parent' cohorts (whether self-employed or employer) passing and/or selling the farm to younger 'family' cohorts. Either way, the data in panel 8b show that while the overall number of dairy industry employers has increased only marginally (refer Figure 1), there *is* rejuvenation in the industry, with younger employers replacing older ones along similar lines to their all-industry counterparts. This finding explains the relatively small increase in average age for dairy farm industry employers shown in Table 2.

By contrast, paid employees in the dairy farm industry have experienced a greater rate of ageing than their all-industry counterparts (as well as their dairying counterparts), because of a substantially greater rate of decline in retention among younger cohorts, and a greater propensity for older dairy industry cohorts to remain in (or replace those already in) the industry. Paid employee cohorts born 1972–76 and 1977–81, for example, show declines in size of 16.0 and 16.8 percent, respectively, across the period 1996–2006, while their all-industry counterparts show increases of 2.7 and 42.2 percent (Table 4). At the same time, dairy industry, paid employee cohorts born 1962-66 and earlier show somewhat greater retention than their all-industry counterparts, a difference which can be seen most vividly in Figure 9.

Figure 9: Change in size (number) by birth cohort and age for paid employees, dairy farming industry and total New Zealand industry, 1996-2006



Finally, this paper examines the contribution of overseas-born people to the changing size of each cohort, using Country of Birth (COB) data (Table 5, Appendices C and D). It should be recalled that COB does not imply recent migration, as those born overseas may have moved to New Zealand at any age, including as a child. Again, only cohorts for which the three observations (1996, 2001 and 2006) are available are considered. It should also be noted that there are minor discrepancies between the foregoing industry data and the data by COB, due to some persons not stating their country of birth in the census; thus 'New Zealand-born' and 'Overseas-born' refer to *known* country of birth.

Table 5: Contribution of overseas-born to cohort size 1996-2006, dairy cattle farming and total New Zealand industry

	Overseas born (% of cohort)			Change 1996-2006 (n)		
Dairy cattle farming						
Cohort born	**1996**	**2001**	**2006**	**NZ-born**	**Overseas-born**	**Total change**
1977–1981	3.4	5.0	12.0	-555	237	-318
1972–1976	5.6	6.6	10.8	438	225	663
1967–1971	6.9	8.3	11.7	213	225	438
1962–1966	7.9	8.5	10.9	-672	84	-588
1957–1961	6.5	7.7	9.0	-1191	21	-1170
1952–1956	7.5	8.2	10.1	-1032	0	-1032
1947–1951	8.3	8.1	9.0	-1008	-72	-1080
1942–1946	8.7	9.8	9.6	-984	-78	-1062
Total New Zealand industry						
Cohort born	**1996**	**2001**	**2006**	**NZ-born**	**Overseas-born**	**Total change**
1977–1981	3.4	5.0	12.0	-555	237	-318
1972–1976	5.6	6.6	10.8	438	225	663
1967–1971	6.9	8.3	11.7	213	225	438
1962–1966	7.9	8.5	10.9	-672	84	-588
1957–1961	6.5	7.7	9.0	-1191	21	-1170
1952–1956	7.5	8.2	10.1	-1032	0	-1032
1947–1951	8.3	8.1	9.0	-1008	-72	-1080
1942–1946	8.7	9.8	9.6	-984	-78	-1062

Table 5 shows that the contribution of the overseas-born to the dairy farming industry is quite substantial, ranging (in 2006) from 9.0 per cent for each of the two cohorts born 1947–61 and 1957–61, to 12.0 per cent for the cohort born between 1977 and 1981. However, these proportions are substantially lower than those for total New Zealand industry, where the proportions range from almost 23 per cent (cohorts born 1952–56 and earlier) to 27 per cent (cohorts born 1962–66 and 1967–71). In all cases these proportions have increased, typically more so for total New Zealand industry than for dairy farming. Between 1996 and 2006 the overseas-born accounted for the majority of growth in two dairy industry cohorts, those born 1967-1971 (51.4 per cent of growth) and 1977-1981 (74.5 per cent of growth), while they accounted for somewhat greater proportions of growth for the five all-industry cohorts born 1952-56 through to 1972-76. A notable exception is for the cohort born 1977–81, where, for the dairy industry, the overseas-born component has increased by a greater margin than for all-industry, in the process partially offsetting a decline in the dairy industry cohort.

For all older dairy farming cohorts (born 1962–66 and earlier), there is a decline in the New Zealand-born component, while this is only apparent for the 1942–46 and 1947–51 overseas-born cohorts. For total New Zealand industry, it is only the New Zealand-born cohorts of 1952–56 and earlier that show decline, and this is again apparent only for the overseas-born cohorts of 1942–46 and 1947–51.

To summarise, the COB data support the foregoing analysis. They paint a picture of older New Zealand-born dairy industry workers departing the industry earlier and in greater proportions than both their all-industry counterparts *and* their overseas-born counterparts (with the exception of the cohort born 1947–51, for which the proportions leaving are almost identical). At the same time, there is relatively greater offset of the youngest dairy industry cohort (here 1977–81) by the overseas-born, than of the all-industry cohort. Similar can be said of the augmentation of the farming cohorts born 1967–71 and 1972–76, where the overseas-born have accounted for respectively one-half and one-third of change over the period 1996–2006. While not as great as for their all-industry counterparts, the data also support the argument that New Zealand's dairy farming industry is the recipient of a degree of youthful rejuvenation.

Summary and Discussion

This paper has outlined demographic change in New Zealand's dairy industry over the period 1996 to 2006. Despite using industry data rather than occupation data, its findings in terms of average age and rates of ageing are almost identical to those found by other researchers for dairy farmer and dairy farm-worker occupations (e.g. Wilson & Tipples (2008) covering the period 1991-2006, and Fairweather & Mulet-Marquis (2009) (covering a longer period, 1971-2006). The finding suggests that dairy cattle farming industry data, of which around 75 percent is accounted for by on-farm dairy farmers and farm workers, can be used as a proxy for 'dairy farmers', with the added advantage of accounting for critical supporting occupations such as herd testers and artificial breeding technicians. However, where the research focus is on-farm trends or future workforce provision, it is clear that it would be better to disaggregate the on-farm and off-farm components (author, forthcoming).

In the present study, which is concerned with the question of whether or not dairy farmers are ageing more rapidly than the overall New Zealand workforce, the approach has been to disaggregate dairy farming industry data by employment status (self-employed, no employees, employer', and paid employees), and to subject these data to cohort analysis in order to trace birth cohorts as they have aged. The benefits of this approach are clear from the study's findings. Where the previously widely reported increase in numbers and proportions over the age of 55 years in the industry has been popularly interpreted as older farmers disproportionately remaining in the industry, and the declining numbers at younger ages as plummeting entry and retention in the industry, this paper has found a somewhat different picture – at least for the self-employed with no employees, and employers. Older farm industry cohorts can be seen to have departed the industry at a considerably greater rate than their all-industry counterparts (also their grain, sheep and beef counterparts, not directly shown in this paper) and this is definitively so for the self-employed without employees group. All self-employed-no employee dairy industry cohorts born 1967–71 and earlier at least halved in size over the 1996 to 2006 period, while the changes for their all-industry counterparts range from an increase of 15.3 percent for the cohort born 1957–61 to a decline of just 1.6 percent for the cohort born 1947–51. It cannot be ascertained from these data how many who were previously "self-employed, no employees" in the dairy industry became employers over the period, but since the number of dairy industry employers increased only minimally (and fell between 2001 and 2006), it could not have been many. By comparison, the two youngest dairy industry self-employed-no employee cohorts increased in size, the youngest more so than its all-industry counterpart.

Contrasting with this picture – but also with the popular interpretations referred to above – among the youngest dairy industry employer cohorts there is a significant increase in entry/ retention that is greater than for their all-industry counterparts. The cohort born 1977–81 increased in size by a factor of 43 against a factor of just 12 for its all-industry counterpart. The dairy industry employer cohort born 1972–76 also increased by a greater margin than its all-industry counterpart, although the difference was not as pronounced.

The situation for the employee population differs again, with significant loss of retention for all younger dairy industry cohorts compared with growth for their all-industry counterparts, but greater retention (or entry at older ages) for older dairy industry cohorts than all-industry cohorts. These trends explain the greater rate of ageing for the dairy industry employee population than for its self-employed-no employee and employer counterparts.

While not disaggregating by employment status, the paper also examined the role of country of birth in augmenting cohort size and/or offsetting decline. It found that dairy industry cohorts contain much smaller proportions of overseas-born than their all-industry counterparts, although in neither case can overseas-born be interpreted as recent migration, as some people may have moved to New Zealand in childhood. What did stand out among the findings is that older New Zealand-born dairy industry cohorts are vacating the industry at a greater rate than both their overseas-born counterparts and their all-industry counterparts, with the sole exception of the cohort born 1947–51, for which the proportions leaving are almost identical. At the same time, the youngest New Zealand-born dairy industry cohort (born 1977–81) experienced overall decline in the period 1996 to 2006, which would have resulted in a significantly greater decline for that overall dairy industry cohort had it not been for its overseas-born component.

In all cases these trends challenge popular perceptions of an ageing, stagnating dairy industry, and paint a picture of emerging rejuvenation and 'reinvention', albeit not in the same numbers as in the past. However while positive, these shifts would also appear to have important longer-term implications for the face of New Zealand's dairy farming industry. The decreasing practice of being self-employed-without employees (e.g. the pre-1990s sharemilker), and the increasing share of overseas-born among the younger cohorts — a disproportion of whom are likely to be paid employees — suggests a relative dearth of local buyers for the slowly burgeoning number of future sellers (Penn 2013). Equally pertinent questions at this time might thus be what can be done to encourage younger New Zealanders into farming (Garnaut & Helali 1999; *Waikato Times* 2012), and why older dairy farmers are more likely to leave in greater proportions than their all-industry and overseas-born counterparts.

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Appendix A: Dairy Cattle Farming Industry, Numbers by Cohort and Age, 1996–2006

Dairy Industry (All)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	2775										...
1982-1986	3156	2691									...
1977-1981	3231	2553	2895								-10.4
1972-1976		3018	3126	3666							21.5
1967-1971			3687	4008	4110						11.5
1962-1966				4947	4785	4344					-12.2
1957-1961					5043	4479	3864				-23.4
1952-1956						4008	3687	2964			-26.0
1947-1951							3585	3234	2499		-30.3
1942-1946								2775	2469	1716.0	-38.2
1937-1941									2157	1713	...

Dairy Industry (Self Employed, No Employees)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	18										...
1982-1986	24	141									...
1977-1981	30	189	414								1280.0
1972-1976		405	747	801							97.8
1967-1971			1239	1359	1071						-13.6
1962-1966				2106	1770	1269					-39.7
1957-1961					2301	1836	1152				-49.9
1952-1956						1926	1455	909			-52.8
1947-1951							1599	1305	774		-51.6
1942-1946								1104	939	528	-52.2
1937-1941									864	660	...

Dairy Industry (Employers)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	6										...
1982-1986	12	87									...
1977-1981	9	75	393								4266.7
1972-1976		111	447	843							659.5
1967-1971			528	1011	1155						118.8
1962-1966				1119	1368	1362					21.7
1957-1961					1308	1359	1350				3.2
1952-1956						1062	1221	1056			-0.6
1947-1951							1065	1104	885		-16.9
1942-1946								900	888	585	-35.0
1937-1941									702	621	...

Dairy Industry (Employees)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	2379										...
1982-1986	2610	2346									...
1977-1981	2376	2145	1977								-16.8
1972-1976		2199	1764	1848							-16.0
1967-1971			1569	1407	1644						4.8
1962-1966				1200	1314	1407					17.3
1957-1961					903	1011	1077				19.3
1952-1956						588	753	741			26.0
1947-1951							480	582	549		14.4
1942-1946								384	402	354	-7.8

Appendix B: Total New Zealand Industry, Numbers by Cohort and Age, 1996–2006

Total New Zealand Industry

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	136974										...
1982-1986	117759	179478									...
1977-1981	124086	153285	177102								42.7
1972-1976		181881	175050	206529							13.6
1967-1971			193113	199950	230403						19.3
1962-1966				206376	221625	249597					20.9
1957-1961					210435	223680	238530				13.4
1952-1956						198570	200970	202515			2.0
1947-1951							190116	183033	175167		-7.9
1942-1946								139467	125478	108117	-22.5
1937-1941									100200	76509	...

Total NZ Industry (Self Employed, No Employees)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	1512										...
1982-1986	1428	4923									...
1977-1981	1623	4398	10425								542.3
1972-1976		5559	11118	19377							248.6
1967-1971			13431	20253	27573						105.3
1962-1966				22251	28053	33297					49.6
1957-1961					27123	31779	33807				24.6
1952-1956						27183	30444	31335			15.3
1947-1951							27756	30630	30654		10.4
1942-1946								22059	23601	21705	-1.6
1937-1941									17982	16881	...

Total NZ Industry (Employers)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	270										...
1982-1986	282	1251									...
1977-1981	360	921	4350								1108.3
1972-1976		1506	4374	10926							625.5
1967-1971			6009	11196	18096						201.1
1962-1966				13698	18147	23130					68.9
1957-1961					20220	22674	24996				23.6
1952-1956						21465	22275	22395			4.3
1947-1951							21882	21411	18939		-13.4
1942-1946								16434	14565	10815	-34.2
1937-1941									11217	8358	...

Total NZ Industry (Employees)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (%)
1987-1991	126255										...
1982-1986	107886	166284									...
1977-1981	109779	141225	156129								42.2
1972-1976		164457	152370	168885							2.7
1967-1971			163269	160362	175782						7.7
1962-1966				158652	166188	183771					15.8
1957-1961					151266	160308	170712				12.9
1952-1956						139200	140577	141072			1.3
1947-1951							130662	123633	117702		-9.9
1942-1946								93021	80637	68328	-26.5

Appendix C: Dairy Cattle Industry, Numbers by Cohort, Age, and Country of Birth, 1996–2006

Cohort	**Dairy Farming Industry**											Contribution to Change	
1977-1981	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)	Number	(%)
NZ-Born	3096	2415	2541								-555	-174.5	-17.9
Overseas-Born	108	126	345								237	74.5	219.4
Total	3204	2541	2886								-318	-100.0	-9.9
	3.4	5.0	12.0										
1972-1976	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born		2823	2907	3261							438	66.1	15.5
Overseas-Born		168	204	393							225	33.9	133.9
Total		2991	3111	3654							663	100.0	22.2
		5.6	6.6	10.8									
1967-1971	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born			3393	3669	3606						213	48.6	6.3
Overseas-Born			252	333	477						225	51.4	89.3
Total			3645	4002	4083						438	100.0	12.0
			6.9	8.3	11.7								
1962-1966	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born				4521	4362	3849					-672	-114.3	-14.9
Overseas-Born				387	405	471					84	14.3	21.7
Total				4908	4767	4320					-588	-100.0	-12.0
				7.9	8.5	10.9							
1957-1961	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born					4677	4119	3486				-1191	-101.8	-25.5
Overseas-Born					324	342	345				21	1.8	6.5
Total					5001	4461	3831				-1170	-100.0	-23.4
					6.5	7.7	9.0						
1952-1956	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born						3687	3366	2655			-1032	-100	-28.0
Overseas-Born						297	300	297			0	0	0.0
Total						3984	3666	2952			-1032	-100	-25.9
						7.5	8.2	10.1					
1947-1951	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born							3252	2949	2244		-1008	-93.3	-31.0
Overseas-Born							294	261	222		-72	-6.7	-24.5
Total							3546	3210	2466		-1080	-100.0	-30.5
							8.3	8.1	9.0				
1942-1946	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change N		
NZ-Born								2505	2211	1521	-984	-92.7	-39.3
Overseas-Born								240	240	162	-78	-7.3	-32.5
Total								2745	2451	1683	-1062	-100.0	-38.7
								8.7	9.8	9.6			

Appendix D: Total New Zealand Industry, Numbers by Cohort, Age, and Country of Birth, 1996–2006

Cohort	Total New Zealand Industry											Contribution to Change	
1977-1981	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)	Number	(%)
NZ-Born	111294	130845	130839								19545	-36.5	17.6
Overseas-Born	10938	21396	45003								34065	-63.5	311.4
Total	122232	152241	175842								53610	-100.0	43.9
	8.9	14.1	25.6										
1972-1976	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born		159360	144489	153306							-6054	-23.0	-3.8
Overseas-Born		19476	29532	51879							32403	123.0	166.4
Total		178836	174021	205185							26349	100.0	14.7
		10.9	17.0	25.3									
1967-1971	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born			160218	158073	167310						7092	18.4	4.4
Overseas-Born			29952	40665	61365						31413	81.6	104.9
Total			190170	198738	228675						38505	100.0	20.2
			15.8	20.5	26.8								
1962-1966	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born				165807	171777	180801					14994	-34.1	9.0
Overseas-Born				37623	48450	66645					29022	-65.9	77.1
Total				203430	220227	247446					44016	-100.0	21.6
				18.5	22.0	26.9							
1957-1961	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born					169458	175524	178401				8943	-31.2	5.3
Overseas-Born					37944	46653	57678				19734	-68.8	52.0
Total					207402	222177	236079				28677	-100.0	13.8
					18.3	21.0	24.4						
1952-1956	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born						157980	157758	154389			-3591	84.1	-2.3
Overseas-Born						37776	41667	45639			7863	-184.1	20.8
Total						195756	199425	200028			4272	-100	2.2
						19.3	20.9	22.8					
1947-1951	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born							146823	141540	133218		-13605	-93.6	-9.3
Overseas-Born							40344	39984	39408		-936	-6.4	-2.3
Total							187167	181524	172626		-14541	-100.0	-7.8
							21.6	22.0	22.8				
1942-1946	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Change (N)		
NZ-Born								106632	96480	81843	-24789	-79.4	-23.2
Overseas-Born								30726	27903	24282	-6444	-20.6	-21.0
Total								137358	124383	106125	-31233	-100.0	-22.7
								22.4	22.4	22.9			

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The Association of Residential Mobility with Affiliation to Primary Care Providers

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Abstract

There has been considerable discussion in the literature about theoretical and empirical associations between the health of individuals and the material and social deprivation of their place of residence. However, the importance of residential mobility for use of primary care services has not been thoroughly assessed in the literature. Knowledge about such effects may, for example, help primary care physicians decide which patients to concentrate on. In this paper, we take advantage of longitudinal data to explore the association between residential mobility and affiliation with a Primary Care Provider (PCP) in New Zealand. Affiliation refers to having a doctor, nurse or medical centre one could go to if need arises. We found that respondents who moved were less likely to be affiliated with a PCP than those who did not move, even after controlling for likely known confounders and all unmeasured time-invariant confounders in logistic fixed-effects regression models. Our findings suggest that policies to encourage the building and maintaining of the relationship between a PCP and patients should be in place before and after patients move, with follow-up to aid mobile families and individuals

This paper considers the relationship between affiliation with a primary care provider (PCP) and residential mobility over time. Affiliation, which refers to having a usual source of care (doctor, nurse or medical centre) or primary care provider, is a key attribute of primary health care systems (Starfield, 1992). A PCP is usually the first point of contact with health services for patients, and PCPs in New Zealand, and in some other countries, are "gatekeepers" who facilitate

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access to more costly secondary and tertiary care. Affiliation with a PCP is particularly important in New Zealand where patients need to be enrolled/registered with a General Practitioner (GP) to be eligible for lower GP consultation fees. Hence, patients pay more for a GP visit if they are not affiliated with a PCP. Research has suggested that having a regular and consistent source of care is associated with lowering health care costs (Weiss & Blustein, 1996) by decreasing use of emergency services (Christakis, Wright, Koepsell, Emerson, & Connell, 1999; Gill, Mainous, & Nsereko, 2000) and hospitalisations, (Gill & Mainous, 1998; Mainous & Gill, 1998), particularly for ambulatory-care-sensitive conditions (conditions that are more amenable to primary care interventions). Hence, identifying and understanding factors that help or hinder affiliation with a PCP is important for population health. Residential mobility is one such factor that can play both a positive and negative role in affiliation with a PCP.

There has been considerable discussion in the literature about theoretical and empirical associations between the health of individuals and the material and social deprivation of their place of residence (Cox, Boyle, Davey, & Morris, 2007; Curtis, 2004; Curtis & Rees Jones, 1998; Diez-Roux, 1998, 2000; Duncan, Jones, & Moon, 1993; Macintyre, Maciver, & Sooman, 1993). People in poor health are typically more concentrated in socioeconomically deprived areas while those in better health are likely to live in more advantaged places. Empirical research has also shown that the associations between area deprivation and health are likely to be temporally dynamic processes. For example, some studies are concerned with socio-geographical processes of 'health selection' through which people with illness (especially chronic conditions) are more likely to move into, or remain in, relatively deprived areas while people in better health are more likely to move into, or remain in, more affluent areas. These selective migration patterns may over time contribute to greater concentrations of people in poor health living in deprived, rather than advantaged areas. There is some evidence of such socio-economic 'sorting' of people according to their health status, namely that health selection contributes to, but does not completely account for, area inequalities in health (Boyle, Norman, & Rees, 2002; Brown & Leyland, 2009; De Verteuil et al., 2007; Larson, Bell, & Young, 2004).

Extending this health and place and health selection debate to primary health care raises questions, such as whether people are less healthy in certain areas because they don't have an affiliation with a PCP, or because they are mobile. Also, if people are mobile, they might be less likely to affiliate with a PCP, and this in turn may negatively affect their health. Thus, a related but less recognised issue is whether mobility predicts affiliation with a PCP. Mobility produces challenges and opportunities and can have both negative and positive impacts on affiliation with a PCP. For example, it is likely that moving disrupts affiliation and it takes time for movers to find and register with a PCP and become affiliated again. It is also possible that moving residence could affect health positively if a low-quality affiliation is replaced with a higher-quality affiliation. Frequency of residential movement adds another dimension to this debate.

However, little is known about whether and how residential mobility is associated with affiliation with a PCP. Knowledge about such effects may, for example, help primary care physicians decide which patients to concentrate on, and would extend the theoretical debate on health and place and health selection. To determine whether residential mobility and affiliation with a PCP are associated, and whether health is a motivation for residential mobility, we need longitudinal information on residential mobility, affiliation with a PCP, and health events. Such data are not readily available. This paper aims to examine the effect of change in residence on affiliation with a PCP using three waves of data (waves 3, 5 and 7) from a New Zealand longitudinal study. We hypothesise that after adjusting for demographic, socio-economic, health behavioural and health factors, those who moved residence are less likely to be affiliated with a PCP compared with those who did not move residence. New Zealand provides an ideal environment for examining the association between mobility and affiliation with a PCP: there is a high level of domestic migration and a requirement that patients be enrolled/registered with a GP to access lower GP consultation fees. Just under half of the New Zealand usually resident population changed domestic residence in the period between 1996 and 2006 (Statistics New Zealand, 2002).

Methods

Data

This research used data from three waves (waves 3, 5 and 7) of the SoFIE-Health survey, which is an add-on to the Survey of Family, Income and Employment (SoFIE Version 2, Wave 1 to 7) (Carter, Cronin, Blakely, Hayward, & Richardson, 2010). SoFIE is an eight-year (2002–2010) longitudinal household panel survey, managed by Statistics New Zealand under the Statistics Act (1975). Computer-assisted face-to-face interviews were used to collect information annually on income levels and sources, and on the major influences on income such as employment and education experiences, household and family status, demographic factors, and health status.

The population covered by SoFIE is the usually resident population of New Zealand living in private dwellings (excluding people living in institutions or establishments such as boarding houses, rest homes, etc.). The initial SoFIE sample comprised approximately 11,500 responding private households (response rate of 83 percent), with 22,265 adults (aged 15 years and older) responding in wave 1, this reduced to just over 19,000 in Wave 3 (86 percent of wave 1) and almost 17,000 in Wave 7 (76 percent of wave 1).

The SoFIE-Health add-on comprised 20 minutes of questionnaire time in waves 3 (2004/05), 5 (2006/07) and 7 (2008/09), in the following health-related domains: SF-36 (Short-Form health survey), Kessler-10 (K-10), perceived stress, chronic conditions (heart disease, diabetes and injury-related disability), tobacco smoking, alcohol consumption, access and continuity of primary health care, and an individual deprivation score.

Measures

The main outcome measure was affiliation with a PCP; this was measured by asking individuals "Do you have a doctor, nurse or medical centre you usually go to, if you need to see a doctor?". Response categories included 'Yes', 'No', 'Don't know' and 'Refused'. We recoded this measure into two categories that contrasted affiliated with not affiliated. For this paper, we excluded the 'Don't know' and 'Refused' categories as there was no a priori way of categorising these respondents as 'Yes' or 'No'. The affiliation

measure was only available in waves 3, 5 and 7, restricting analyses to just those waves.

The main exposure used in this paper was residential mobility, derived by Statistics New Zealand. This is a categorical variable that indicates whether a respondent has changed meshblock (aggregations of approximately 100 people) from the time of the last interview in the immediately preceding wave. Thus a non-reference value for the mobility indicator at wave 5 means the movement was between waves 4 and 5 (not between 3 and 5). We used this information to derive a variable indicating movement over the two waves preceding the current wave (w = 3, 5 or 7), with levels of no movement in either of the two previous waves, movement two waves before the current wave (between w-2 and w-1), movement one wave before the current wave (between w-1 and w), or movement in both preceding waves. Thus for wave 3, movement two waves before the current wave means movement between wave 1 and 2, movement one wave before the current wave means movement between wave 2 and 3, and movement in both preceding waves means movement between wave 1 and wave 2, and between wave 2 and wave 3. The reference was no movement in either of the two preceding waves. Note that the movement indicator is a lower limit for the number of actual meshblock movements since respondents may have changed meshblocks more than once between interviews on consecutive waves.

Time-varying confounders measured at each wave are labour force status, marital status, family structure, self reported health, New Zealand Deprivation Index 2001 (Salmond & Crampton, 2012) (a measure of small area deprivation, categorized into quintiles, where quintile 5 corresponds to higher deprivation), wave (time), and NZiDep (Salmond, Crampton, King, & Waldegrave, 2006) (a measure of individual deprivation).

Also used in the analysis were the time-invariant confounders sex and ethnicity. The ethnicity variable was constructed using a "prioritised" definition. Each respondent was assigned to a mutually exclusive ethnic group by means of a prioritisation system commonly used in New Zealand: Māori (the indigenous people of New Zealand), if any of the responses to self-identified ethnicity was Māori; Pacific, if any one response was Pacific but not Māori; Asian, if any one response was Asian but not Māori/Pacific; and the remainder non-Māori non-Pacific non-Asian (nMnPnA; mostly

New Zealanders of European descent, but strictly speaking not an ethnic group). The reference group used here was nMnPnA.

Analysis

Analyses were conducted on an unbalanced panel of eligible respondents in wave 1 who responded in waves 3, 5 and 7, and who were aged more than 15 years. Transition probabilities for mobility and affiliation averaged over waves 3, 5 and 7 were computed to illustrate the dynamic nature of meshblock movement and affiliation "behaviours".

Since affiliation is a binary outcome variable, we modelled the probability of being affiliated using fixed effects conditional logistic models. Such models eliminate nuisance variables representing time-invariant unobserved confounding by conditioning on a sufficient statistic (Agresti, 2002; Allison, 2005; Wooldridge, 2002). Exponentiated parameter estimates for the affiliation model can be interpreted as odds ratios (specifically the odds of having a health provider relative to the reference level of the specified covariate).

Fixed effects conditional logistic analysis only uses change occurring within the same individuals over time to estimate effects and ignores observations on variables that do not change temporally. Thus it excludes the effect on affiliation of those who never move (or always move). However, it is possible to fit interactions between time-varying and time-invariant variables in a fixed effects model. We included interactions between gender and mobility, and between ethnicity and mobility, to test whether the association between mobility and affiliation has been modified by gender or ethnicity. We also included a main effect for health and an interaction between health and mobility to see whether the association between mobility and affiliation was modified by health (time-varying). In our previous work, we have shown that gender, ethnicity and health are significant predictors of affiliation (Jatrana & Crampton, 2009). A significant interaction for gender would mean that the relationship between affiliation and mobility depends on gender, and similarly for ethnicity and health interactions. We also tested for an interaction between mobility and age at wave 5, coded as a 2-level covariate cut at age 25 years, to see if there was variation in the association of mobility and affiliation by age.

All counts presented in this paper are averaged over waves 3, 5, and 7, and rounded as per the Statistics New Zealand protocol. Analyses were done within the Statistics New Zealand data laboratory using the R environment (http://www.r-project.org) for statistical computation, version 2.13.0, available from the Comprehensive R archive Network (CRAN) website (http://cran.r-project.org).

Results

Table 1 shows the empirical mean transition probability matrix for residential meshblock movement over waves 3, 5 and 7 using a total of 29515 transitions in residential mobility from an unbalanced panel of 16355 adults (averaged across waves 3, 5, and 7). Each row of the transition matrix represents categories of mobility at wave w (= 3 or 5) while the columns represent categories of movement at wave $w + 2$. Note that relative frequencies in each row sum to 1, within rounding error. For example, of those who did not change meshblock in the two waves prior to any given wave, 2.5% changed meshblock (at least) once in each of the subsequent two waves. The numbers on the table diagonal (bold) show the proportion of transitions to the same movement state in waves 3, 5 and 7. Thus, 83.7 percent of respondents did not change meshblocks in the two waves before or after a given wave.

Table 1: Empirical transition probabilities (%) derived from counts of the number of times respondents reported the indicated pair of meshblock movement states in successive observations over three waves.

	To (w+2)			
From (w)	No move	One move: wave w-2 to w-1	One move: w-1 to w	Two moves
No move	**83.7**	7.0	6.8	2.5
One move (w-2 to w-1)	64.0	**13.8**	14.4	7.8
One move (w-1 to w)	58.7	17.7	**13.1**	10.4
Two moves	38.9	19.9	19.3	**21.9**

Table 2 shows the mean empirical transition probability matrix for affiliation with a Primary Care Provider (PCP) over waves 3, 5 and 7. Each row of the transition matrix represents categories of affiliation with a PCP at wave w while the columns represent categories of affiliation with a PCP at wave $w + 2$. For example, of those who were affiliated with a PCP in a given wave, 5.1 percent were not affiliated two waves later. The

numbers on the table diagonal (bold) show the people who do not change affiliation between waves 3, 5 and 7: 94.9 percent remained affiliated and 38.8 percent remained not affiliated. Approximately 5 percent of people move from affiliated to not affiliated, and 61 percent from not affiliated to affiliated.

Table 2: Empirical transition probabilities (%) derived from counts of the number of times respondents reported the indicated pair of affiliation states in successive observations over three waves.

	To	
From	Affiliated	Not affiliated
Affiliated	**94.9**	5.1
Not affiliated	61.2	**38.8**

Table 3 presents mean (across waves 3, 5 and 7) cross-sectional associations between time-varying covariates and affiliation with a PCP. The proportion of respondents reporting affiliation with a PCP was 91.8 percent. The average proportion of affiliation among those respondents who did not move meshblocks was 93.4 percent. For those who moved once in the previous two waves, once in the previous wave, and in both previous waves, the corresponding proportions were 88.5, 85.1 and 79.6 respectively.

The highest average affiliation was found for those reporting fair to poor health (97.1 percent), the lowest (88.2 percent) for those reporting excellent health. Overall, affiliation declined as reported health increased, and conversely for those who were not affiliated. The average affiliation rate with a PCP among married and divorced, widowed or separated respondents was 93.5 percent and 95.2 percent respectively, but somewhat lower for respondents who had never married (84.0 percent). Amongst levels of the Family Status variable, affiliation with a PCP among single people averaged 94.1 percent, whereas sole parent respondents (88.6 percent), couples with no dependants (91.0 percent), and couples with dependants (91.5 percent) reported lower levels of affiliation. Affiliation with a PCP was on average slightly higher for non-working (93.7 percent) than working respondents (90.5 percent). Affiliation levels were also similar across levels of deprivation (91.8 percent in the least-deprived areas, 91.2 percent in medium-deprived areas, and 91.2 percent in the most deprived areas) and individual deprivation (affiliation 91.2 – 92.5 percent). Affiliation levels for respondents with qualifications at degree or higher level were on average 88.1 percent, slightly below that observed for

other qualifications (90.5 percent for those with school qualifications, 92.4 percent for those with vocational qualifications, and 93.7 percent, those with no qualifications).

Table 3: Means and standard deviations of study population counts and proportions for movement status and demographic strata by affiliation status for SoFIE-Health waves 3, 5, and 7.

	N (SD)	% Not Affiliated (SD)	% Affiliated (SD)
Total	16,354 (1155)	8.2 (0.8)	91.8 (0.8)
Movement			
None	13,445 (245)	6.6 (0.5)	93.4 (0.5)
One move (wave *w*-2 to *w*-1)	1537 (196)	11.5 (1.6)	88.5 (1.6)
One move (wave *w*-1 to *w*)	1527 (275)	14.9 (1.3)	85.1 (1.3)
Two moves	782 (120)	20.4 (2.2)	79.6 (2.2)
Health			
Excellent	5099 (659)	11.8 (1.1)	88.2 (1.1)
Very good	5831 (237)	8.4 (0.8)	91.6 (0.8)
Good	3770 (177)	5.3 (0.5)	94.7 (0.5)
Fair-poor	1654 (94)	2.9 (0.3)	97.1 (0.3)
Marital status			
Never married	3925 (206)	16.0 (1.5)	84.0 (1.5)
Divorced, widowed, or separated	2574 (76)	4.8 (0.2)	95.2 (0.2)
Married	10782 (557)	6.5 (0.6)	93.5 (0.6)
Family Status			
One person	4999 (200)	5.9 (0.7)	94.1 (0.7)
Sole parent	3695 (145)	11.4 (1.2)	88.6 (1.2)
Couple only	1621 (115)	9.0 (0.8)	91.0 (0.8)
Couple with dependents	6974 (375)	8.5 (0.8)	91.5 (0.8)
Labour Force Status			
Working	11335 (500)	9.5 (0.9)	90.5 (0.9)
Not working	5948 (347)	6.3 (0.3)	93.7 (0.3)
NZDeprivation			
Least deprived	10607 (250)	8.2 (0.8)	91.8 (0.8)
Medium deprived	3544 (261)	8.8 (0.6)	91.2 (0.6)
Most deprived	3133 (327)	8.8 (0.8)	91.2 (0.8)
NZiDeprivation			
0	12551 (752)	8.4 (0.7)	91.6 (0.7)
1-2	3657 (212)	8.8 (1.0)	91.2 (1.0)
3-7	1070 (137)	7.5 (0.6)	92.5 (0.6)
Highest Qualification			
Degree or higher	2585 (20)	11.9 (0.8)	88.1 (0.8)
No qualification	4115 (353)	6.3 (0.5)	93.7 (0.5)
School qualification	4602 (243)	9.5 (0.8)	90.5 (0.8)
Vocational qualification	5979 (219)	7.6 (0.9)	92.4 (0.9)

Note: Total counts are rounded means

Table 4 shows mean cross-sectional associations between time-varying covariates and meshblock movement. For those who did not move meshblocks in the preceding two waves, moved once two waves previously, moved once in the previous wave, and moved in both previous waves, the overall proportion of respondents was 76.7, 9.3, 9.2, and 4.7 percent respectively. As might be expected, the overall proportion of respondents who moved meshblocks in both preceding waves was lower than for either single movement category. Overall proportions of movers in each of the single movement categories were similar in magnitude. These patterns were often repeated in each covariate group.

The proportion of respondents who did not move meshblocks in the previous two waves were lowest for the unaffiliated (58.3 percent), those in (individual) deprivation (64.3 – 67.9 percent), sole parents (67.0 percent), and never married (69.9 percent). These same groups generally showed the highest rates of movement (e.g. for double movers the proportions were 11.8 percent, 7.8-10.1 percent, 9.0 percent, and 8.8 percent respectively). Highest rates of no movement (and lowest rates of movement) were seen amongst those with no qualifications (83.0 percent), the unemployed (81.8 percent), those reporting fair-poor health (81.7 percent), one-person families (81.1 percent), and those not individually deprived (80.1 percent).

Table 4: Means and standard deviations of study population counts and proportions for affiliation status and demographic strata by movement status for SoFIE-Health, waves 3, 5, and 7.

	N (SD)	% No moves	% One move wave *w*-2 to *w*-1	% One move wave *w*-1 to *w*	% Two moves
Total	16354 (1155)	76.7 (2.0)	9.3 (0.5)	9.2 (1.0)	4.7 (0.4)
Affiliation status					
Not affiliated	1361 (183)	58.3 (3.8)	13.1 (1.1)	16.8 (2.2)	11.8 (0.7)
Affiliated	15171 (916)	78.3 (1.7)	9.0 (0.5)	8.6 (0.9)	4.1 (0.3)
Health					
Excellent	5099 (659)	74.1 (2.1)	9.8 (0.7)	10.5 (1.1)	5.6 (0.3)
Very good	5831 (237)	76.4 (2.3)	9.5 (0.7)	9.2 (1.1)	5.0 (0.5)
Good	3770 (177)	78.7 (1.4)	8.9 (0.6)	8.5 (0.8)	3.9 (0.3)
Fair-poor	1654 (94)	81.7 (1.5)	7.9 (0.3)	7.1 (0.9)	3.2 (0.5)
Marital status					
Never married	3720 (259)	69.9 (1.9)	9.5 (0.3)	11.8 (0.9)	8.8 (0.9)
Divorced, widowed, or separated	2424 (119)	79.2 (0.8)	9.0 (0.4)	8.3 (1.2)	3.5 (0.1)
Married	10408 (680)	78.4 (2.2)	9.3 (0.8)	8.6 (1.1)	3.6 (0.3)
Family Status					
One person	4836 (260)	81.1 (2.0)	8.0 (0.7)	7.4 (0.8)	3.4 (0.5)
Sole parent	3469 (211)	67.0 (1.9)	11.0 (0.4)	13.0 (1.4)	9.0 (0.9)
Couple only	1529 (141)	72.5 (2.0)	11.3 (0.5)	10.2 (1.0)	6.0 (0.6)
Couple with dependents	6784 (433)	79.3 (2.0)	8.9 (0.8)	8.5 (1.1)	3.3 (0.1)
Labour Force Status					
Working	10903 (663)	74.0 (2.2)	10.5 (0.7)	10.0 (1.0)	5.6 (0.5)
Not working	5709 (395)	81.8 (1.3)	7.1 (0.2)	7.9 (1.0)	3.2 (0.1)
NZDeprivation					
Least deprived	10241 (387)	76.7 (2.3)	9.5 (0.8)	9.3 (1.1)	4.5 (0.4)
Medium deprived	3398 (306)	75.6 (1.4)	9.4 (0.1)	9.4 (1.1)	5.6 (0.3)
Most deprived	2974 (357)	77.8 (1.6)	8.6 (0.1)	8.7 (0.9)	4.9 (0.6)
NZDeprivation					
0	12100 (891)	80.1 (1.9)	8.3 (0.5)	8.1 (1.1)	3.5 (0.3)
1-2	3443 (236)	67.9 (2.0)	11.9 (0.5)	12.4 (0.8)	7.8 (0.8)
3-7	991 (149)	64.3 (2.6)	12.7 (0.7)	12.9 (1.6)	10.1 (0.5)
Highest Qualification					
Degree or higher	2474 (67)	71.2 (2.9)	12.0 (1.0)	10.1 (0.7)	6.7 (1.3)
No qualification	3965 (383)	83.0 (1.3)	6.5 (0.2)	7.7 (0.7)	2.9 (0.4)
School qualification	4433 (291)	75.2 (1.7)	9.0 (0.7)	10.5 (1.1)	5.2 (0.1)
Vocational qualification	5741 (307)	75.7 (2.4)	10.3 (0.6)	9.0 (1.4)	4.9 (0.4)

Note: Total counts are rounded means

Results from the fixed effects conditional logistic models are provided in Tables 5 to 7. Three models are reported in these tables: Model 1 (Table 5) included only movement and wave as covariates, while model 2 (also Table 5) included the full set of time-varying covariates (discussed above) as main effects. Model 3 (Table 6) extends model 2 by adding an interaction between ethnicity (time-invariant) and movement, and model 4 (Table 7) extends model 2 by adding a main effect and an interaction between health and movement. The interaction between gender and movement was not significant.

The results in Table 5 indicate that moving meshblocks was significantly associated with affiliation with a PCP. After controlling for demographic and socio-economic factors (model 2), relative to those who did not move the odds of being affiliated with a PCP were 0.61 times lower for those who moved once over the previous two waves, 0.40 times lower for those who moved in the previous wave, and 0.33 times lower for those who moved in both preceding waves. The interaction model 3 in Table 6 shows that these odds were dominated by those of European ethnicity (equivalent odds ratios are 0.63, 0.35 and 0.30 respectively). The effect of moving meshblocks was similar for Māori (equivalent odds ratios are 0.68, 0.34 and 0.31), although unlike European respondents the effect of moving once 2 waves ago was not significant. Odds ratios were generally not significant for respondents of Pacific or Asian ethnicity (confidence intervals include the null). In model 4 (Table 7), the main effect for health was significant, but the interaction of health with movement was not, suggesting that the association between moving meshblock and affiliation was similar across levels of health. Including just the main effect for health did not substantially change the odds ratios for affiliation reported above.

Table 5: Models 1 and 2 - Odds ratios (95% confidence intervals) for a fixed effects conditional logistic regression model predicting the probability of being affiliated with a health provider

Characteristics	Model 1		Model 2	
	OR (CI)	*p*-value	OR (CI)	*p*-value
Mobility				
No move	1.00		1	
One move (wave *w*-2 to *w*-1)	0.61 (0.51, 0.72)	<0.0001	0.61 (0.51, 0.73)	<0.0001
One move (wave *w*-1 to *w*)	0.39 (0.33, 0.46)		0.40 (0.34, 0.48)	
Two moves	0.33 (0.26, 0.41)		0.33 (0.27, 0.42)	
Wave				
3	1		1	
5	0.79 (0.71, 0.87)	<0.0001	0.80 (0.72, 0.89)	<0.0001
7	1.19 (1.06, 1.33)		1.21 (1.07, 1.36)	
Marital status				
Currently married			1	
Previously married			1.19 (0.78, 1.81)	0.35203
Never married			1.26 (0.92, 1.71)	
Family Type				
Couple only			1	
One person			0.91 (0.69, 1.22)	0.09323
Sole parent			1.35 (0.89, 2.04)	
Couple with dependants			1.14 (0.89, 1.47)	
Labour force status				
Employed			1	0.13216
Not employed			1.12 (0.93, 1.36)	
NZ Deprivation				
Least deprived			1	
Middle deprived			1.07 (0.87, 1.33)	0.13186
Most deprived			1.29 (0.99, 1.69)	
NZiDeprivation				
0 dep			1	
1-2 dep			1.18 (1.00, 1.33)	0.13225
3-7 dep			1.16 (0.83, 1.55)	
Education				
Degree or higher			1	
No qualification			1.53 (0.84, 2.78)	0.09513
School qualification			1.69 (1.06, 2.71)	
Vocational qualification			1.80 (1.07, 3.03)	

Notes:

1. All covariates in models a1 and 2 enter as main effects only.
2. *p*-values represent the significance of adding covariates to the model sequentially from first to last.

Table 6: Model 3 - odds ratios (95% confidence intervals) for movement by ethnicity relative to respondents (of the same ethnicity) reporting no movement

Health	OR (CI)
European : No moves	1
European : One move (wave *w*-2 to *w* 1)	0.63 (0.51, 0.78)
European : One move (wave *w*-1 to *w*)	0.35 (0.29, 0.43)
European : Two moves	0.30 (0.23, 0.38)
Māori : No moves	1
Māori : One move (wave *w*-2 to *w*-1)	0.68 (0.40, 1.16)
Māori : One move (wave w-1 to *w*)	0.34 (0.21, 0.54)
Māori : Two moves	0.31 (0.16, 0.61)
Pacific : No moves	1
Pacific : One move (wave *w*-2 to *w*-1)	0.46 (0.19, 1.11)
Pacific : One move (wave *w*-1 to *w*)	1.29 (0.65, 2.56)
Pacific : Two moves	0.67 (0.26, 1.72)
Asian : No moves	1
Asian : One move (wave *w*-2 to *w* -1)	0.36 (0.21, 0.63)
Asian : One move (wave *w*-1 to *w*)	0.70 (0.40, 1.22)
Asian : Two moves	0.55 (0.27, 1.10)

Notes:
1. Model 3 extends Model 2 by adding an interaction term between ethnicity and movement.
2. The *p*-value for the interaction term is 0.0006.

Table 7: Model 4 - odds ratios (95% confidence intervals) for mobility in a fixed effects conditional logistic model that include health as a covariate

Characteristics	OR (CI)	p-value
Mobility		
No move	1	
One move (wave *w*-2 to *w*-1)	0.60 (0.50, 0.72)	<0.0001
One move (wave *w*-1 to *w*)	0.40 (0.34, 0.48)	
Two moves	0.33 (0.26, 0.41)	

Notes:
1. Model 4 extends model 2 by adding a main effect for health and an interaction between health and movement.
2. *p*-values represent the significance of adding mobility to the model.

An additional model extended model 2 by including an interaction between age (at wave 5) and movement. However, the interaction was not significant.

Discussion and Conclusion

In our investigation of the association between change in residence and affiliation with a PCP, a strong independent effect of residential mobility on affiliation with a PCP was found. The relationship between change in residence and affiliation with a PCP was not attenuated (and remained highly significant) when we controlled for known potential confounders.

In New Zealand, primary care is the most important gateway to the formal health care system. It provides timely and comprehensive care and, when necessary, referrals for specialist care. The results of this study demonstrate the majority of the sample reported having an affiliation with a PCP. However, the probability of having a regular health care provider varies depending upon residential mobility.

We found that respondents who moved were less likely to be affiliated with a PCP than were those who did not move, even after controlling for likely known confounders and all time-invariant unmeasured confounders. This is in line with our hypothesis that movement disrupts relationships with PCPs. The higher probability of affiliation among non-movers may be interpreted in many ways. One simple hypothesis is that people affiliate with a PCP when they need health care, and stay affiliated until they move. However, reality is probably more complex: on the one hand, affiliation may discourage people from moving while, on the other hand, those who are affiliated may have characteristics that make them less likely to move or, if they do move, be quicker to re-affiliate. The interpretations of relatively low affiliation of the movers may, to some extent, be explained by their socio-economic characteristics. Movers tend to be young, never married, sole parents, currently working and more educated, though this is not the whole story since even after controlling for such known time-varying confounders and all time-invariant unmeasured confounders, an association between meshblock mobility and affiliation remains. Movers may have other priorities associated with settling in a new place, more important to them than finding a new PCP. For example, moving is not only psychologically stressful and disruptive (e.g. stress generated from the process of removal and resettlement and disruption generated by losing friends, and familiar neighbourhood) (Bollini, 1992; Bollini & Siem, 1995; Shuval, 1993) but challenging as well in terms of being in a new and unfamiliar

neighbourhood. Movers would be occupied with their new houses or jobs and have less time than usual to find a PCP. On top of that, if the move is motivated by a personal crisis, say as a result of divorce, death, remarriage or loss of employment, adjustment to the new environment would be a higher priority rather than finding a new PCP.

Results from our interaction models (Model 4, Table 7) show that including the interaction of health with affiliation was not significant, which suggests that the association between affiliation and moving meshblock is similar across levels of health. Thus, there is no evidence that the association between residential mobility and affiliation was influenced by health selection effects (whereby those who moved did so because they had poor health), hence contaminating the association of movement with affiliation. Additionally, it is possible that the relationship between residential mobility and affiliation changes with age since, as noted before, younger individuals are more likely to be mobile and less likely to be affiliated. To check this, we included an interaction between age and mobility in our fixed effect models. The interaction, which compared the effect of mobility on affiliation for SoFIE respondents aged younger than 25 years with those older than 25 (at wave 5) was not significant. Thus at least for these age groups, there seems to be no difference in the relationship between mobility and affiliation.

There are several limitations of this study that need to be considered. First, one of the most restrictive assumptions of these models is that of *strict exogenity* which rules out some types of feedback from past outcomes to current covariates and current outcome to future covariates. Thus having controlled for a given set of covariates (including mobility) at each time point, no past values of those covariates can affect current affiliation and, in turn, current affiliation cannot modify future values of those covariates. Importantly these models cannot allow for the effect of affiliation on (future) mobility, known as reverse causation (Wooldridge, 2002), or past mobility on current affiliation (state dependence). Second, as with other self-reported surveys, affiliation status is measured using self-reported data which rely on respondent ability to recall information accurately. Errors of this type can lead to biased results in comparison with other samples. Third, our analyses may have been affected by selection bias if those who dropped from the study would have reported substantially more or less affiliation. If those who dropped out of the study

were more likely to have reported affiliation with a PCP and greater residential mobility than those that remained, then the true population relationship between residential mobility and affiliation with a PCP would be weaker than found in this study. However, the mobility-affiliation relationship in the "drop-outs" would need to be very different to the "stay-ins" to change our conclusions. Fourth, although we have adjusted for many confounding variables, it is possible that the differences we found in association with affiliation with a PCP could be the result of other time-varying factors associated with movement and affiliation that we did not measure.

Furthermore, our measure of residential mobility is a proxy measure which precluded using a distance dimension in the relationship between mobility and affiliation: we do not know whether short or long distance movers are more or less likely to be affiliated with a PCP than non-movers. It would be useful to explore this issue in future studies. Also the reason for moving or not moving is important in such analyses, for example, the individuals may be more or less likely to move because of personal characteristics or because of features of the area in which they live. While these are important questions, the analysis presented here is less interested in the 'context' versus 'composition' debate than in movement per se, and we recommend future studies look into these issues.

Bearing in mind these limitations, the conclusions from our analysis have significance for international debates about mobility and access to health services in countries where affiliation with a PCP is necessary in order to access high quality primary health care. This study used a large, national survey and a variety of health measures to examine the association between a change in residence and affiliation with a PCP. Our results suggest that moving residence has a negative effect on affiliation with a PCP. As noted earlier, research has suggested that having a regular and consistent source of care is associated with lowering health care costs (Weiss & Blustein, 1996; Christakis, et al., 1999; Gill, et al., 2000; Gill & Mainous, 1998; Mainous & Gill, 1998). Our findings suggest that policies are needed to encourage the building and maintaining of the relationship between a PCP and patients. Importantly, these policies should be in place before and after patients move, with follow-up to aid mobile families and individuals. Further research to determine the underlying reasons for residential mobility is required. Some of these

reasons may be external to the individual, at a macro social or economic level. This paper identifies the importance of residential mobility for primary health care access and demonstrates that mobility is associated with low affiliation.

Statistics New Zealand Security Statement

Access to the data used in this study was provided by Statistics New Zealand in a secure environment designed to give effect to the confidentiality provisions of the Statistics Act, 1975. The results in this study and any errors contained therein are those of the authors, not Statistics New Zealand.

Disclaimer

Opinions expressed in this paper are those of the authors only and do not necessarily represent the views of peer reviewers or the University of Otago.

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The Demographic Implications of Climate Change for Aotearoa New Zealand: A Review

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Abstract

Despite near universal recognition of the importance of climate change impacts on future generations, to date there has been no dedicated research on the effects of climate change on the population distribution in Aotearoa New Zealand. This paper reports on a review of international literature on the demographic impacts of climate change, with a particular focus on the likely implications for Aotearoa New Zealand. The paper argues that the greatest impacts are likely to be felt in terms of internal migration changes, with smaller but still significant effects on international migration and mortality rates.

Introduction

> We are facing a global climate crisis. It is deepening. We are entering a period of consequences (Al Gore, speech at National Sierra Club Convention, 9 September, 2005).

Advocates raising awareness on global climate change almost universally warn of dire consequences for future generations should action not begin now to mitigate the effects of global climate change (see, for example, Stern (2007) and Garnaut (2011)). However, climate change and its population impacts are not a new phenomenon. Climate has affected human population growth and distribution since prehistoric times (Gamble, Davies, Pettitt & Richards, 2004). The key difference is that current patterns of global climate change, that is, those occurring since the industrial revolution, are different from those observed in the past, and are generally accepted as being caused by human activity (Hegerl et al., 2007). For instance, the Fourth Assessment Report of the

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Intergovernmental Panel on Climate Change (IPCC) notes that "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level" (IPCC, 2007, p. 30). The capacity of the earth to deal with such sudden anthropogenic climate change has been questioned (Rockström et al., 2009).

The consequences of global climate change are substantial, and will severely constrain human activity. Several effects have been noted in the Fourth Assessment Report of the IPCC as having "high confidence" or "very high confidence" of occurring (IPCC, 2007). Agricultural productivity is expected to decline on average (Mendelsohn & Dinar, 2009), leading to increasing global food insecurity (Schmidhuber & Tubeillo, 2007; Hanjra & Qureshi, 2010). Freshwater availability is expected to decline, particularly in glacier- or snowmelt-fed river basins (Kundzewicz et al, 2007; Alcamo, Florke, & Marker, 2007; Hanjra & Qureshi, 2010). Desertification and frequency of drought are expected to increase (Burke, Brown, & Christis, 2006; Lioubimtseva & Adams, 2004). At the other extreme, increasing rainfall intensity is expected to lead to more frequent and widespread flood events (Nicholls et al., 2007; Pall et al., 2011), while sea-level rise is expected to inundate low-lying coastal areas and increase coastal erosion (Kundzewicz et al., 2007). Groundwater salinisation is also likely to increase, due to decreasing groundwater recharge and increasing evapotranspiration (Kundzewicz et al., 2007).

Inevitably, these changes will make some areas less suitable for human habitation, while other areas become relatively more suitable, with consequent impacts on demographic change. However, despite the obvious implications for human systems, to date there has been no dedicated research on the effects of climate change on the population distribution in Aotearoa New Zealand. In 2012, the Ministry of Business, Innovation and Employment (MBIE) contracted the National Institute of Water and Atmospheric Research (NIWA) and Landcare Research to undertake a wide-ranging assessment of the impacts of climate change on Aotearoa New Zealand to 2100 (Rutledge & Tait, 2013). As part of that project, a climate-calibrated regional demographic model of Aotearoa New Zealand is under development. There are substantial gaps in our knowledge about the implications of climate change for Aotearoa New Zealand – much more needs to be investigated. The model will specifically address the lack of

systematic analysis of the available evidence on the demographic impacts of climate change in Aotearoa New Zealand.

This paper reports on an initial review of the international literature on the demographic impacts of climate change, undertaken as part of that research project, with a particular focus on the likely implications for Aotearoa New Zealand. The paper begins by briefly reviewing the possible effects of climate change on Aotearoa New Zealand, and how climate affects population processes, before looking in turn at possible impacts on fertility, mortality and migration (internal and international) for Aotearoa New Zealand.

Climate Change in Aotearoa New Zealand

Mullan et al. (2008) identified and mapped the likely future effects of climate change across New Zealand. Their results were based on results from General Circulation Model simulations prepared for the IPCC Fourth Assessment (Meehl et al., 2007). Specifically, the results from 12 global climate models were statistically downscaled (Mullan, Wratt, & Renwick, 2001) to provide local spatial detail for New Zealand, along with initial analyses from NIWA's regional climate models. The results demonstrate that New Zealand temperatures, on average, are expected to increase by about 1°C by 2040, and by about 2°C by 2090. However, these average changes mask significant differences in temperature change at the local level. The greatest increases in average summer temperatures are expected to occur in the North Island (and in particular in the central and west of the North Island), while the greatest increases in average winter temperatures are expected to occur in the central South Island (Mullan et al., 2008).

The models demonstrate a marked increase in the seasonality of rainfall and wind patterns, with increased frequency of westerlies in winter and spring, but decreased frequency of westerlies in summer and autumn. Rainfall is expected to increase during winter and spring in the west of both the North and the South Islands, with lower rainfall expected in the east and north. Conversely, in summer and autumn, drier conditions in the west of the North Island and increased rainfall in the east are expected (Mullan et al., 2008). They also projected increases in the incidence of extreme weather including high temperatures, extreme

rainfall and strong winds, but decreases in frost incidence and snow cover. However, it isn't clear whether these projected climate changes are reversible in the future through human intervention, or whether they represent part of a hysteretic transition to a new more-or-less permanent climate regime.

Climate Change and Population Processes

The changes in local climate outlined in the previous section, as well as the wider changes in global climate, are expected to have an impact on the demographic future for New Zealand. If we want to understand the impacts of climate change on the size and distribution of the future population, we need to recognise the effects climate change will have on population processes. Simply, the future population size and distribution relies on three key interacting factors: (1) fertility rates, (2) mortality rates, and (3) migration (international and internal). Thus, to understand the impact of climate change on the future population size and distribution, we must first understand its likely impact on each of these three factors.

However, before we consider directly the potential impacts of climate change on the factors that determine future population, we must first consider two broader issues. First, climate change is an ongoing and long-run process, which leads to an identification problem. For instance, when considering population data it might not be possible to empirically separate the proportion of changes in fertility, mortality or migration that occurs as a result of changing climate from changes resulting from other long-run processes such as demographic fertility transitions (particularly in developing countries), increases in life expectancy due to improved infant and youth health or life extension at older ages, or migration due to economic or other factors. Thus, while it may be intuitively appealing to attempt to empirically determine the incremental contribution of climate change to future demographic change, there is likely to be a significant amount of statistical error associated with any such estimates based on past data. These errors will then transfer into projections of demographic parameters that are based on past data and used to project future population.

A second related issue is that of uncertainty more generally. Population projections are known to be subject to a great deal of uncertainty (Lutz & Goldstein, 2007), particularly at smaller geographical scales (Cameron & Poot, 2011; Wilson, 2013). Dowd, Blake, and Cairns ((2010) identify three sources of uncertainty: (1) model uncertainty, wherein we do not know the true model that underlies the demographic process; (2) parameter uncertainty, wherein we do not know the true parameter values for the model; and (3) forecast uncertainty, which arises from any given model being projected into the future. These sources apply to all demographic parameters, but uncertainty is likely greatest in the case of migration. As a graphic example of the relative uncertainty of migration, Cameron and Poot (2011) demonstrate the relative stability over time of natural increase compared with net migration for New Zealand as a whole.

Added to this, models of climate change are also subject to a great deal of uncertainty. This uncertainty arises because of uncertainty about future greenhouse gas emissions, the extent and intensity of mitigation efforts, and the impact of new technologies, as well as uncertainty about the effects of emissions on future climate (so-called climate sensitivity) (Visser, Folkert, & Hoekstra, 2000; Stainforth et al., 2005). Uncertainty about future population will therefore include uncertainty from both demographic modelling and climate change modelling. Furthermore, it is possible that these sources of uncertainty are correlated, which further increases the complexity of the required modelling.

While these two issues (identification and uncertainty) might give cause for concern about developing population projections, I argue that neither issue is particularly problematic for demographers. In terms of the identification issue, traditional modelling of future fertility, mortality, and migration based on past trends is likely to be sufficient to account for most of the climate-related variation in the near future, since climate change is a gradual process that is already impacting on population change. While this doesn't solve the identification problem, a distinction between climate and other effects on population parameters is largely unnecessary over short time frames. In contrast, longer-term projections can mitigate the identification issue by using projections of demographic parameters that are calibrated to climatic conditions, particularly for sub-national projections. The second issue is also not problematic. The uncertainties in

climate projections and population projections can be quantified. The combined uncertainty can be incorporated into population projections in the same way as demographic uncertainty is – by using probabilistic or stochastic projection techniques (Tuljapurkar, 1992; Cameron & Poot, 2011). The extent of uncertainty can then be shown by presenting the range of outcomes (or a suitable projection interval) (Cameron & Poot, 2011).

Fertility and Mortality

The international literature reveals little about changes in fertility as a result of climate change, though a changing climate is likely to result in biological changes that affect fertility in both humans and other animals. While global fertility clearly has large implications for future population growth and therefore flow-on effects on carbon emissions and climate change, there is to date no evidence of effects of climate change on the total fertility rate, or the timing or spacing of births in developed countries. Philibert, Tourigny, Coulibaly, and Fournier (2013) found that climate change influenced conception/birth seasonality in the Kayes region of Mali through affecting rates of foetal loss (due to changes in malaria incidence) and changes in agricultural cycles that affect energy balance and sexual behaviour. In a developed country like New Zealand, where food security for the majority of the population is not associated with agricultural cycles, it seems unlikely that fertility will be affected through these mechanisms. Thus, we can be fairly certain that fertility rates will not be directly affected by climate change. However, there may be indirect effects. If climate change affects labour productivity, which in turn affects the incentives for women to engage in labour market activity, fertility (or more likely the timing of births) is likely to be affected. If international migration changes the ethnic mix of the population, in-migration of ethnic groups of traditionally higher (or lower) fertility than the current population on average may cause changes in average age-specific fertility rates. However, it is worth noting that despite dramatic structural and compositional changes in the New Zealand population over recent decades, the total fertility rate has remained fairly stable around replacement levels.

There are a number of mechanisms through which climate change is likely to affect mortality globally, including cardiovascular and

respiratory problems associated with extreme heat (Kalkstein & Greene, 1997), altered transmission of (particularly tropical) infectious diseases (Semenza & Menne, 2009; de Souza, Owusu, &Wilson, 2012), and malnutrition associated with changes in agricultural cycles and food insecurity (Battisti & Naylor, 2009).

Heat-related mortality has been shown to follow a J-curve (McMichael, Haines, Sloof, & Kovats, 1996), with temperatures at both extremes (hot and cold) associated with increased morbidity and mortality (Curriero, Heiner, Zeger, Samet, & Patz, 2002), but with mortality at its highest at high temperatures. The European summer of 2003 provides a recent example that demonstrates the potent effect of extreme heat, as temperatures were approximately 3.5°C higher than average. The extreme heat resulted in as many as 70,000 heat-related deaths (Robine et al., 2008). Notwithstanding the large absolute number of deaths associated with the heatwave, the crude excess mortality was less than 1.6 deaths per 10,000 population, compared with an underlying crude death rate of about 99 per 10,000 population in 2002 (Eurostat, 2005). This equates to an increase in death rates of about 2 percent. As noted earlier in this paper, the *average* temperature in New Zealand is expected to rise by about 2°C by 2090. It is likely that there will be many years in the future where the increase in temperature above the current average will be similar or greater in magnitude to that of the European heatwave in 2003, and so modestly increased summer mortality rates are likely in those years. However, there also is evidence to suggest that the positive relationship between heat and mortality is declining over time due to adaptation and through the use of technology such as air conditioning (Barreca, Clay, Deschenes, Greenstone & Shapiro, 2012). Thus, we can probably expect a small increase in summer heat-related deaths associated with climate change in New Zealand (see also Woodward, Hales, & de Wet, 2001), but the effect on the overall mortality rate is likely to be small.

Increased summer deaths may even be offset by a reduction in winter deaths. New Zealand currently experiences excess winter deaths, particularly among the oldest and youngest (Davie, Baker, Hales, & Carlin, 2007). In part, this increased risk of death is due to low quality housing stock, resulting in cold, damp conditions in many homes during winter (Ministry for the Environment, 2005). Increased winter temperatures may mediate the mortality effects of the low quality of the housing stock,

resulting in fewer winter deaths. In both cases (increased summer deaths and decreased winter deaths), age-specific mortality rates will be differentially affected, with increased summer deaths and decreased winter deaths both likely to be concentrated among older New Zealanders, particularly older women (Stafoggia et al., 2006; Davie et al., 2007). The change in age-specific mortality rates is likely to be small, but given structural changes in the population with greater numbers of older people, the absolute number of deaths may increase.

Increased temperatures and rainfall (particularly in spring and summer) are associated with increased reproduction and survival rates of protozoa, bacteria, viruses, and their associated vectors such as mosquitos (Gubler, Reiter, Ebi, Yap, Nasci, & Patz, 2001). The incidence of vector-borne diseases, such as malaria (Parham & Michael, 2010), dengue fever (Hopp & Foley, 2003), and Ross River virus (Woodruff, Guest, Garner, Becker, & Lindsay, 2003), have been shown to be related to changes in climate. These diseases are likely to further spread and increase in incidence through the Pacific due to climate change (Potter, 2008). Furthermore, there is evidence to suggest that food-borne infectious diseases such as salmonellosis (Kovats et al., 2004) and campylobacteriosis (Kovats et al., 2005) are related to temperature. Thus, incidence of these diseases may also alter with changes in climate. New Zealand is projected to get both hotter and wetter in parts. This is likely to increase the suitability of the climate for vector-borne and other infectious diseases (Woodward et al., 2001). For instance, the Foundation for Research, Science and Technology-funded Health Analysis and Information for Action (HAIFA) project found that under the IPCC's A2 high emissions scenario for 2090, campylobacteriosis would increase by a maximum annual average percentage change of 23 percent, and seasonal influenza (with vaccination) would decrease by 27 percent (Baker, Winstanley, & Slaney, 2013). Despite relatively large increases in rates of incidence of infectious diseases, actual mortality from these diseases is likely to remain low (see for example Harley, Sleigh, & Ritchie (2001) on Ross River Virus). Moreover, it is unclear what effects, if any, climate change may have on important and useful microbiota. Overall, despite the large relative changes in the diseases noted above, the absolute numbers are likely to remain small. Given the availability of modern medicine, New Zealand is likely to experience some increases in morbidity, but little change in

mortality from climate-induced increases in infectious diseases. A better understanding of the interactions between infectious disease morbidity and later mortality in New Zealand is clearly needed, perhaps as an extension to recent work on functional limitation and health expectancy such as that by Graham, Blakely, Davis, Sporle, and Pearce (2004).

Finally, climate change is likely to affect agricultural productivity, and aggregate global agricultural output is expected to fall. While New Zealand is currently a large net exporter of agricultural products, and this is expected not to change under even the most extreme climate scenarios (Tait, Baisden, Wratt, Mullan, & Stroombergen, 2008), reductions in availability of food and the growing global population are likely to significantly raise the price of food. The combination of rising food prices and decreasing food availability is likely to lead to increased food insecurity and malnutrition among the poorest in society, partially offset by a reduction in food waste (Godfray et al., 2010). In turn, food insecurity is likely to lead to nutritional deficits and worsening maternal and infant health (Olson, 1999; Cook et al., 2004). Food insecurity in New Zealand may already be higher than in other developed countries (Parnell, Reid, Wilson, McKenzie, & Russell, 2001).), and the extent of future food insecurity in New Zealand arising from climate change is difficult to determine and may be another fruitful area of future research. However, despite the inevitable effects on morbidity, the effects on mortality are likely to be slight, as projections for the global burden of malnutrition due to climate change show no sizeable impact at all on developed countries (Campbell-Lendrum, Corvalan, & Pruss-Ustun, 2003).

Migration (International and Internal)

One of the most widely cited estimates of global climate-induced migration is the 200 million environmental refugees claimed by Myers (2002). Myers's paper itself provides little in the way of empirical support for this claim, and uses an extremely broad definition of environmental refugees, being "people who could no longer gain a secure livelihood in their homelands because of drought, soil erosion, desertification, deforestation and other environmental problems, together with the associated problems of population pressures and profound poverty" (Myers, 2002, p. 609). Leaving aside for a moment the problems associated with use of the term "refugee", this definition draws no distinction between internally displaced

people and those that migrate internationally, and neither does it distinguish between those who are permanently displaced and those who are temporarily displaced due to extreme weather events such as hurricanes or floods. However, a similar estimate on climate refugee numbers was recently obtained by Biermann and Boas (2010). Both estimates appear to be largely based on estimates of the population exposed to risk, rather than considering the number of people who would actually migrate (Kniveton, Schmidt-Verkerk, Smith, & Black, 2008). Myers's estimates in particular have been widely criticised (see for example, Castles, 2002, and Kolmannskog, 2008) and debated in the media and elsewhere, but the fact that they are often accepted at face value (see, for example, Stern, 2007, and Brown, 2008) simply reveals a lack of substantive work that focuses on the change in migration patterns that may arise from climate change. This demonstrates the importance of further quantitative research on the migration implications of climate change.

Gemenne (2011) reviewed the available estimates of people displaced by environmental change, and noted in particular a number of problems with Myers's estimates, including: (1) they are a stock, rather than a flow, (2) they do not distinguish between different types of environmental changes as migration drivers and assume that all people displaced in an area affected by environmental changes have been displaced solely because of these changes, and (3) they combine estimates from many other studies, which employ widely varying methods. Gemenne (2011, S48) concluded that existing estimates of people displaced by environmental change "lack robust methodological foundations, and are generally grounded in a deterministic perspective, assuming that all people impacted by environmental changes will move away from their homes". However, these methodological problems are beginning to be addressed in more recent quantitative evaluations (see, for example, Marchiori, Maystadt, & Schumacher, 2012), though a robust theoretical framework with direct relevance to New Zealand remains elusive.

The debate outlined above raises a number of important issues, which must be considered before we can interpret the international literature and its implications for New Zealand. First, there is no commonly accepted definition for a climate-induced migrant, with terms such as "environmental refugees", "environmentally displaced people" and

"climate migrants" often used interchangeably. The identification of the excess migration that arises due to climate change is complicated by the multi-causal, complex nature of migration, wherein climate change is only one of many drivers of migration (Black, Bennett, Thomas, & Beddington, 2011; Barnett & Chamberlain, 2010; Hugo, 2011a). Piguet (2010, 517) even goes as far as to claim that: "there is truly no such thing as a climate or environmental migrant in the narrow sense of a migrant exclusively moving for environmental reasons". Despite this assertion, it is likely that climate change will affect the migration decision-making process for a large number of people, both now and in the future, and climate change must therefore be taken into consideration when estimating future migration flows.

The issue of defining who is and who is not a climate-induced migrant is further complicated by the likelihood that climate change will affect existing drivers of migration, such as by changing agricultural profitability and employment opportunities in rural areas (Government Office for Science, 2011). Furthermore, while climate change might make individuals want to migrate, their *ability* to migrate may be constrained by legal, political or economic reasons (Goldin, 2011). Thus, not all people affected by climate change will migrate and estimates of climate-induced migration based on exposure to climate change may lead to overestimates of future migration flows.

Second, most of the migration flows induced by climate change are likely to be internal (i.e. within national boundaries) rather than international. This follows the fact that most of the world's current migrants are internal rather than international – according to the International Organization for Migration (IOM) there were 214 million international migrants, compared with 740 million internal migrants in 2010 (IOM, 2011). It is unlikely that there will be a major re-balancing towards international migration in the future.

Different factors affect climate change-induced international migration from the factors that affect internal migration. International migrants generally need greater financial means because of the larger distances involved, and typically require an established social network in the destination country in order to effectively settle (Carrington, Detragiache, & Vishwanath, 1996; Zhao, 2003). Furthermore, the direction and size of migration flows will likely be determined by prior migration ties

between the sending and receiving countries (Adamo & de Sherbinin, 2011). In the New Zealand context, climate-induced international migrants are most likely to originate from low-lying Pacific atolls that are at risk of inundation by sea-level rise, more frequent droughts, and tropical cyclones of greater frequency and intensity (Mimura et al., 2007), or similarly affected areas in the major river deltas of South and South-East Asia such as Bangladesh and Vietnam (Cruz et al., 2007; Ericson, Vörösmarty, Dingman, Ward, & Meybeck, 2006).

For Pacific countries, New Zealand is an obvious destination choice due to its proximity and the dense social networks of foreign-born (and New Zealand-born) Pacific Islanders, particularly in urban centres. However, it is unlikely that *all* affected Pacific Islanders would migrate to New Zealand. There are similar advantages to resettlement in Australia and the United States, which also boast large Pasifika communities, and Fiji has offered to resettle affected Pacific populations (Bedford & Bedford, 2010). Furthermore, it is likely that climate-induced migration will first be accommodated within the islands rather than by international relocation (Campbell, Goldsmith, & Koshy, 2005; Campbell, 2010). However, the capacity of the islands to accommodate increases in internal migration, particularly to urban centres, has been called into question (Locke, 2009; Hunt, 1996). Given this lack of capacity within the Pacific countries, some increase in international migration seems inevitable.

Currently, permanent and long term migration arrivals into New Zealand from Oceania (excluding Australia) make up about five percent of the total arrivals.[1] A substantial incremental increase in arrivals from the Pacific would be required in order to significantly affect the future population of New Zealand. However, this substantial increase may be possible because to date, most migration to New Zealand has been from smaller Pacific countries such as Samoa and Tonga while the migration flows from populous Melanesian countries such as Papua New Guinea have been much smaller. However, as the impacts of climate change are increasingly felt in these more populous countries, migration flows (both internal and international) can be expected to increase (Moore & Smith, 1995). Thus, the numbers of international migrants from the Pacific to New Zealand in the future is likely to grow as a result of climate change, and may increase as a proportion of total in-migration if migration from Papua New Guinea (in particular) increases.

For non-Pacific-Island countries, distance and the associated cost of travel ensure that only relatively wealthy migrants will have the resources necessary to migrate to New Zealand. This includes large numbers of potentially environmentally displaced people in Asia. Many of these displaced people will prefer other destinations, but at least some will want to migrate to New Zealand, which already attracts migrant flows from countries likely to be greatly affected by climate change such as those areas highlighted in Schneider et al. (2007). Some of these migrants may attempt to enter New Zealand as refugees. Despite the rhetoric that labels climate-induced migrants as environmental refugees (see, for example, Myers, 2002), climate change is not recognised as one of the factors that defines a refugee under international agreements such as the United Nations Convention Relating to the Status of Refugees 1951 (United Nations High Commissioner for Refugees (UNHCR), 2008). Thus, New Zealand is not obliged under these agreements to accept environmental refugees (Burson, 2010). In more general categories of migration, New Zealand currently restricts the conditions under which potential migrants may gain residency (Burson, 2010). Without some relaxation of these regulations, New Zealand is unlikely to experience a large-scale increase in migration. Thus, the impacts of climate change outside of the Pacific Islands are unlikely to induce substantial additional migration flows into New Zealand.

In contrast, internal migration is not affected by the legal barriers noted above, and is much less costly for potential migrants. The possible effects of climate change differ substantially between the North and South Islands, as noted earlier in this paper. Differences in small-area climate have been shown in international studies to affect internal migration flows (Barrios, Bertinelli, & Strobl, 2006; Barbieri et al., 2010). For example, Poston, Zhang, Gotcher, and Gu (2009) demonstrated that temperature and humidity, but not wind, were related to inter-state migration rates in the United States between 1995 and 2000, and concluded that climate acts more as a pull factor than a push factor for migration. Thus, in addition to present long-term trends in population movement from the South Island to the North Island and from rural areas to urban centres, we can expect to see small but significant climate-induced internal migration effects as changes in local climate affect the relative attractiveness of the different regions. However, the effects are likely to be gradual. Hugo (2011b) notes,

in a recent review of climate change effects on the population of Australia, that "climate change is unlikely to cause massive rapid dislocation of population and population redistribution" (p.65).

In addition to international and internal migration, at the small area level there is likely to be a redistribution of population away from vulnerable coastal and flood plain areas. According to McGranahan, Balk, and Anderson (2007), about 13 percent of the population in New Zealand and Australia currently resides in vulnerable low elevation coastal zones. However, it seems likely that most of the population at risk of sea level rise will either adapt *in situ*, or migrate within the local area (Hugo, 2011a). Thus the impact of these changes is unlikely to be dramatic except at the localised level in coastal and low-lying areas. However, it is worth noting that most net internal migration in New Zealand is towards coastal cities, similar to the experience of Australia (Hugo, 2011b). This population growth may increase the vulnerability of these areas to further climate effects if the current pattern of internal migration persists, as well as increasing the size of the affected population.

Summary and Future Research Directions

Climate change is likely to have profound impacts, both globally and locally in New Zealand. However, the impacts on population size and distribution are likely to be lessened by humans' innate ability to adapt to changes in the environment. To date there has been no systematic evaluation of the likely impacts of climate change on demographic change in New Zealand. The review presented in this paper demonstrates that climate change is unlikely to greatly affect fertility rates, and will likely have a small but significant effect on mortality rates. The effect on international migration will largely depend on future government policy with respect to in-migration, but regardless migration from the Pacific will likely increase, both in absolute terms and as a proportion of total migration. Changes in the pattern of internal migration are also likely, as climate change will differentially affect the various regions in New Zealand.

As noted in the introduction, this paper marks the beginning of a four-year MBIE-funded project investigating the impacts and implications of climate change for New Zealand. As part of that project, a climate-

calibrated sub-national demographic model is currently under development. The model will operate at the regional level, and is based on a standard cohort component method, with parameters that are calibrated to account for past and future changes in climate variables, including both average and extreme climate variables (e.g. average daily temperature, and the number of days where temperature exceeds certain values). The relationship between all-cause mortality by region and climate variables is being investigated in order to better incorporate climate-related changes in mortality rates. Gravity models incorporating climate variables at both the inter-regional level (for internal migration) and international level (for international migration) are under development. The inclusion of climate-calibrated parameters in the demographic model addresses the identification issues noted earlier in this paper. The model can also be extended to a stochastic model, following Cameron and Poot (2011), to incorporate both climate and demographic uncertainty. The final model will be integrated into a coupled human-environmental systems model to estimate the future impacts and implications of climate change for New Zealand (Rutledge & Tait, 2013). The model will help to inform decision-making at the national and sub-national level, and provide guidance for future research that can look more deeply into a wider range of demographic and socio-economic impacts of climate change.

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Notes

1 Based on Statistics New Zealand permanent and long-term migration data, there were 87,778 permanent and long term arrivals in the year ended May 2013. Of these, 4207 (4.8 percent) originated from Oceania (excluding Australia). Similarly, arrivals from Oceania (excluding Australia) totalled 4309 of 83,789 (5.1 percent) in the year ended May 2012, and 4299 of 83,781 (5.1 percent) in the year ended May 2011.

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New Zealand Population Review, 38:143-145

Book Review: *Welcome to Our World? Immigration and the Reshaping of New Zealand*

By Paul Spoonley & Richard Bedford.
Dunmore Publishing Ltd (2012)
325 pages

MANYING IP*

This book is a comprehensive resource offering a clear and easy-to-use guide to the understanding of New Zealand's immigration policy and how it has shaped the country as a modern nation. As such, it can be a useful textbook or reference tool for entry-level tertiary students, or a handbook for various journalists or policy-makers who need to report on immigration or ethnic relations as "instant experts". The authors, Paul Spoonley and Richard Bedford, are among this country's foremost experts on immigration matters – the former a sociologist, and the latter a demographer and human geographer. Together, they have produced this volume which is encompassing in scope, and also sharply insightful and highly readable.

Spoonley and Bedford bring their experience to bear in the succinct introduction that spells out clearly what immigration means to New Zealand, and outlines the unique characteristics that set New Zealand apart from other immigrant nations. The tensions between immigration policy and settlement outcomes are spelt out early on, and both the role of immigration in New Zealand's economy and society and the politics of immigration are highlighted. A short concluding paragraph at the end of a 15-page introductory chapter states that "The story of migration to and settlement in New Zealand is ultimately a very human story." This sets the tenor of the book.

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The book describes New Zealand's early immigration policy as closely related to the "nation building" enterprise, part of the "colonial project". It was part and parcel of a highly selective colonisation scheme to bring about a better Britain of the South Pacific. Since the social Darwinists unquestioningly believed that British "stock" was superior, there was legislative and institutionalised discrimination against the "racialised Other", such as the Chinese, Indians and Jews. The chapter also highlights the highly gendered factor in migration.

Researchers commonly consider citizenship, which "formalises membership and residency in a country", as the ultimate end-point of the migration process. The authors point out that in New Zealand, "aliens" such as the Chinese were barred from even applying for citizenship, while British migrants could gain citizenship after a year's residence. One intriguing point raised by the authors is that in modern times, the New Zealand government has adopted "flexible citizenship" – a strategy favoured mostly by the migrants themselves.

The story of New Zealand immigration and the process of nation building saw the weakening of the British connection coinciding with the strengthening of the Asia-Pacific migration trend. The authors argue that the country underwent a defining pivotal change when the preference for the traditional source country for migrants was abandoned. Henceforth New Zealand became incorporated as part of a broader trend, and was no longer a reserved migrant destination for Britons.

Two broad groups of immigrants are closely examined in two different chapters: immigrants from Asia, and those from the Pacific. Neither of these groups was among the preferred settlers under the colonial system, and both have suffered many challenges to settlement, in what the authors call the "unfortunate history" of racial discrimination. The two regions are geographically close to New Zealand, and this book examines the significance of their increasing strong strategic links with New Zealand. The discussion of the contemporary evolution of the Asian and Pacific communities includes perceptive examination of the artistic and literary representation of the sense of identity and belonging by the ethnic artists, playwrights and songwriters. Such an examination of self-articulation is highly nuanced and allows the communities to speak for themselves, thus enriching a book devoted to immigration policies and statistics.

Welcome to our World? also presents a chapter on refugees and one on asset-rich immigrants who arrive under the business and skilled categories, analysing the costs and benefits of migration to both the host country and to the migrants themselves. Refugees and asylum seekers are accepted on humanitarian grounds, while business and skilled migrants are accepted because they have significant human capital. While the former group are undoubtedly vulnerable and face prejudice, the latter group also suffer from hurdles; for example, non-recognition of their professional degrees and a widespread belief of "jobs for Kiwis first".

After this study of two categories of immigrants, the volume presents two chapters on public perceptions of immigrants. One chapter explores the media portrayal of immigrants, how Asian immigrants are framed and presented, and how politicians utilise and exploit the popular anti-immigrant sentiment. In the subsequent chapter on "Migrant spaces and places", the authors provide a socio-geographical study on the emergence of "ethno-burbs" in Auckland, New Zealand's gateway city.

The concluding chapter re-evaluates the present and looks into the future. Since the two authors are highly knowledgeable on the topic, their predictions are based on robust fundamental information. Diversity management and tackling the issues of multiculturalism will loom large for New Zealand's future. This is particularly challenging in the light of the Treaty partnership between the State and indigenous Māori – the official formula is one of biculturalism rather than multiculturalism. The authors repeatedly point out attitudes among Māori towards migrants are considerably more stringent than that of their Pākehā counterparts, possibly because of perceived economic competition or the future worry of the country being overwhelmed by yet another introduced element. The possible impact of post-9/11 concern around international terrorism on immigration is also examined. The volume ends with the optimistic forecast that New Zealand will see diversity as part of its development and its nationhood.

The topics explored in this volume are neatly interlinked and systematically set out. *Welcome to Our World?* should be read by anyone wishing to find out about New Zealand's immigration policy, past and present. Much more than a handbook and a bibliographical guide, it is a thought-provoking read. Its sharp and insightful analysis and comments will make it a standard reference on this topic for years to come.

New Zealand Population Review, 38:147-149

Book Review: *Counting Stories, Moving Ethnicities: Studies from Aotearoa New Zealand*

Editors: Rosalind McLean, Brad Patterson, David Swain.
University of Waikato (2012)
254 pages

FRANCIS L. COLLINS *

The study of population is principally a practice of enumeration, classification and generating meaning. The notion of *population* that forms the foundation of the field itself has only emerged in a modern era when technologies of calculation have become much more widely employed as a practice of the state. One of the most widespread, if also controversial, practices of population study is the enumeration of *race* and *ethnicity*, which emerges equally in political contexts underpinned by logics ranging from colonialism, apartheid and eugenics through to a multicultural emphasis on diversity. The enumeration of 'race' and 'ethnicity' is then also an area where there remains much scope to explore the implications of the measurement and governance of population. In this regard, the edited volume *Counting Stories, Moving Ethnicities: studies from Aotearoa New Zealand* promises to offer an important contribution to the study of population both in this country and more broadly.

The volume emerged as a result of a one-day workshop on "ethnic counting" organised by Brad Patterson. Patterson, along with Rosalind McClean and David Swain, has edited this collection which includes contributors from the workshop and two invited chapters, one by Tahu Kukutai and the other by Michael Goldsmith. The workshop and the volume sought to focus on the practices of counting ethnicities and their

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implications for our knowledge of the worlds we inhabit. In doing so, the editors recognise that "quantification is as much or more about classification, words and meanings as it is about counting" (p. 3). With the notable exception of Kukutai's chapter, they also focus explicitly on the construction of Pākehā or New Zealand European ethnicities, an area that they accurately note remains relatively understudied in the New Zealand context.

Across the seven substantive chapters, introduction and afterword that make up the volume, the authors in this collection cover a significant territory in terms of topics, approaches and styles of presentation. This includes chapters that explore specific research findings in relation to ethnicity, such as Gerard Horn's examination of the role of ethnicity in Wellington's Irish protestant community and Angela McCarthy's fascinating discussion of the role of ethnic identities in lunatic asylums. By contrast, the three chapters authored by Rebecca Lenihan, Ian Pool, and Jo Barnes and David Swain provide more methodological accounts that place emphasis on the tools that demographers and others can use in the exploration of ethnicity, including different data sets for assessing migration patterns (Lenihan), fertility rates (Pool), and the value of genealogical data for analysis of ethnicity (Barnes and Swain).

Kukutai and Goldsmith, two authors who somewhat curiously were not involved in the original workshop, provide without a doubt the standout chapters in this volume. Kukutai's incisive account of the changing conception of "Māori" is particularly important for framing a volume which often seems to get stuck in the minutiae of data sets. The focus here is threefold: on the collective awareness of ethnicity, the institutional power involved in counting and classification and the complexity of state practices associated with ethnicity. Through this lens, Kukutai nimbly delineates the manner in which the idea of Māori as a category has shifted from predictions of racial demise through pressures to amalgamate and ideas of caste and quantum, to economic integration and the much more variegated assemblage of ancestry, ethnicity and iwi affiliation that has emerged since 1986. Similarly, Goldsmith offers an insightful account of the use of the European category in Aotearoa New Zealand, tying ethnic categorisation to the emergence of modern thinking on population and its important connection to the changing socio-political orientation of the state. Collectively these two chapters illustrate what is

possible when demographic techniques are put under the spotlight of critical scholarly attention – questions of ideology, power, the state, people and populations, race and ethnicity as constructed yet concrete ideas, and the implications of institutional practices for everyday life emerge and offer the potential for new insights into our histories of counting.

Unfortunately, despite these important contributions, this volume is characterised by inconsistency. As the summary of chapters here suggests, the volume lacks coherence in terms of its focus, and once the reader moves beyond Kukutai and Goldsmith, theory largely falls off the radar. In part this relates to differences in approach, but this raises the question as to whether these authors are all pursuing similar goals – it seems difficult to reconcile the vast chasm between ideas of ethnicity as governmental practice (as in Kukutai and Goldsmith), social construct (for the editors and McCarthy), mere category of the world, or even as a "genetic" factor that is influential in migration decisions (in Barnes and Swain's chapter, p. 135). There is also variation in presentation, with some chapters lacking in content or clear arguments. Finally, while the editors are right that minimal emphasis has been placed on this country's presumptive "normal" ethnicity – that is, Pākehā or European – the volume feels somewhat partial without some account of the counting of other ethnicities, bar of course Kukutai's account of Māori. While much has been written on Asian and Pacific ethnicities in recent years, very few authors have engaged in critical reflection on practices of classification which are at the heart of this volume.

As Patterson notes in his afterword, "the connecting thread in this volume is counting" (p. 209). Readers will find some useful material here on histories of counting in Aotearoa New Zealand, and some directions for future research on demographic questions that may shed light on the historical constitution of this country's population. The chapters can be read independently and the editorial introduction does offer a useful framing for this area of study. Notwithstanding a notable inconsistency, then, this volume offers value to a range of students and scholars concerned with our histories of counting ethnicity and what they might mean for the future of our population.

INSTRUCTIONS TO CONTRIBUTORS

The *New Zealand Population Review* is a peer reviewed journal carrying articles on many aspects of population, mainly relating to New Zealand, but in some cases dealing with issues in the Pacific, Australia, Asia or elsewhere. These articles may be based on new empirical research, theoretical perspectives or policy-related analysis. The Review is normally published once a year and solicits substantive articles of 5,000 to 8,000 words, as well as shorter research notes and commentaries.

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