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# Editors' Note

This 2018 issue marks the third fully digital issue of *New Zealand Population Review*. NZPR is the flagship publication of Te Roopu Whaka Waihanga Iwi o Aotearoa, Population Association of New Zealand (PANZ). NZPR is proud to be an open-access publication that is committed to the promotion of population research relevant to Aotearoa New Zealand and the wider Pacific region. We welcome all contributions on population-related issues including empirical studies, theory and policy analysis.

*NZPR* publishes original research articles as well as shorter format research notes. In this issue, we also debut a new feature: the invited commentary. This is an opportunity for influential individuals from the broad field of population research to reflect on an issue or question of national significance. We are delighted that Len Cook, CBE, accepted the invitation to provide our inaugural commentary.

Len holds the unusual distinction of being a Government Statistician in two jurisdictions. He was the Government Statistician in Aotearoa New Zealand from 1992 to 2000 and National Statistician of the United Kingdom from 2000 to 2005. More recently, Len was a Families Commissioner and Chair of Superu, the Social Policy Research and Evaluation Unit (now disestablished). Len has long-standing interests in population change and public policy, public administration, official statistics and the place of science in policy. In 'Enriching public policy with a population perspective', Len makes the case for the enduring importance of demographic insight and analysis for sound policy development and analysis. He also cautions against the misallocation of public resources arising from policy inertia and failings in assessing population change.

This issue of *NZPR* rises to Len's call by offering insights into topics of core demographic concern. The first two empirical papers are from current and recently graduated doctoral students from the National Institute of Demographic and Economic Analysis (NIDEA). Moana Rarere uses New Zealand census data to explore the potential influence of cultural identity on the fertility outcomes of Māori women. Age composition

features prominently in Omoniyi Alimi's paper (co-authored with supervisors Jacques Poot and Dave Maré), which was awarded the 2017 Jacoby Prize by PANZ at its biennial conference. Their paper examines the effects of population ageing on spatial-temporal changes in the distribution of personal income, distinguishing between metropolitan and non-metropolitan areas. The conceptualisation and measurement of Māori community capital is the focus of the article by John Ryks and colleagues. Drawing on the work of eminent academic Sir Mason Durie, they present a framework and indicators for measuring Māori community well-being and apply them to the context of three settlements in the Waikato Region.

The issue ends with two research notes. The first, by Ward Friesen, looks beyond the Recognised Seasonal Employer Scheme (RSE) to consider the history and characteristics of Aotearoa New Zealand's temporary work migration system in relation to Pacific workers. Finally, Tahu Kukutai and Donna Cormack focus on Census 2018 and reflect on the implications of lower response rates for the users and uses of Māori and iwi data.

In addition to our regular annual issue in 2019, we are also pleased to announce that we will be publishing a Special Issue 'Capturing the diversity dividend? Diversity matters in Aotearoa New Zealand', with guest editors Arama Rata and Jessica Terruhn.

We thank the contributors to this issue and look forward to strengthening our online and open-access presence.

Tahu Kukutai
Bryndl Hohmann-Marriott

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*New Zealand Population Review, 44, 3–20.*


# Invited Commentary: Enriching Public Policy with a Population Perspective

LEN COOK*

## Abstract

Statistics often provide answers, but equally, so they point to questions that need to be asked. What we now know about some past condition will change with the knowledge we continue to gain. Population statistics and demographic analyses are amongst our most reliable windows on our society and economy. They are less shaped by political and institutional forces that determine the nature of the public evidence base. Changing demographic influences have made it essential to remain aware of the effect of population change on specific policies and investments. The institutional leadership that is needed for this is discussed in this paper.

Population change – past, current and prospective – is a major driver of policy initiatives and of commercial investment. While much of New Zealand's post-WWII population change through to the 1970s could be roughly characterised as New Zealand-wide fertility-driven growth alongside rural depopulation and a drift to the north, other drivers of population change have since come to prominence. We now have unprecedented levels of diversity in age structures, gender, ethnicity, mobility and subnational differences in growth (Jackson & Brabyn, 2018), along with high levels of economic and social fragility that are the focus of political attention.

At the same time, concepts of personal responsibility, social investment (Boston & Gill, 2018) and predictive risk modelling (Keddell, 2014) have become more prevalent in public policy, especially the justice and social sectors (e.g. child protection). These approaches generate analyses that can be overly reliant on behavioural theories that focus on the individual characteristics of those in situations of need or vulnerability.

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By contrast, population studies show the evolution of the base population as defined by age, ethnicity or place, enabling age, cohort and period effects relevant to the policy area. In short, while population approaches inform and challenge systemic responses to situations, behavioural models tend to focus on the need for individual rather than system change.

Currently, studies of the impact of population change on sub-populations are rare, and major issues including welfare benefits, housing and prisons now only earn attention analytically when they become a political embarrassment. However, population analysis is of sufficient importance that it should be an obligation that is recognised either in the cabinet manual or the Public Finance Act. This paper identifies and describes some of the potential risks of severe misallocation of public resources in New Zealand arising from policy inertia and failings in assessing population change. This misallocation has made public policy in justice, welfare, housing and retirement provision less responsive, and even ignorant, of known population dynamics and trends. Missed opportunities arise from the generally weak application of the tools of population analysis and weakness in the analytical breadth of public policy analysis.

## The nature of population change

A wide range of influences have resulted in New Zealand's population dynamics and structure now being less dominated by its extraordinary post-war baby boom. Migration has continued to exacerbate the concentration of the population in Auckland, far more so than in the other main urban centres. The determinants of population change in each of the four main ethnic groupings (European or Other, Māori, Pacific peoples, Asian) are quite different (Stats NZ, 2017). Sometime after 2050, deaths, which are currently half the number of births, will exceed the number of births. While the national age structures change steadily, at a local level age structures have changed quite dramatically, with parts of the country already having the age structures projected for New Zealand in some thirty years' time.

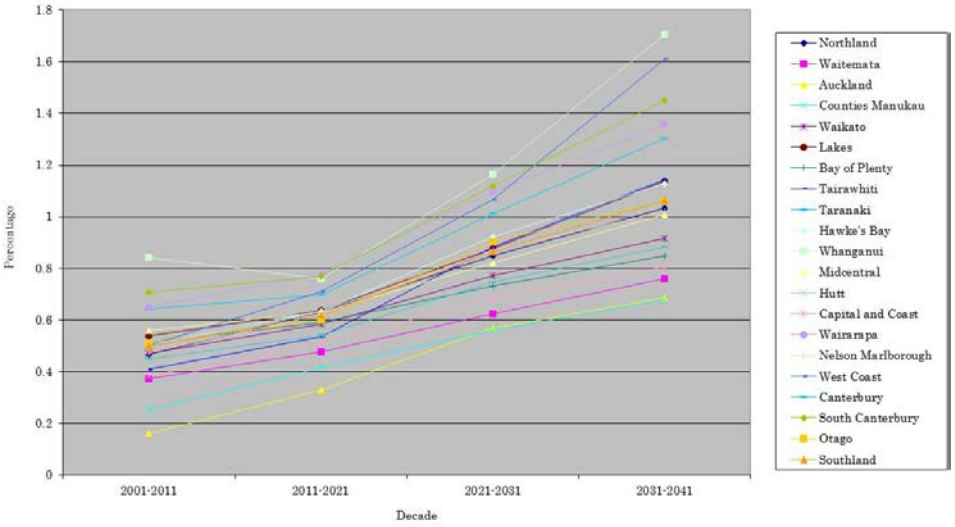
Population change in New Zealand has included an accelerating diversity in subnational and ethnic age structures and growth patterns. The work of Natalie Jackson and others has highlighted how the

continuing, albeit slowing, population growth at a national level is an aggregation of a great deal of local and ethnic diversity.[1] For some sub-populations there is absolute population decline, while for others growth continues most across age groups. The share of the population that is Pākehā will continue to decline.

How people gather in families and communities generally amplifies the effect of population change on the demand placed locally for services. In recent decades, social change, higher longevity, changing fertility and changed patterns of household formation and dissolution have led to an accelerated growth in the number of families and households compared with the increases seen in the population overall. The growth in multi-family households is one of the exceptions to the general trend of household sizes getting smaller and more work is needed to distinguish economic and cultural influences on the significant ethnic differences in the growth of multi-family households. Household form and formation rates influence the gap between the demand and supply of houses. This affects the workload and volatility of activity levels in the building and construction industries. One example pointing to the scale of difference in regional demands for housing and other services (in this example, health expenditure attributed to the projected population 75 and over) is highlighted in Figure 1.

At the other end of the life cycle, for each decade since the 1980s, the care of each new generation has fallen on fewer families because of declining fertility and because an increasing share of men and women are choosing not to have become parents before reaching middle age (Didham, 2016). We have yet to find ways of ensuring that those who are themselves not bringing up children can contribute fairly to the bringing up of the later generations which sustain our society, in part because the importance of population renewal is poorly understood by all generations.

**Figure 1: Percentage of increase in health expenditure attributed to over 75 population**




At any time, unusual period effects of economic and social forces can result in significant downstream effects on those most affected. An illustrative example of this was the effect of the 1930s Great Depression on the health, education and life course of those who lived through it, and their distinctive later attitudes to risk (Cogley & Sargent, 2005). The post war Baby Boomers who followed them had the opposite experiences that left them healthier and more affluent than any earlier generation, and less risk averse and more open to opportunity.

In most areas of public policy, measures of cohort differences matter because they take account of generational differences in how people live, relate and use their time, and the composition of the population at any time. We can analyse cohorts by a range of differentiating factors so that cultural, gender and generational differences in age-specific experience can be separated. These factors are at risk of being ignored when simply looking at age-specific rates. This is especially important in New Zealand where generation experiences at ages and times have been very different or where individual ethnic communities, especially Māori, have had markedly different experiences than Pākehā with multiple government agencies and agents that span more than a century. Age-period-cohort analyses enables us to untangle the complex and confounding effects of age, period and cohort and can capture the unique

experiences and exposures of age groups as they move across time (Lin et al., 2018). When cohort, period and age influences are measured in the available evidence base, they can be confronted and challenged by available but less tangible evidence from individual experiences.

We have a rich but underused understanding of much about the nature of the New Zealand population and the certainty with which it will change over the next three decades, along with a considerable array of knowledge about the interdependence among government programmes. The breadth of policy whose relevance will be consequently challenged will require a stronger focus in our national research agenda. The sources of uncertainty we need to reduce include the compression of morbidity, the effect on later life chances of childhood poverty, historical influences that continue to affect outcomes for Māori and Pacific populations, managing the impact of chronic health conditions on population health, responding to the rapid shift in the age distribution within smaller cities and places, and what makes up good housing.

## The Relationship between the Population Base and Public Investment and Service Provision

Shifting population structures affect those who require some form of local or regional infrastructure or use public goods and services, as well as those in or serviced by highly trained occupations where demand has to be anticipated well ahead, such as doctors, nurses and teachers. There are many sectors of policy where life course and intergenerational influences exist because interactions with services at one point in the life course can influence the likelihood or form of later service interactions. Historical experience has a long reach in sectors such as justice, health and housing. The early involvement with child protection services is now known to have been a significant forerunner to later connection as an adult with the justice system (Stanley, 2016).

Policy risks are amplified where costs and benefits involve different time periods and accumulate over much longer periods than is usual for government budgeting. Immunisation and child health are examples, as is the screening for conditions such as diabetes where there is a high likelihood that early detection and treatment will curtail the much later potential demand for dialysis. Early knowledge of conditions often signals

an opportunity to fund preventive or remedial action with an initial cost that is outweighed by any later payback. This type of analysis does not sit well with the three-year budget cycle of governments, nor of the electoral term. The ultimate cost to government of alternative shorter-term responses is to generate fiscal pressures downstream that are likely to lead to services being curtailed or rationed, if they continue to exist, unless they are predicted.

The range of alternative responses will usually be at its greatest when preventative measures or options for risk mitigation can have an effect. For example, changes in age-specific fertility rates will have later implications for pupil numbers and consequently the number of teachers that need to be trained or recruited. As we are currently experiencing with the teacher shortage in New Zealand, we observe first-hand the consequence of delayed action is to search internationally at the eleventh hour for people to bring from overseas. New Zealand has long been dependent on a capacity to compete internationally for the highly qualified individuals needed to offset the extraordinarily high loss overseas of doctors, nurses and other graduates, but we now see many trades and some partly skilled jobs such as drivers facing the same issues. The construction sector has long been affected by boom and bust, the net effect of this over several decades is a smaller and ageing permanent workforce with little capacity to train an upcoming generation. The longer-term effects of a reliance on short-term levers from immigration has led to structural imbalances in the age and experience mix of key occupations that could take decades to resolve even if training intakes were to reach levels more appropriate for self-sustainability (Medical Training Board, 2008).

There is immense variation in the size of the communities that form the service base for optimal use of public resources such as hospitals and specialist health workforces, schools, universities. ports and public housing as well as nationally managed regional resources such as dams, prisons, roading, railways and airports. This is especially important for New Zealand, both because of our small population and the way that the population is spread. These two characteristics limit the opportunity to have sufficient population mass to ensure the viability of providing services where people have concentrated. The scale of service justified economically by the population mass will determine its current and future

viability as a service operation with the capability to function in a sustainable way. Information and communications technologies and enhanced transportation services continue to bring radical change to service value chains. Even so, for many services there is a high likelihood that population levels and public services and public investment and disinvestment will be poorly connected.

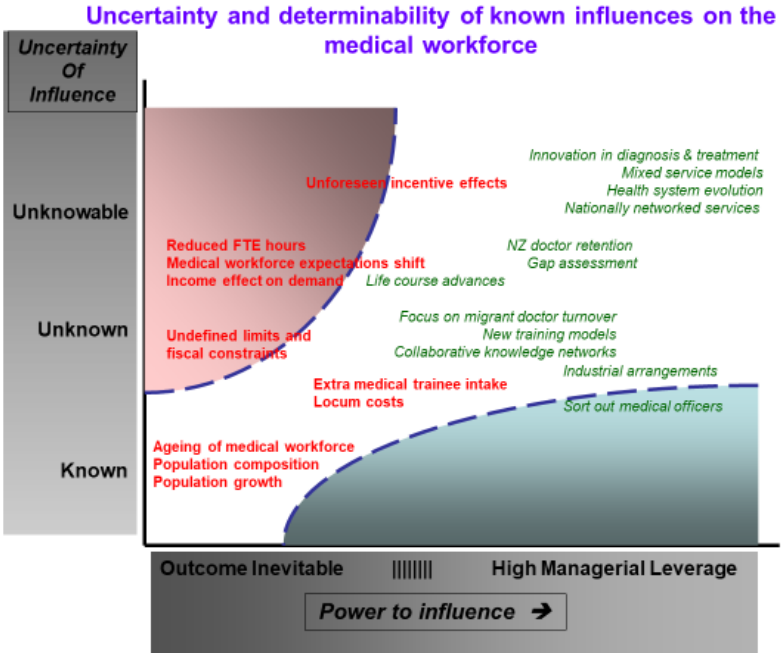
### *Example from planning significant workforces*

Examples of the dependence between cohorts are seen in teaching and health workforces, such as the matching of teacher numbers to pupils or in providing care workers for the infirm elderly, as well as where there are apprenticeship models, particularly in industries such as building and construction which are subject to both economic and demographic fluctuations. Despite quite clear-cut connections between demand and supply, generation differences can exist in participation in occupations where attitudes and opportunity have shifted. For example, eight per cent of the annual birth cohort of all young women born around 1956 had trained in nursing by 1976. In comparison, thirty years later, of the annual cohorts of young women born each year around 1986, just 0.4 percent were trained in nursing.

By analysing cohorts, population projections can take account of a diverse range of influences on future population levels and apply a wider range of variables when selecting assumptions. For example, in work done some time ago (2008) to advise on the number of additional medical school places, the modelling sought to identify the most significant factors influencing the demand for doctors. Figure 2 below presents the range of variables. The work was done to challenge the use, up to then, of simple models relating doctor numbers to growth in the total population.

The chart demonstrates the many factors alongside population change that influence the scale of future demand for medical graduates, and what are the uncertainties that limit the reliability of models of any sort in workforce forecasts.

**Figure 2: The range of variables influencing the demand for doctors**




Source: Medical Training Board reports, Ministry of Health 2008.

## *Example from prisoner forecasting*

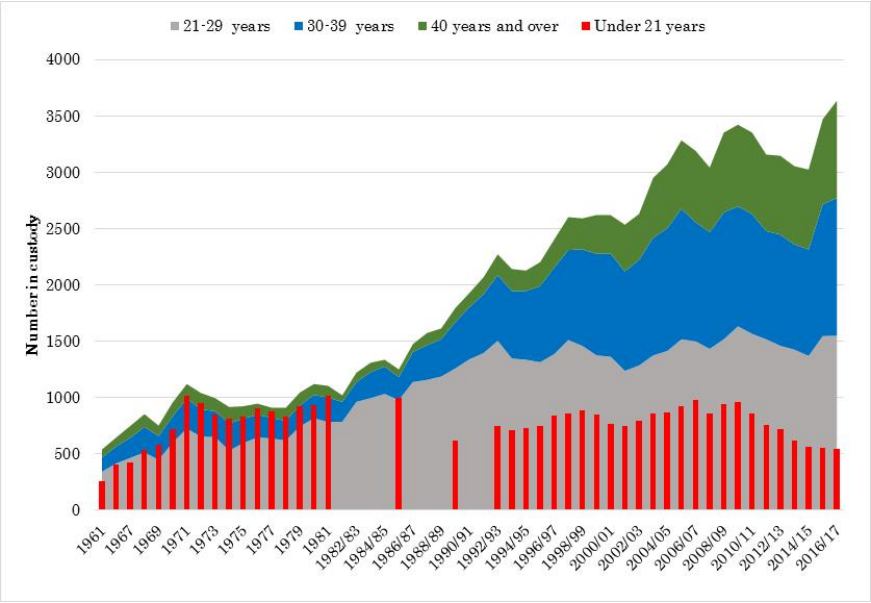
Despite the availability of the relevant demographic information, most reporting of the prison system has the narrow purpose of overseeing the management of a corrections system where flows in and out operate independently and huge volatility is just part of the picture. The analytical efforts that have prominence are those that seek to explain the characteristics of those captured by the system, who are disproportionately Māori, rather than the interaction of the population at large with the whole justice system It should therefore be no surprise that justice policy in New Zealand is characterised by Parliamentary responses to a series of one-off incidents involving penalising offenders by more imprisonment, and these generally have had culture and cohort-wide consequences that are rarely considered. Many New Zealanders who have experienced imprisonment when older were as children involved with past processes of child justice and institutionalisation that we simply would not countenance now. The continuing influence of those past experiences needs to be recognised.

For New Zealand, the justice system has long had different approaches for Māori, and while these differences in treatment appear to have diminished, the harm done in earlier times has had a continuing impact on the life course of those Māori as they get older. Of significance has been the lifelong impact on Māori males who were taken into state custody as teenagers during the 1970s, at a time when some 52 per cent of the Māori population was aged 15 years and under. One in fourteen Māori boys were placed in some form of state custody (Donnell & Lovell, 1982) compared with one in a hundred Pākehā boys. There was a clear racial bias in the threshold for being placed in custody.

The differences have been echoed in later imprisonment rates of this same cohort of Māori males as they aged, in the 1980s for mainly property offences, then later in 1990s with a growing share of violence offences.

Figure 3 shows the disproportionate contribution of Māori children aged 16 and under, to the number of Māori males of all ages who were in state custody during the 1970s and 1980s. Before the late 1980s, the number of Māori over 30 who had been incarcerated had changed little but this number grew rapidly from around 1990 as the birth cohorts who had been placed in custodial situations at very high rates as children then became adults. (Note: The statistical series before 1982 uses different age ranges, and the information on those aged 16 and under is available only for some years.)

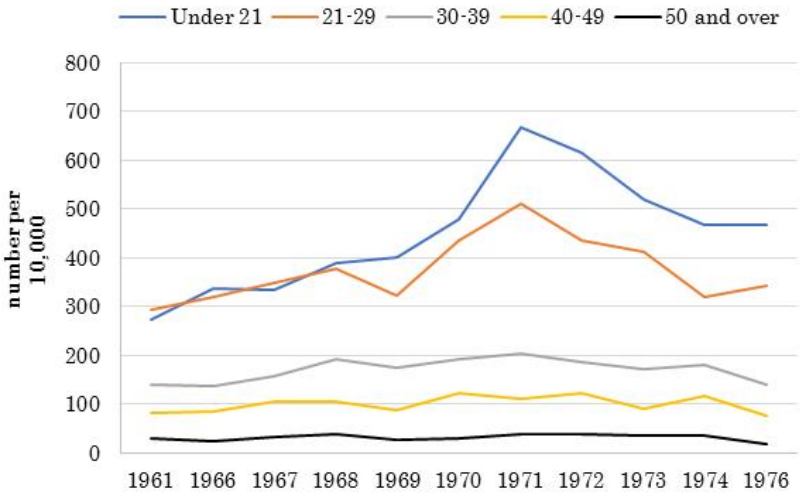
**Figure 3: Number of Māori males in prison, 1961–2014/15**




Source: Compiled by author from official statistics publications.

Figure 4 shows that the rate of imprisonment of adult Māori males aged 30 years and over was unchanged over the two decades from 1961 until the late 1980s when much of the growth in the increase in the rate of child custody took place. In particular, the rate of imprisonment of Māori males aged 21–29 rose in the middle of the same 20-year period but had returned to near the 1961 level by 1976.

**Figure 4: Imprisonment rates of Māori males for key age groups, 1961–1971 (calendar years)**




Source: Department of Statistics Population Miscellaneous Bulletin No 7 November 1978.

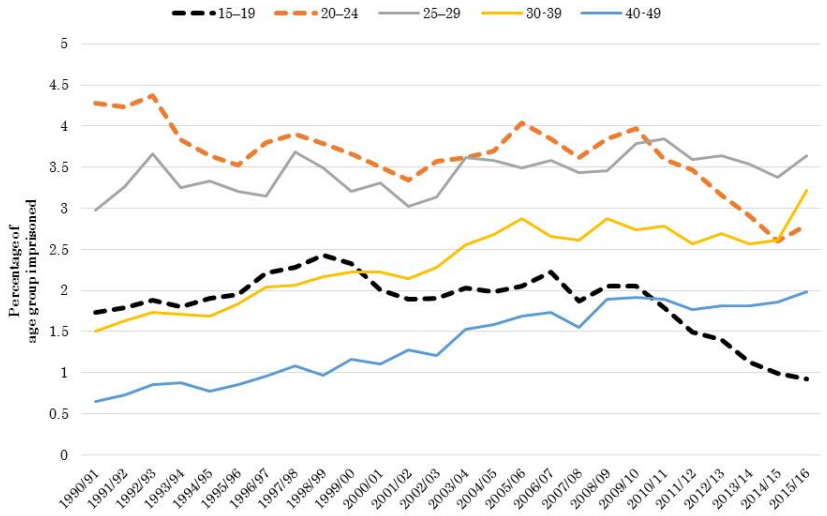
Finally, Figure 5 presents the age-specific rates of incarceration from 1990 to 2015 when a consistent series of measures is available. While the rates changed little over the three decades up to 1990, the fastest rising age groups of incarcerated Māori males since then are those aged 30–39 years and 40–49 years. The decline in the rate of those aged 15–19 years and 20–24 years seen in the last 8–10 years is the first significant decline in Māori male incarceration since the rate of putting Māori children into custody fell after the late 1980s. This suggests that the dynamics of incarceration of Māori males continues to be age-specific, but who are most deeply affected has changed significantly. Cohort analysis is needed to disentangle the period and age effects.

## The Necessity for Population Analyses that Inform and Challenge Fiscal Analyses

Policy analysis of necessity can involve projecting fiscal, personal and community impacts over the course of the term of the Executive Government of the day. The fiscal and performance measurement practices under which the public sector operates has resulted in the fiscal performance at an agency level dominating the analysis and direction of

social services and affecting the execution of policy in most domains. While it is essential to know of the cohort relationships and connections that are relevant in any sector in order that the long-term impact may be foreseen with any reliability, the pressures of political life and the nature of public policy making generate contrary forces which often limit the nature of long-term analyses, unless it is expedient at any time to produce and publish them. The processes for holding government to account are often inadequate for the task.

**Figure 5: Trends in imprisonment of Māori males by age group, 1990/91–2014/15**




Source: Compiled by author from Department of Corrections and Statistics New Zealand

Because policy choices tend to place more emphasis on perceptions of political palatability rather than analytical rigour, operational practices have little foundation for evaluation and continuous improvement. This undervalues multi-sector investments and long payback periods. Both nationally and regionally there is a lack of visibility of the accumulated obsolescence of public investments in hospitals, schools, prisons and public housing. The recent Counties Manukau failure to account for depreciation is probable a signal of problems all DHBs face, as with schools, prisons and the public housing stock. This short-changes future generations as they will have to fund a disproportionate share of new capital required to sustain well-established services over their lifetime. The future population base that will need to be serviced is neither consistently recognised nor is

the likely pathway likely to be sufficiently understood. Programme interdependencies, social and demographic change, cohort effects and unexpected impacts necessitate remedial responses, while the political context will usually be dominated by local or national public sentiment rather than the quality of the scientific analysis available. Over the lifespan of all forms of assets, we must now expect that future consumers of those assets will vary in ways unique to the region through population change.

Worldwide there is debate on the age of eligibility for state paid retirement pensions and their funding creates a highly visible crucial test of the capacity of legislators to act in the face of public sentiment. Population sciences highlight the increases in longevity we continue to experience, and the impact of their concentration now on improving years of life after age 55, but this needs to be responded to in the face of the inequalities in outcomes we now measure. Without recognising the significance of the structural shifts and dynamism in sub-populations, then interventions to support high-risk, high-cost populations will not be of known effectiveness and efficacy. These evaluations are sensitive to assessments of the target populations, who themselves can be vulnerable groups, some of whom may be in the custody of the state.

While we might regard demography to be comparatively well placed to inform fiscal analysis, in many areas of public policy there are notable examples where that evidence has not informed policy. Without analysis, agencies have diverted attention from their impact on population groups including Māori. We need to ensure that institutional arrangements exist that allow independent evidence to be regularly published separate from policy conclusions. The extent to which freedom of information legislation obliges Ministers to make public the evidence available when making decisions is also important. Where institutional arrangements are unsatisfactory, it can lead to reduced information in the public domain, and limitations on the capacity of professional public officials to talk in the public domain about their research.

## The place of cohort analyses in evaluating model selection in public policy

The policies of the state that influence the combined effectiveness of markets and government in the welfare of the people in households are those of redistribution, public goods, public safety and regulation. Social progress is usually measured at a national level by long-term trends in improved health, life expectancy and education, and when this progress does not include all groups in society, it can create the ironic situation that the policies that lead to improvements in overall well-being result in a more divisive society. Such divisiveness appears in vast differences in outcomes generationally, between ethnic groups and across the workforce, just as the administrative processes of service delivery of the state, including income support, reinforce divisions. Unless measures of well-being capture such diversity and division, they will present a false picture of the well-being of those in the nation and encourage redistributional policies whose effectiveness is ephemeral.

Cohort, age and period analyses can bring to light effects of shifts over time of policies at any point, and the lingering effect of policies or events long past. By connecting with theoretical developments in social sciences, epidemiology and criminology, for example, we can have more certainty when forecasting the long-term implications of current policy settings. Where access to public goods has been limited by screening criteria (time, money, transport, communication capability), those screened out will be less likely to benefit from ongoing general improvements in the disability-free life expectancy experienced generally by the population. We need to know where people can be missed from the information base, particularly the census of population, as they are more likely to come from the tails of the income distribution.

Changing norms determine the selection of models and practices used in government, and generally narrow the focus of policy and practice to middle-class expectations and norms, deceiving policymakers about their relevance for informing political choices that involve redistribution. The same is the case with many aggregate measures of well-being. Indicators tend to be highly summarised and contain little that put to test the fundamentals of policy settings. Consequently, well-being measures do not substitute for the need to have processes for the vindication of the

implementation policy. The justice example above exemplifies this. Figure 6 provides examples of where publicly relevant concepts have become narrowed in the measures used in the policy domain.

**Figure 6: Examples of publicly relevant concepts being narrowed by the policy measure or model**

| Publicly relevant concept | Policy measure or model |
|---|---|
| Cost of living | Consumer price inflation |
| Housing | Home ownership |
| Retirement income | Personal savings (KiwiSaver) |
| Common free education | Decile-ranked school |
| Income substitution | Means-tested benefits<br>Sanctions of process |
| Free medicine | Part charges for doctor and prescriptions<br>No dentist |
| Prison as punishment | Prison for punishment |

Behavioural models bring a tendency for analysis to be overly reliant on data sources that focus on the individual characteristics of those in some selected situation of need or vulnerability. Given this, they then seek to identify the similarity of their characteristics and experiences is with others in the same situation, in order to make predictions about the propensity of others in that situation to have that need or vulnerability. The potential in behavioural models for continuing ethnic and other biases is well documented, particularly the work of Emily Keddell on predictive risk modelling. There is bias from proxy measures, errors in variables, and avoidance of developments in social and economic theory, and they all bring serious consequences, as does the ecological fallacy of imputing the characteristics of a group, however accurate, to all the individuals in that group. All of these are serious issues, perhaps enabling the removal of a baby from its mother or determining the likelihood of incarceration of remand or convicted offenders. Where models have been screened from public view through obligations to protect commercial confidentiality, it releases public servants and Ministers from proper accountability. The Government Statistician recently released a report on the use of

algorithms across government agencies, which included the use of predictive risk modelling,[2] which was comprehensive in its description of the practices but highlighted the limited thinking so far on the ethical, statistical and accountability issues.

### *The nature of the challenge for population experts*

In analysing population change and the consequences of policy, it is not easy to disentangle and isolate the influences of population, policy, politics and public sentiment, especially where both investment and disinvestment will be critical to the long-term viability and fiscal sustainability of public programmes. Much regional population change will be considerable yet foreseeable, but the impact will be complicated by large shifts in inequality, climate, globalisation and technological change. The demographer's role as a public communicator will be vital in underpinning the trust that communities will need to have in understanding, managing and coping with such change. Population studies underpin many public programmes and inform policy about them.

We know that legislators are more inclined to introduce policy measures that respond quickly and agreeable towards public sentiment and less inclined to reverse policy measures that conflict with public sentiment. This is more obvious in policies that transfer resources to communities, or which deliver benefits long after costs need to be paid. Similarly, where policies incur costs or face higher risks in order to deliver a benefit to others later, such costs may not be incurred. Obvious examples include the willingness to be vaccinated (e.g. MMR), the location of health and education services, and the age of eligibility for retirement pensions.

Without strong pressure, it is unlikely that politicians will reform practices, and the inconsistent commitment of public services to investing in relevant evidence as critical infrastructure has shown no signs of change. The Chief Science Advisor model has been a good step, but the disestablishment of the Crown's Social Policy Research and Evaluation Unit (Superu) without associated promised shifts in resources for analysis and evaluation within the public service points to some hiatus in commitment. Increasing public literacy and numeracy may reduce the barriers to change, on the rare occasions when evidence has been communicated well to the public. The Treaty of Waitangi Act uplifted the quality, standing and imperative to act on historical studies in New

Zealand, and it may take something similar, perhaps appropriate amendments to the Cabinet Manual or the Public Finance Act, to do the same for population studies. Scientists, including population experts, and their professional bodies and institutions, all have a need to increase their effectiveness at presenting in the public domain the nature of population change and the consequences of inadequate policy responses, and promoting solutions of this sort.

## Conclusion

The linkages between evidence and policy are often fraught, because of the often-immeasurable influence that sentiment, values, political compromise and occasionally accident or error play in making policy decisions.

It must be up to scientists and their professional bodies, including population experts, to increase the understanding of their methods and highlight their effectiveness at explaining in the public domain the nature of population changes and the consequences of inadequate policy responses. Currently the depth of policy analysis and the necessary wider analytical competence in demography and other social sciences in government has yet to match the increased computational opportunities. As we move into an era where big data is seen as a changemaker, it is critical that giving greater recognition to demographic structure is not side-lined by the new interest in summarising the content of the administrative records. The richness of demographic thinking can provide a powerful spotlight on potential policy distortion and system limitations of social policies much more than is possible from single-source analysis, predictive modelling and the perceived potential of algorithmic methods.

Given the significance for communities, places and generations now of projected demographic change, it may be timely for all policy initiatives, including the periodic review of continuing programmes, to be supported by an independent demographic assessment of the basis and quality of long-term projections supporting the introduction or retention of the policy. This should be a requirement that is reinforced by appropriate directives contained in amendments to the Cabinet Manual or the Public Finance Act, that recognise the essential place of population analysis in policy selection.

## Notes

1 See the 2017 special issue of *Policy Quarterly*, 'The ebbing of the human tide: What will it mean?' https://ojs.victoria.ac.nz/pq/issue/view/547.

2 https://www.data.govt.nz/assets/Uploads/Algorithm-Assessment-Report-Oct-2018.pdf.

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# Understanding 'higher' Māori Fertility in a 'low' Fertility Context: Does Cultural Identity Make a Difference?

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## Abstract

The Māori fertility transition brought an end to decades of very high fertility rates, and a convergence towards long-term fertility levels similar to Pākehā/New Zealand European women. However, important differences endure. The Māori total fertility rate (TFR) remains above replacement level, and Māori women have children earlier and over a longer period. All of this has and still is occurring in a society that facilitates and favours low fertility and small family sizes. Using births data and cultural identity markers in the New Zealand Census, this paper explores the influence of culture as a contributing factor to higher fertility outcomes amongst Māori women in a low-fertility society.

Described as one of the most dramatic fertility transitions to occur in recent history (Pool, 1991; Wereta, 1994), Māori birth rates underwent a steep and rapid decline between 1966 and 1976, abruptly ending decades of very high fertility. Even more extraordinary is that this phenomenon occurred against a backdrop of a predominantly Pākehā population that had already been through a fertility transition nearly a century earlier (Pool, 1991; Pool, Dharmalingam, & Sceats, 2007). Not only did the timing of both transitions differ, but the mechanisms and determinants through which low fertility was achieved also differed. For Pākehā women, changing marriage patterns mostly facilitated their fertility transition during the latter part of the 19th century (Pool et al., 2007), while the uptake of more effective contraceptive methods and sterilisation were important factors that enabled the Māori fertility transition to occur (Pool, 1991). Pool (1991) describes this dichotomy within the relatively "tiny" nation: a nation that

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consists of two major populations whose histories have been very much intertwined since first contact, and yet two very distinct demographic histories have transpired, involving quite different fertility and family formation patterns (Pool et al., 2007).

Despite both populations experiencing quite different fertility transitions in timing and mechanisms, differences in fertility levels have diminished over time (Pool, 1991; Pool et al., 2007; Pool & Sceats, 1981). If we compare total fertility rates (TFR), Māori fertility appears to be converging towards Pākehā fertility. For example, in 1977 the Māori TFR and New Zealand TFR was 3.0 and 2.3, respectively, and by 2017, it was 2.3 and 1.8, respectively (Stats NZ, 2017b). However, there are some important differences that endure. Māori TFR has consistently exceeded Pākehā TFR; never have the two rates intersected. Taking national TFR as a comparator, the smallest difference (between Total New Zealand TFR and Māori TFR) was in 1990, at 2.16 and 2.18, respectively, and the largest difference was in 1997, at 1.95 and 2.73, respectively (Stats NZ, 2017b).

There are other features that challenge this notion of convergence. One key aspect is that Māori women have different age-specific fertility patterns, with peak childbearing at younger ages. From 2002 and 2012, age-specific fertility rates for Māori peaked at ages 20–24 years, only moving to 25–29 years in 2013 (Stats NZ, 2017a); the median age of mothers was 25.8 years in 2013 and has slowly shifted upwards to 27.0 in 2018 (Stats NZ, 2018). Indeed, rather than a simple pattern of fertility convergence, closer inspection of age-specific fertility patterns has uncovered a mix of converging, diverging and corresponding trends between Māori and Pākehā fertility (Didham & Boddington, 2011; Jackson, Pool, & Cheung, 1994). As explained by Jackson et al. (1994), general fertility trends have been similar, and both populations have also experienced falls in fertility at 15–19 and 20–24 years since the 1960s.

However, since the 1980s, the two populations diverged at ages 25–44 years, where Māori fertility rates fell below non-Māori. At the same time, both populations have seen a rise in fertility at ages 25–39 years due to a "recuperation effect", as posited by Pool and Sceats (1981). Of course, the shift to older maternal ages are more marked for non-Māori and has increased the differentials between Māori and non-Māori (Jackson et al., 1994).

Taylor (2011) and Johnstone (2011) found similar patterns of earlier childbearing in other "neo-Europe" countries, notably Canada, Australia and the United States. Despite fertility declines during the latter years of the 20th century, indigenous fertility remains concentrated at younger ages – an observation that Pool (1991) noted for Māori 20 years earlier. From a global standpoint, it is a scenario that partly explains the irony of why New Zealand, being one of the "low fertility" countries, has one of the highest fertility rates in the developed world (McDonald & Moyle, 2010).[1]

While the demographic literature describes how historical Māori and indigenous fertility patterns have unfolded over time, less attention has been devoted to understanding the "why" (Douglas, 1977b; Pool, 1991). One of the key criticisms is that conventional demography practices tend to treat indigenous populations as a deficient group (Kukutai & Pool, 2014) that requires "fixing". This line of thinking underscores the common analytical approach to make inter-group comparisons in Aotearoa New Zealand. Up until recently, most analyses of Māori fertility have been approached and examined in relation to non-Māori fertility patterns. A further criticism of this approach is that it promotes a unidimensional representation of populations that are inherently multi-dimensional (Kukutai & Pool, 2014) because conventional categories and contexts do not necessarily reflect indigenous realities (Johnstone, 2011; Kukutai, 2011; Kukutai & Pool, 2014; J. Taylor, 2009). As a consequence, important intra-group differences are overlooked. Most of the fertility literature has primarily focused on demographic and socio-economic factors, while the possible influence of cultural factors has received less attention and articulation.

Using data from the New Zealand Census of Population and Dwellings, this paper explores how fertility varies between Māori women based on their expressed identification. In doing so, it aims to contribute a better understanding of how cultural factors might contribute to fertility outcomes amongst some Māori women in society. Here, we use the term "culture" quite loosely to encapsulate the ideas, customs, social behaviours, values, worldviews, etc. of a group of people (Jenks, 2005; Ogburn, 1937). The motivation to explore the cultural element stems from the dearth of literature on this subject in the field of demography, but more importantly, the need to include indigenous worldviews in the analysis of indigenous

fertility. The Demographic Transition (DT) model has been the main framework for theorising and analysing indigenous fertility (Dyson & Murphy, 1985; Omran, 2005; Reher, 1999). Like Māori, other indigenous peoples in colonised nation states have also undergone significant fertility transitions "near-simultaneously" (Caldwell, 2006), and these have often been interpreted as evidence of a global convergence towards fertility behaviour (Johnstone, 2011). DT theory, and other dominant fertility theories (e.g. low-fertility theories based on rational choice and gender equity), are underpinned by Western-based experiences and worldviews (Kirk, 1996; van de Kaa, 2008). However, Johnstone (2011) points out that colonisation has affected indigenous populations. Pool (2015) clearly shows the impact of colonisation on early Māori demography, but most importantly the enduring domino effect on other aspects of Māori society, including social, economic and cultural. The problem is, as pointed out by Johnstone (2011), demographic theor[ies] do not serve well in understanding colonised indigenous populations fertility experiences because those theor[ies] "fail to account for the impacts of colonisation" (p. 116). Research in the indigenous demography space has highlighted the unique issues pertaining to the interpretation of indigenous population change (Johnstone, 2011; Kukutai, 2011; Kukutai & Pool, 2014; A. Taylor, 2011; J. Taylor, 2009) but more work is needed in developing theoretical frameworks that incorporate indigenous views. It is the intent of this research to weave into the study of Māori fertility interpretations that resonate with and are important to Māori.

The next section provides the historical context for Māori fertility and reviews some of the key arguments about Māori fertility patterns. Hypotheses regarding the variation of fertility based on expressed identification are tested using quantitative methods. The paper ends with a discussion of how the findings provide insight into the validity of cultural influences on Māori fertility outcomes.

## Background: The persistence of 'higher' Māori fertility

The history of Māori fertility patterns in the field of demography has been well documented (Douglas, 1977a, 1977b, 1981; Pool, 1974, 1977, 1991; Zodgekar, 1975), and forms the basis of today's fertility patterns.

Throughout the post-colonial period until the Māori fertility transition, Māori birth rates were generally understood to be "high". Assumptions about Māori fertility prior to the 1900s were rather sketchy, making it challenging to fully substantiate whether they were "high" or "low" (see Chapter 4 in Pool, 1977). However, through the extrapolation of 1961 vitals data, estimates going as far back as 1844, clearly show the height of Māori fertility before the transitional decline. The estimated Māori fertility rates at various time points between 1844 to 1961 produced by Pool (1991) are replicated here in Table 1.

There was a general increase in fertility rates over the period but with particularly higher rates in the forty years (1921–1961) immediately preceding the Māori fertility transition. Higher rates of fertility just before a long-term decline was a feature shared with other countries. In moving towards an explanation for this general pattern over the period under scrutiny, Pool (1991) considers at least two explanations: (1) the natural history of venereal diseases, and (2) the natural history of reproduction before a fertility transition (see Chapter 5 in Pool, 1991). Sexually transmitted diseases (STDs), and exposure to diseases and malnutrition that affected fecundability and foetal survival were cited as major factors impacting on fertility levels around the mid-1800s (Pool, 1991). However, in explaining the increase in fertility from the 1880s and thereafter, it appears that "a degree of equilibrium" and "partial immunity" had lessened the severity of the disorders, and improved survivorship levels through better living conditions and nutrition (Pool, 1991). Other features of higher Māori fertility included high levels of early exposure to conception (15–19 year olds), even though there was only a small percentage of those who ever married, and there were few attempts to limit family size at older ages (Pool, 1977).

**Table 1: Estimated Māori total fertility rates, 1844–1961**

| Year | Māori TFR (estimated) |
|---|---|
| 1884 | 4.5 |
| 1857/8 | 4.9 |
| 1878 | 5.5 |
| 1886 | 6.1 |
| 1891 | 5.7 |
| 1896 | 5.7 |
| 1901 | 5.9 |
| 1911 | 5.7 |
| 1921 | 6.1 |
| 1926 | 6.7 |
| 1936 | 6.9 |
| 1945 | 6.5 |
| 1951 | 6.7 |
| 1956 | 6.9 |
| 1961 | 6.9 |

Source: Pool (1991), Tables 5.3 and 6.2.

In explaining high Māori fertility, Douglas (1977b) analysed some of the cultural responses deeply embedded within close-knit rural tribal communities. He defined cultural in terms of the "interdependence of economic, social and psychological factors in determining norms and values" (Douglas, 1977b, p. 663). In traditional Māori society, customary marriage, including remarriage, was universal, and although unions were mostly endogamous (i.e. to other Māori), inter-tribal marriage was frequent for the purpose of forming political and economic alliances (Biggs, 1960; Wanhalla, 2011). Intermarriage with Pākehā did exist, although it was not encouraged so as to prevent "rapid alienation from Māori ways and the eventual loss of descendants to the pakeha world" (Douglas, 1977b, p. 666). Children were also valued as an essential part of the social and economic functions of rural Māori society but were also important in sustaining whakapapa (genealogy), a key principle in whānau (family) formation (Douglas, 1977b).

The 1960s are generally observed as the turning point for the Māori fertility transition. Fertility rates began to decline quite sharply at the start of the decade, and then accelerated, with the greatest and most rapid decline occurring between 1971 and 1976 (see Table 2). This transition drew significant interest from a number of demographers

because of the magnitude and speed of the shift, from decades of high levels of fertility to seemingly low levels of fertility similar to Pākehā rates.

**Table 2: Māori total fertility rates, 1962–1986**

| Year | Māori TFR (estimated) |
|---|---|
| 1962 | 6.2 |
| 1966 | 5.5 |
| 1971 | 5.1 |
| 1976 | 3.1 |
| 1981 | 2.5 |
| 1986 | 2.2 |

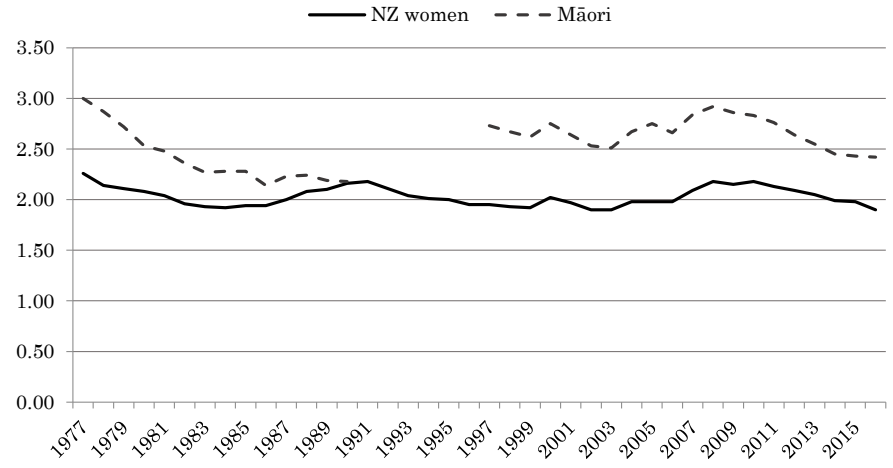
Source: Pool (1991), Table 8.2.

In explaining Māori fertility decline, some of the reasons presented included urbanisation, rising educational aspirations and achievements, changing mortality, and intermarriage with Pākehā (Pool, 1974, 1991). Douglas (1977b) applies the same cultural lens used in understanding a high fertility regime to understanding Māori fertility decline. He points out acculturation as an influencing factor facilitated by assimilation policies as a means of "civilising" and "assimilating" Māori into Pākehā society:

> Many Maoris, especially younger ones, have been so well acculturated that they accept pakeha ideals of what a good Maori should be. The desire for acceptance by pakeha mentors and peers has had further effects on changing the residual Māori values, especially in the area of family life. (Douglas, 1977b, pp. 677–678).

The days of high birth rates are now a distant memory. Since 1976, Māori TFRs have hardly exceeded three children per woman but still hover above the theoretical replacement level of 2.1 (see Figure 1).[2]

**Figure 1: Total fertility rates of Māori and New Zealand women, 1977–2016**

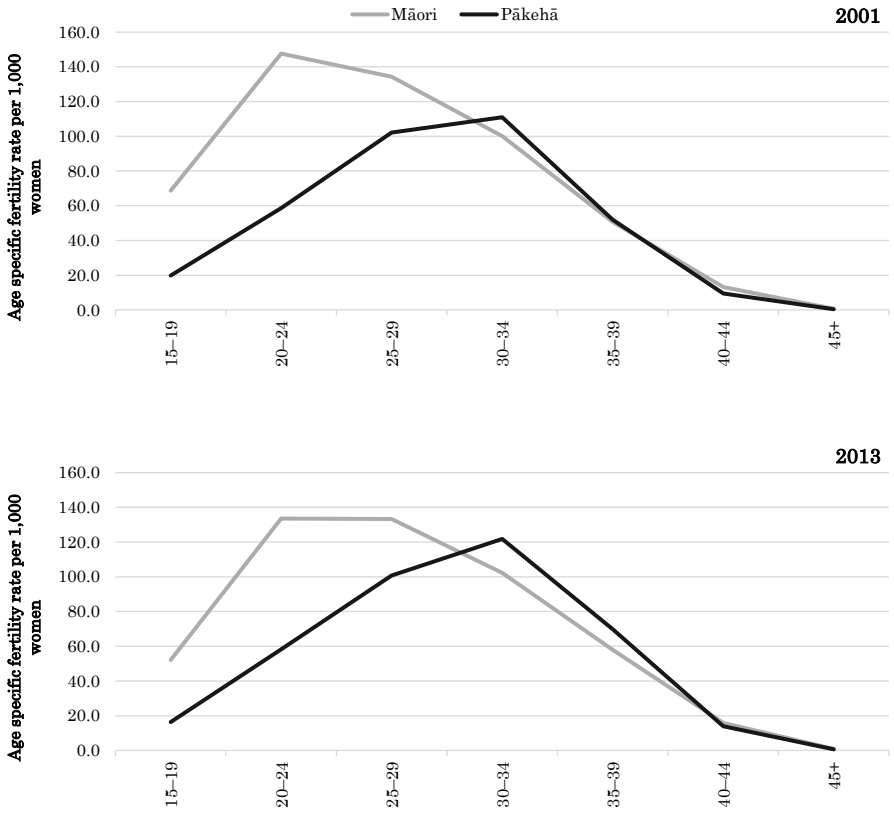



Source: Statistics New Zealand infoshare Table DFM044AA (Annual June); last updated 17 November 2016.

The shift has generally been interpreted to mean that Māori fertility levels have converged towards Pākehā levels. However, as Jackson et al. (1994), Johnstone (2011), and Didham and Boddington (2011) have pointed out, Māori and non-Māori women's fertility still differ at key reproductive ages. The incidence of Māori births and age of first births are much more concentrated at younger ages (15–29 years) (Figure 2).

The peak ages at which Māori fertility is highest occurs between 20 and 29 years, the period during which formal tertiary education, training, and career opportunities are mostly undertaken. Education, in itself and as a proxy for human capital development, has been cited as the primary factor in delayed family formation (Bledsoe, Casterline, Johnson-Kuhn, & Haaga, 1999; Rindfuss, Bumpass, & St. John, 1980). What then, are some of the motivations for Māori women to start or continue bearing children at these young adult ages?

**Figure 2: Age-specific fertility rates (per 1000 women) for Māori and Pākehā/New Zealand European women, 2001 and 2013**




Source: Statistics New Zealand age-specific fertility.

This study draws from the learnings framed by Douglas back in 1977. If acculturation was considered to be a factor in the decline in Māori fertility transition, then to what extent has the Māori renaissance, indigeneity, or decolonisation influenced Māori women's fertility aspirations since? Are there still some undercurrents of culture that influence the way in which Māori women think about family formation, the value of children, childbearing and rearing in terms of timing, spacing, and number of children, etc? One of the aims of colonisation is to displace indigenous identity. However, Māori identity is multi-faceted (Barcham, 1998; Borell, 2005; Durie, 1995, 1998; McIntosh, 2005; Walker, 1989; Webber, 2008), although at the heart of identity is whakapapa or shared descent.

The closest proxy to cultural identity in the census is expressed identification. The aim is to look at whether Māori women who have multiple unambiguous ties to Māori identity in terms of reporting Māori descent, at least one iwi, and singular Māori ethnicity have higher fertility (using indicators of childless, and average number of children) than women with fewer ties to Māori identity. It is not the intention here to make judgements about degrees of "Māoriness" (Barber, 2004). Rather, there are diverse expressions of Māori identity, and this study offers one way of being able to explore the nexus of culture and fertility for Māori.

## Data and methods

This analysis uses data from the fertility question collected in the New Zealand Census of Population and Dwellings. The census asks each woman aged 15 years and over for "the number of children ever born alive" (Statistics New Zealand, 2013b). By this definition, it does not include foetal deaths, stillborn children, stepchildren, adopted children, foster children, nor wards of the State (Statistics New Zealand, 2013b). Data are classified by the number of children specified from 0 to 10+, and residual-type categories. Given the sensitivity surrounding the question, women can also tick "object to answering". The question was first asked in the 1981 Census, and repeated in the 1996, 2006 and 2013 Censuses.[3] This analysis compares the "average number of children per woman" and the "proportion childless" using the 2013 Census.

The census also collects information that can represent, in a very broad sense, ties to Māori cultural identity through expressed Māori identification.[4] There are three ways in which the census captures expressions of Māori identity: descent, ethnicity and iwi (Māori tribes). The definition for each is conceptually distinct and yields different population sizes (Kukutai, 2011). Māori descent is a biologically based concept that captures those people who have or claim Māori ancestry (Statistics New Zealand, n.d.–b). The question asks: "Are you descended from a Māori (that is, did you have a Māori birth parent, grandparent or great-grandparent, etc)?" The Māori descent population is the largest and most inclusive of the three Māori identity groupings (Kukutai, 2011).

Ethnicity in the census has a social and cultural foundation. It is statistically defined as:

> ...the ethnic group or groups that people identify with or feel they belong to. Ethnicity is a measure of cultural affiliation, as opposed to race, ancestry, nationality or citizenship. Ethnicity is self-perceived and people can belong to more than one ethnic group. (Statistics New Zealand, n.d.–a, para.1)

The Māori ethnic group (MEG) is the second largest of the Māori identity categories and is the primary reference group used in census tabulations, media and for administrative and policy purposes (Kukutai, 2011). Iwi affiliation provides yet another way of expressing Māori identity. The concept of iwi affiliation in the census is the closest approximation to a te ao Māori concept of whakapapa-based group membership (Kukutai, 2011).[5] Iwi data were collected in early colonial censuses but discontinued after 1901. The iwi question was reinstated in the 1991 Census, largely for the purposes of meeting the Government's statistical needs and obligations (Kukutai & Rarere, 2013; Walling, Small-Rodriguez, & Kukutai, 2009).

The relationship between all three categories is asymmetrical, meaning that, for various reasons, not all individuals who identify with one category identify with any of the others. For example, in the 2013 Census, 17 per cent ($n$ = 110,928) of Māori descendants ($n$ = 668,724) did not know their iwi, and 16 per cent ($n$ =107,391) did not report Māori ethnicity (Statistics New Zealand, 2013a). Both the ethnicity and iwi questions provide for multiple responses.

The inclusion of three Māori identity markers in the census means that various kinds of categories can be delineated (Kukutai, 2004, 2011), some of which are set out in Table 3. This paper compares the fertility outcomes of Māori women in three mutually exclusive categories:

- a core group that comprises Māori women who unambiguously identify as Māori on the basis of descent, iwi affiliation and exclusive Māori ethnicity
- Māori+ which is women who identity with two or more ethnic groups, one of which is Māori (and who may also report Māori descent and/or an iwi affiliation), and
- women who identify as Māori only by descent (not by ethnicity or iwi affiliation).

While the focus is on understanding within-Māori diversity, all of the analysis also includes a non-Māori comparator.

**Table 3: Group configurations based on Māori categories in the census**

| Category label | Description of category configuration |
|---|---|
| Core | Māori descent and solely MEG and at least one iwi identified |
| Māori ethnic group (MEG) | Total MEG; i.e. sole MEG and MEG with another ethnic group(s) |
| Māori | MEG and any other ethnic group; i.e. excludes MEG |
| Māori descent | Total descent; i.e. descent only, descent with MEG, and descent with iwi identified |
| Descent only | Solely descent; i.e. no MEG and no iwi identified |

A key advantage of using the census is that analyses can be cross-tabulated with other variables of interest. This study thus looks at fertility differences by Māori identification, taking account of differences in education level and Māori spatial population share.

## Analysis: Intra-group Fertility Differences

This analysis begins with an overview of some key socio-demographic characteristics for each category of Māori women aged 15 years and older. Table 4 shows significant differences between the categories, reaffirming "cultural and socio-economic heterogeneity within indigenous populations" (Kukutai & Pool, 2014, p. 442).

In terms of group size, the largest in Table 4 is Māori+ (105,003). The number of Māori women identifying with at least two ethnic groups increased by 23 per cent, from 84,816 in 2006 to 105,003 in 2013, which exceeded the growth in the other two categories. The continuing growth in the number of Māori+ is a reflection of a "changing ethnic mosaic of New Zealand" (Khawaja et al., 2000, p. 4). Younger people are more likely to identify multiple ethnic groupings than their predecessors are, partly as a result of inter-ethnic marriage, and also changes in the "concept and understanding of ethnicity" (Khawaja et al., 2000, p. 15). Unsurprisingly, the age structure of the Māori+ grouping is also much younger, with higher proportions at the younger ages (15–24 years) and smaller proportions at

the older ages (50+ years). Age structure differences would be even more marked if children were included in the analysis.

**Table 4: Demographic and socio-economic profiles of women (15+) by category, 2013 Census**

| Indicator | Core | Māori + | Descent only | non-Māori |
|---|---|---|---|---|
| Number of women 15+ | 91,611 | 105,003 | 18,414 | 1,306,068 |
| **Age structure(%)** | | | | |
| 15–19 | 10.6 | 16.5 | 12.6 | 7.2 |
| 20–24 | 9.5 | 14.6 | 12.0 | 7.5 |
| 25–29 | 8.3 | 11.1 | 9.6 | 7.3 |
| 30–34 | 7.9 | 10.2 | 9.0 | 7.6 |
| 35–39 | 8.6 | 10.1 | 9.6 | 8.1 |
| 40–44 | 9.9 | 9.6 | 10.0 | 9.4 |
| 45–49 | 9.8 | 7.7 | 8.7 | 9.2 |
| 50–54 | 10.0 | 6.8 | 8.5 | 9.1 |
| 55–59 | 8.1 | 4.7 | 6.3 | 7.9 |
| 60–64 | 6.2 | 3.4 | 4.5 | 7.1 |
| 65+ | 11.2 | 5.3 | 9.1 | 19.7 |
| **Highest education level (%)** | | | | |
| None | 36.2 | 22.3 | 24.4 | 18.5 |
| Secondary | 39.7 | 48.1 | 47.7 | 41.5 |
| Diploma | 13.5 | 14.6 | 14.3 | 16.2 |
| Degree+ | 10.5 | 14.9 | 13.7 | 23.9 |
| **Labour force status (%)** | | | | |
| Employed | 48.9 | 56.9 | 63.2 | 58.9 |
| Unemployed | 12.2 | 9.8 | 6.0 | 3.9 |
| Not in the labour force | 38.9 | 33.3 | 30.8 | 37.1 |
| **Occupation (%)** | | | | |
| Managerial and professional | 44.2 | 47.9 | 45.7 | 54.2 |
| Service and administration | 34.3 | 39.3 | 40.8 | 35.2 |
| Labour intensive | 21.5 | 12.8 | 13.4 | 10.6 |
| **Te reo (%)** | | | | |
| Can speak te reo | 37.0 | 13.2 | 1.7 | 0.6 |
| **Māori Ethnic Group (MEG)** | | | | |
| Lives in a TA with at least 20% MEG (%) | 48.7 | 30.9 | 24.4 | 15.7 |

By contrast, both the Core and Descent-only groupings declined in size between 2006 and 2013, at 0.6 and 3.6 per cent, respectively. The larger Core grouping has an older age structure than the other Māori groupings, with higher proportions at ages 40+ years but is still much more youthful than the non-Māori category. The age structure of the Descent-only grouping is not as young as the Māori+, but is more so than the Core grouping.

Different age structures also have a flow-on effect on socio-economic status and fertility outcomes. It is generally understood that Māori have poorer outcomes than non-Māori across a number of socio-economic and health indicators (Ajwani, Blakely, Robson, Tobias, & Bonne, 2003; Robson & Harris, 2007). Māori also tend to be over-represented in occupations that are deemed lower skilled, lower paid, and more vulnerable to economic shocks. These inequities are also reflected in Table 4. However, intra-group differences are also clearly marked. Women with multiple ties to Māori identity are more disadvantaged than either women whose only tie to Māori identity is through descent or women who identify as Māori with at least one other ethnicity. For the majority of the latter, the other ethnicity is Pākehā/New Zealand European. Women in the Core category, while having richer ties to te ao Māori,[5] also seem to be disproportionately exposed to processes that are correlated with poor outcomes, including racial discrimination and fewer opportunities (Harris et al., 2012; Houkamau & Sibley, 2015; Kukutai & Pool, 2014; Pack, Tuffin, & Lyons, 2016; Robson & Harris, 2007).

Age composition also has important implications for this analysis. Fertility, which refers to the actual "reproductive performance rather than capacity" (United Nations, 2017), is affected by the fecundity and fecundability of the individual and/or couple. *Fecundity* is defined as the "capacity for a man, woman, or couple to participate in reproduction" (United Nations, 2017), whereas *fecundability* refers to the probability of a woman conceiving per menstrual cycle, excluding periods of pregnancy, anovulation, and practising contraception (Potter & Sakoda, 1967; United Nations, 2017). Over the reproductive span, of which the lower and upper parameters are set by menarche and menopause, respectively, fecundability varies by age generally as follows: increasing during teenage years, peaking at ages 20–29 years, and declining gradually thereafter (Pool & Sceats, 1981). With this in mind, we therefore restrict our analysis

to the fertility outcomes of women aged 30–34 years old.[6] This is based on the premise that we are very unlikely to capture "completed fertility" for women under age 30 and that the probability of conceiving decreases markedly after age 35 (Weinstein, Wood, Stoto, & Greenfield, 1990).

The effects of age on fertility are illustrated in Table 5, which shows the age-specific rates of childlessness and the average number of children for each grouping. Obviously, as we progress through the age groups, proportions of childlessness become smaller. However, women who identified multiple unambiguous ties to Māori identity had significantly lower rates of childlessness than their peers at each age group over the key reproductive ages 15–34 years. Even if we focus on ages 30–34 years, intra-Māori differences are still significant. Here we see a gradient where the Core grouping has lower rates of childlessness and higher average number of children per woman, and women who identified only by descent have higher rates of childlessness and lower average number of children. Although the Core grouping has a relatively older age structure, the rates of childlessness were notably lower amongst teenage women aged 15–19 years and young adults aged 20–24 years.

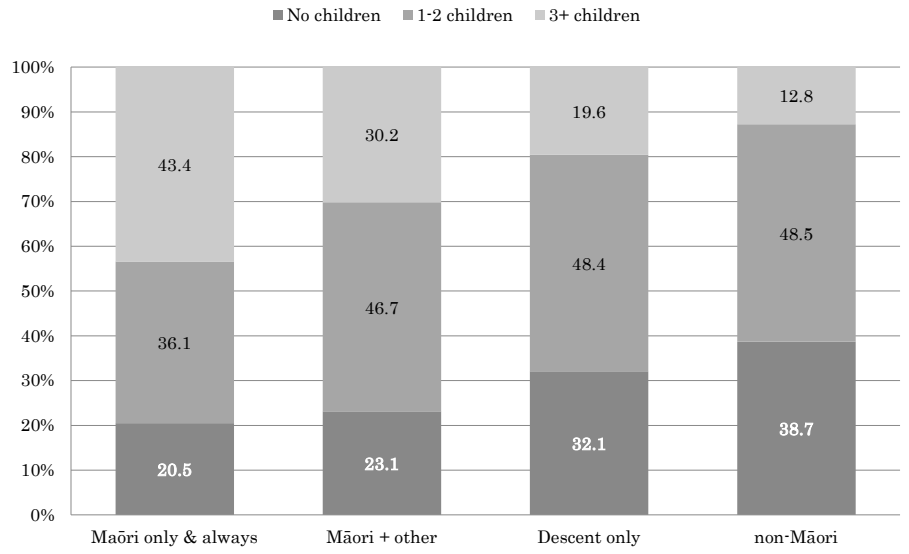
There are also marked differences in family size.[7] Figure 3 shows the proportion of women by the number of children specified.[8] We use two children as the mid-point for distinguishing between "small" (1–2 children) and "large" (3+) families. More than 43 per cent of women aged 30–34 ($n$=2973) who unambiguously identified as Māori had large families, with nearly 13 per cent ($n$ = 378) having more than six children. In contrast, the majority of the Māori+ and Descent-only groupings had smaller-sized families – 47 per cent and 48 per cent, respectively. Again, we see a gradient within the Māori groupings: women in the Core grouping have the lowest proportions of childlessness and highest proportions with large families, and women with "thinner" ties to Māori identity (i.e. Descent only) have highest proportions of childlessness and lowest proportions with large families. Nevertheless, Māori women are still different from New Zealand women who have no connection to Māori identity (i.e. non-Māori), who have the highest level of childlessness, 38.7 per cent, and lowest level of large families, 12.8 per cent.

**Table 5: Average number of children per woman and percentage childless by age groups, 2013 Census**

| Age group | Average # | % Childless |
|---|---|---|
| **Core** | | |
| 15-19 | 0.1 | 90.9 |
| 20-24 | 0.8 | 52.1 |
| 25-29 | 1.7 | 29.0 |
| 30-34 | 2.3 | 20.5 |
| 35-39 | 2.7 | 15.1 |
| 40-49 | 2.8 | 13.7 |
| **Māori +** | | |
| 15-19 | 0.1 | 94.1 |
| 20-24 | 0.6 | 61.8 |
| 25-29 | 1.3 | 36.8 |
| 30-34 | 1.9 | 23.1 |
| 35-39 | 2.2 | 15.3 |
| 40-49 | 2.4 | 12.5 |
| **Descent only** | | |
| 15-19 | 0.0 | 96.9 |
| 20-24 | 0.4 | 73.3 |
| 25-29 | 0.9 | 50.9 |
| 30-34 | 1.5 | 32.1 |
| 35-39 | 1.8 | 20.4 |
| 40-49 | 2.0 | 17.3 |
| **Non-Māori +** | | |
| 15-19 | 0.0 | 98.1 |
| 20-24 | 0.2 | 84.8 |
| 25-29 | 0.6 | 63.7 |
| 30-34 | 1.2 | 38.5 |
| 35-39 | 1.7 | 22.1 |
| 40-49 | 1.9 | 16.9 |

Source: Statistics New Zealand customised data, 2013.

**Figure 3: Proportion of women (ages 30–34) by family size, 2013 Census**




Source: Statistics New Zealand customised data, 2013.

## *The roles that occupy women: Education and child-bearing*

The inverse association between education and fertility is one of the most extensively and frequently observed relationships in empirical studies of fertility (Cochrane, 1979; Diamond, Newby, & Varle, 1999; Michael, 1973). Women pursuing education tend to delay childbearing, and/or have fewer children (Bledsoe et al., 1999; Michael, 1975). Education is also considered to be a prime factor in conditioning women's roles because it imparts values, aspirations and skills that encourage or facilitate non-familial roles (Rindfuss et al., 1980). With these theories in mind, we look at the education and fertility patterns as shown in Table 6.

**Table 6: Average number of children per woman and percentage childless of women aged 30–34 by highest education level, 2013**

| Highest qualification level | Average # | % Childless |
|---|---|---|
| **Core** | | |
| None | 2.8 | 17.4 |
| School | 2.3 | 19.5 |
| Sub-degree | 2.3 | 20.0 |
| Degree + | 1.6 | 30.8 |
| **Māori +** | | |
| None | 2.6 | 14.0 |
| School | 1.9 | 20.7 |
| Sub-degree | 1.8 | 22.0 |
| Degree + | 1.3 | 36.2 |
| **Descent only** | | |
| None | 2.2 | 18.2 |
| School | 1.5 | 30.9 |
| Sub-degree | 1.5 | 31.4 |
| Degree + | 0.9 | 49.4 |
| **Non-Māori +** | | |
| None | 1.9 | 21.8 |
| School | 1.4 | 30.3 |
| Sub-degree | 1.2 | 35.9 |
| Degree + | 0.9 | 48.8 |

Source: Statistics New Zealand customised data, 2013.

If we reflect on the major fertility differences across the identity categories, we see higher average number of children and lower rates of childless amongst women with no qualifications than those women with a degree or higher. Because of the strong correlation between socio-economic status (especially education) and fertility, it could be argued that fertility differences are driven by education rather than identity. However, looking at the different education levels, we still find major differences across the identification groupings but mostly at the higher education levels. Focusing on those 30–34-year-old women with a degree or higher, the Core grouping still has a higher average number of children per woman (1.6 per woman) and significantly lower rates of childlessness (30.8 per cent) than women categorised in Māori+ and Descent only. Notably, the differentials in childlessness within the Core grouping by education level are much smaller than the internal differences found in both Māori+ and Descent only. This suggests that the progression through higher levels education

has less of an impact on childbearing for women who have "thicker" ties to Māori identity than women who only identify as Māori on the basis of descent.

## Geographical differences in women's childbearing patterns

Global studies of fertility, particularly in Europe and South-East Asia, have highlighted the importance of geographical interpretations of fertility trends and issues. Boyle (2003) argues: "Geographical variations, or the lack of them, matter when we try to understand fertility variations, and place, or context, is important to fertility decision-making" (p. 616). He further highlights that individuals in similar social classes and occupations had very different fertility rates depending on where they lived. Szreter (1996) also theorises the relevance of "communication communities" in shaping fertility behaviours. These are defined as "social networks through which persons acquire, reproduce and negotiate their social and gender identities" (see footnote in Szreter, 2011, p. 79). He also identified that communication communities were strongly related to the unique characteristics of specific towns and other geographical localities (Szreter, 1996, 2011; Szreter & Garrett, 2000). With this in mind, we make a bold assumption that the level of fertility would be higher in spatial areas where there is a greater chance of people being exposed or coming into contact with large communities or networks who share similar socio-cultural identities, and vice versa.

For this undertaking, we look at the fertility outcomes of women aged 30–34 in each grouping by territorial authorities (TAs). However, due to small numbers we have grouped the TAs into three spatial categories based on the population share of Māori (i.e. MEG) living in those areas in the 2013 Census:

- High – TAs with more than 20.0 per cent MEG
- Medium – TAs with 10.0–19.9 per cent MEG
- Low – TAs with less than 9.9 per cent MEG.

**Table 7: Average number of children per woman and percentage childless women aged 30–34 by territorial authorities (TAs) grouped by Māori population share, 2013 Census**

| TA Māori population share | Average # | % Childless |
|---|---|---|
| **Core** | | |
| High | 2.5 | 17.7 |
| Medium | 2.2 | 22.5 |
| Low | 2.0 | 25.8 |
| Total NZ | 2.3 | 20.5 |
| **Māori +** | | |
| High | 2.2 | 16.6 |
| Medium | 1.8 | 24.9 |
| Low | 1.5 | 29.5 |
| Total NZ | 1.9 | 23.1 |
| **Descent only** | | |
| High | 1.7 | 26.3 |
| Medium | 1.4 | 32.9 |
| Low | 1.4 | 37.4 |
| Total NZ | 1.5 | 32.1 |
| **Non-Māori +** | | |
| High | 1.5 | 28.4 |
| Medium | 1.2 | 38.6 |
| Low | 1.1 | 43.2 |
| Total NZ | 1.2 | 38.5 |

Source: Statistics New Zealand customised data, 2013.

The results in Table 7 reflect what we had expected. For every grouping, fertility was higher in areas where Māori comprise at least one fifth of the TA population. In high areas, there was very little difference in childlessness and average number of children between Core and Māori+ women. The effect of geography seemed more marked for Descent-only category, with a much wider range in childlessness than both the Core and Māori+ categories. Descent-only women also shared fertility outcomes similar to non-Māori.

## Conclusion: Does cultural identity make a difference?

The Māori fertility transition brought an end to decades of very high fertility rates, and a convergence towards long-term fertility levels similar to Pākehā/New Zealand European women. However, as recent research has emphasised and re-emphasised, important differences endure. Age-

specific data indicate that Māori women have children earlier and over a longer period. All of this has occurred within a low-fertility context that facilitates and favours low fertility and small families. We considered whether cultural factors might contribute to this phenomenon. As a starting point, we used fertility and Māori identity markers as proxies for culture from the New Zealand Census to test this hypothesis.

So, does cultural identity make a difference to Māori fertility outcomes? This analysis has shown compelling evidence that culture does matter. We found systematic differences in fertility outcomes by Māori cultural identity as measured by expressed identity in the context of the census. These differences were most evident when comparing Māori women with multiple ties to Māori identity markers, and those on the "fringes". These differences were mediated by education and geography. The main take-home point is that there was a consistent gradient, where at the core, fertility was highest and women had more children on average. In contrast, women who expressed singular Māori identity by descent had lowest fertility, fewer children on average, and higher rates of childlessness. Even so, Māori women still had higher fertility outcomes than New Zealand women with no connection to Māori identity.

This research shows that this focus on culture is an important and valid area of research. However, the data presented in this paper indicate that culture only matters to an extent. We acknowledge that this analysis is limited to the concepts, constructs and measures used in the New Zealand Census. In no way can these categories tell us what those cultural values or ideas are that inform attitudes about fertility, and/or shape behaviour. This requires further exploration via qualitative-based methods.

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## Notes

1 Of the OECD, only three countries had higher TFRs than New Zealand (1.9): Israel (3.1), Mexico (2.2), Turkey (2.1).

2 It is important to note here the obvious "break" and "leap" in the Māori TFR data between 1990 and 1997. No figures were available for 1991 to 1996 (see footnotes in Stats NZ, 2017b). We suspect that the leap from 2.2 in 1990 to 2.7 in 1997 is an artefact resulting from broader changes in the collection of ethnicity-based data from "blood quantum" to self-identification during this period (see Kukutai, 2001, 2004, 2012). This change to self-identification was applied to birth registrations from 1995. We also note that since 1991, Māori TFRs are based on the ethnicity of the mother, and were previously based on the ethnicity of the child (see footnotes in Stats NZ, 2017b). This raises a separate question, requiring further examination, about the disjunction between the numerator (all births deemed to be Māori) linked to a denominator that excludes non-Māori mothers, and therefore, an over-estimation of the Māori TFRs. For further details, see Khawaja, Boddington, and Didham (2000).

3 The question has also been included in the 2018 Census.

4 The New Zealand Census also collects information on te reo Māori. Although te reo is a distinctive and enduring marker of collective Māori identity (Ngaha, 2014), it did not make sense to include it as part of expressed Māori identification alongside ethnicity, descent and iwi. A separate analysis was also undertaken to explore fertility differences between Māori women te reo speakers and non-speakers. Preliminary results indicated that there was very little difference in fertility between speakers and non-speakers amongst the Māori Core grouping and Māori ethnic group. Although there were marked differences in other categories, the number of speakers were too small to make any robust conclusions.

5 Te ao Māori translates to the Māori world.

6 For an example that confines an analysis to ages 30–34, see Menken (1985).

7 Used here to mean the average number of children.

8 Those women who "objected to answer" are excluded from the denominator.

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*New Zealand Population Review, 44, 49-84.*


# More Pensioners, Less Income Inequality? The Impact of Changing Age Composition on Inequality in Big Cities and Elsewhere

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## Abstract

As is the case in most developed countries, the population of New Zealand is ageing numerically and structurally. Population ageing can have important effects on the distribution of personal income within and between urban areas. The age structure of the population may affect the distribution of income through the life-cycle profile of earnings but also through the spatial-temporal distribution of income within the various age groups. By decomposing New Zealand census data from 1986 to 2013 by age and urban area, this paper examines the effects of population ageing on spatial-temporal changes in the distribution of personal income to better understand income inequality (measured by the Mean Log Deviation index) at the urban area level. We focus explicitly on differences between metropolitan and non-metropolitan urban areas. New Zealand has experienced a significant increase in income inequality over the last few decades, but population ageing has slightly dampened this trend. Because metropolitan areas are ageing slower, the inequality-reducing effect of ageing has been less in these areas. However, this urban-size differential-ageing effect on inequality growth has been relatively small compared with the faster growth in intra-age group inequality in the metropolitan areas.

This paper examines the role of changes in age structure of the population on income inequality in New Zealand over the 27-year period from 1986 to 2013. The spatial unit of analysis is the urban area, which captures about 85 per cent of the population. More specifically, we contrast metropolitan with non-metropolitan areas. We compare results

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from two popular approaches – the population decomposition by subgroup approach used in Mookherjee and Shorrocks (1982) and the density decomposition approach of DiNardo, Fortin, and Limieux (1996).

Much previous research on income inequality in New Zealand has used survey data.[1] A disadvantage of using survey data in New Zealand is that the number of observations in a survey is often small, leading to relatively large sampling errors at subnational levels. This limits the extent to which survey data can be used to study subnational income inequality. This limitation of survey data is avoided in the present study by using micro-level data on individuals in urban areas from the six Censuses of Population and Dwellings in New Zealand between 1986 and 2013. We focus specifically on the impact of changes in age structure and age-specific incomes within and between urban areas on the personal distribution of income. This is an important topic because the ageing of the population is expected to accelerate in decades to come.

This paper consistently compares intra- and inter-age group differences in the distribution of income over time and across space. Our focus here is strictly on the measure of gross income provided by census data and excludes other important dimensions of inequality such as differences between individuals in consumption.

Our main finding is that, contrary to studies in some other countries, the ageing of the population in New Zealand has *slowed down* overall inequality growth.[2] We find that this effect is smaller in magnitude in metropolitan areas because these areas remain relatively more youthful. The slower ageing of the population in these large cities has made a small contribution to the faster growing inequality in metropolitan areas vis-à-vis non-metropolitan areas. However, most of the difference in inequality growth between the big cities and other urban areas is due to relatively faster growing inequality *within* specific age groups in metropolitan areas.

Inequality has risen in most of the developed world, especially over the last three decades. The literature suggests that growing inequality is inter alia due to changing patterns of household formation, growing international economic integration through migration, trade and capital mobility, growing unemployment, skill-biased technical change, and institutional factors such as decreasing levels of unionisation and minimum wages. Most studies have found that economic factors are the

biggest drivers of growing income inequality,[3] but demographic factors have played a role as well.[4]

New Zealand stands out among the developed countries as having seen the relatively fastest growth in inequality, particularly during the structural and economic reforms of the late 1980s and early 1990s.[5] Changes in income inequality in New Zealand have been well documented.[6] At the subnational level, rapid inequality growth in the two largest metropolitan areas of Auckland and Wellington stands out (Alimi, Maré, & Poot, 2016). This is largely in line with the rest of the developed world where large metropolitan areas are often areas with high – and fast-growing – dispersion of income.[7] We examine here whether ageing of the population has played a role in rising income inequality and what role spatial differences in age composition have had in this context.

In New Zealand, only few studies have examined the distributional impact of changes in the age composition of the population and these studies did so at the national level.[8] The relationship between population ageing and inequality is not clear a priori. The impact of population ageing on the income distribution is uncertain due to the possibility of opposing within-age and between-age effects (von Weizsäcker, 1996). Spatially, the age structure will have effects on both intra-area and inter-area inequality, as areas often have different age profiles. Bigger areas tend to have a greater share of young people. This may mean a higher intra-area inequality, particularly when accounting for post-compulsory education and family formation. At the same time, 'prime aged' workers in the large cities have higher average incomes due to agglomeration and productivity effects. Generally, population size is positive correlated with inequality.[9] In contrast, areas that possess amenities that attract retirees may have lower intra-area inequality due to the relatively narrow dispersion of incomes among retirees.[10] New Zealand offers a relatively generous universal pension of roughly half of median income to all citizens and most other residents aged 65 and over. Hence retirement migration from big cities to lower average income areas lowers intra-area inequality in the retirement areas and increases intra-area inequality in the big cities. Retirement migration may also contribute to changing inter-area inequality. However, the nature of the relationship between age structure and income inequality is blurred by the fact that the underlying dynamics of changing age structure can be complex and dependent on the relative impacts of natural

increase and migration on age composition. Additionally, the way in which migration impacts on income inequality will be strongly dependent on the type of migration.[11]

The paper proceeds as follows: Section 2 reviews the literature on ageing and inequality, Section 3 discusses the two decomposition techniques that are used to analyse spatial-temporal changes in income inequality in New Zealand, Section 4 describes the data and reports the results, and Section 5 concludes.

## Literature review

The patterns of ageing and of income inequality in New Zealand have been well documented at both the national and subnational levels: Jackson (2011) and Johnson (2015) provide descriptive accounts of changes in age structure at the national and subnational levels; Perry (2014, 2015), and Easton (2013) provide evidence of the long-run upward trend in inequality at the national level; and Karagedikli, Maré, and Poot (2000, 2003), Martin (1998, 2000), Pool et al. (2005) and Alimi et al. (2016) provide a subnational analysis of income inequality trends at the regional council level. The relationship between population ageing and the distribution of income has long been examined in the literature, alongside other socio-demographic influences on inequality.[12] However, very few studies use formal theoretical foundations to link ageing to the distribution of income. Notable exceptions are Deaton and Paxson (1994, 1995) and von Weizsäcker (1996). Deaton and Paxson (1994, 1995) use the implications of the permanent income hypothesis to show that income inequality increases as the population ages while von Weiszäcker (1996) examines the role of the public transfer system. He concludes that the effect of ageing on population is ambiguous and distinguishes several channels with opposing effects through which ageing may affect the distribution of income.

Most of the recent research on this topic has been empirically oriented. Fortin, Lemieux, and Firpo (2011) provide a review of adopted methodologies and emphasise the decomposition approaches that have become common in the literature.

Just as the theory suggests, empirical evidence on the relationship between changes in the age structure and the distribution of income has been mixed, although most studies find that population ageing increases

income inequality.[13] Nonetheless, some studies find a very small effect or no effect at all. Barrett, Crossley, and Worswick (2000) focused on 1975–1993 consumption and income inequality in Australia and concluded that the ageing of the population had played only a minor role in growing inequality. Fritzell (1993) examined data from five countries (Canada, Germany, Sweden, UK and USA) and concluded that changes in age distribution or changes in family composition cannot explain changes in inequality in these countries. Jantti (1997) came to similar conclusions when examining data from the Luxembourg Income Study on Canada, the Netherlands, Sweden, UK and USA.

The varied evidence from empirical studies is not surprising. As earlier identified by Lam (1997), any conflicting results on the role of age structure on income distribution can be due to variations between studies in the relative strength of between-group effects and within-group effects. The combined effect of the two depends on which effect is stronger. This may vary across populations.

In New Zealand, few studies to date have examined the effects of age structure on income inequality. Martin (1998, 2000) and Pool et al. (2005) provide descriptive evidence on the distribution of income for various age groups. Martin (2000) uses census data from 1986 to 1996 and calculated medians and inter-quartile ranges to describe changes in the distribution of income across age groups and gender at the subnational level. The study shows that income in New Zealand follows the typical age life-cycle profile with incomes highest in the prime working ages of 25–54 before decreasing. The study also shows that spatial disparity in income is highest at the prime working age group of 25–54 and lowest in the 15–24 group. Pool at al. (2005) conducts a similar analysis and focuses on subnational incomes by age group, sex and ethnicity. Using census data between 1986 and 2001, they examine the distribution of personal income between New Zealand regions. Using measures such as medians and quartiles that have been standardised for age composition, their results confirm previous analysis from Martin (1998, 2000) and affirm the overwhelming dominance of Auckland and Wellington regions in terms of income levels.

Hyslop and Maré (2005) examined the factors contributing to changes in the New Zealand distribution of income between 1983 and 1998. Using the density decomposition approach of DiNardo et al. (1996),

they examined the role of household structure, national superannuation (old age pension), socio-demographic attributes (which include number, age, sex, ethnicity and education levels of adults in the household, together with the numbers of children in various age groups), employment outcomes, and economic returns to such attributes. They found that changes in household structure and socio-demographic attributes were the major factors contributing to changes in the income distribution in New Zealand (each contributing around one-sixth of the overall increase in the Gini coefficient). Changes in household structure tended to raise the top end of the income distribution while lowering the bottom end. Changes in household socio-demographic attributes also widened the distribution of income, particularly at higher incomes.

Ball and Creedy (2015) analysed income and expenditure data from 1983 to 2007 and found that the age and gender composition of the population was important for understanding inequality. However, Aziz et al. (2015) show, using the New Zealand Treasury's microsimulation model to forecast demographic changes that are expected over the next 50 years, that population ageing and expected changes in labour force participation by themselves do not have a significant impact on aggregate income inequality. Our present study is similar to earlier work by Hyslop and Maré (2005), but instead of taking a national approach and examining the role of several economic and socio-demographic factors using survey data, we take a subnational approach and focus exclusively on the spatial-temporal role of the age structure on the distribution of income.

## Decomposition methods

We use two popular approaches in the literature – the decomposition by population subgroup approach of Mookherjee and Shorrocks (1982) and the semi-parametric density decomposition method of DiNardo et al. (1996) – to examine different ways in which changes in the age structure could affect the aggregate distribution of income at the urban area level. We use both methods to analyse the inter-temporal effect of changes in the age structure nationally as well as spatially across metropolitan and non-metropolitan areas between 1986 and 2013.[14] There are two ways in which age structure can affect the distribution of income:

- *The composition effect (or the age shares effect)*: This reveals how much of a role the population composition of an area plays in observed inequality. It is the effect on inequality of differences in the shares of different age groups for given mean incomes at various ages.
- *The age-specific income distribution effect*: This examines the effect of differences in the age-specific income distribution on observed inequality for a given age composition of the population.

For both effects, we consider changes over time and across places.

We focus on the class of Generalised Entropy (GE) measures of inequality due to their desirable property of permitting the expression of overall inequality as a weighted sum of sublevel inequalities. Within this class, we use the Mean Log Deviation (MLD) index as our measure of inequality because the MLD weights the inequality measure for a group by the group's population share. Hence MLD provides a direct evaluation of the effect of changes in age composition. One alternative GE measure is the Theil index of inequality which weights groups by income share. In the present context of analysing the impact of changes in demographic composition, the MLD is the more natural and more easily interpretable index.

MLD can be defined as:

$$MLD = \sum_{a=1}^{A} \sum_{j=1}^{J} \frac{N_{ja}}{N} log \left( \frac{\frac{Y}{N}}{\frac{Y_{ja}}{N_{ja}}} \right) \equiv \sum_{a=1}^{A} \sum_{j=1}^{J} \pi_{ja} log \left( \frac{1}{r_{ja}} \right)$$

The aggregate income of all those in age-group $a$ and income bracket $j$ is $Y_{ja}$. $N_{ja}$ is the population in age-group $a$ and income bracket $j$. $N = \sum_{a=1}^{A}\sum_{j=1}^{J} N_{ja}$ is the overall population. Total income in the economy is $Y = \sum_{a=1}^{A}\sum_{j=1}^{J} Y_{ja}$. Relative income in age group a is $r_a = \sum_{j=1}^{J} \pi_{ja} r_{ja}$ where $r_{ja}$ is $= \frac{\mu_{ja}}{\mu}$. We denote average income in the economy by $\mu = \frac{Y}{N}$, average income of age-group $a$ by $\mu_a = \frac{Y_a}{N_a}$, and relative income of age group $a$ by $r_a = \frac{\mu_a}{\mu}$. Population share in each age group $a$ is $\pi_a = \frac{N_a}{N}$, and population share in age-group $a$ and income bracket $j$ $\pi_{ja}$ is $\frac{N_{ja}}{N_a}$.

Overall, MLD can then be decomposed into the sum of within-age-group inequality and between-age-group inequality:

$$MLD = \sum_{a=1}^{A} \pi_a MLD_a + \sum_{a=1}^{A} \pi_a log\left(\frac{1}{r_a}\right)$$

where $\sum_{a=1}^{A} \pi_a MLD_a$ is the age-group-weighted sum of within-age-group inequality and $\sum_{a=1}^{A} \pi_a log\left(\frac{1}{r_a}\right)$ the age-group-weighted sum of the logarithm of the inverse of age-group-relative income (i.e. between-age-group inequality). It should be noted that such decompositions hold also true for any other mutually exclusive and collectively exhaustive classification, such as gender and location. The decomposition can also be applied hierarchically; for example, when overall income inequality is decomposed by age and sex.

When gauging a change in overall inequality over a given period, equation (2) clearly shows that there are three contributing factors: firstly, changes in the age-group shares (structural population ageing); secondly, changes in inequality within each age group; and thirdly, changes in the age-group-relative incomes (for example, due to changes in the life-cycle profile of earnings). It is easy to see that a change in the MLD can be expressed exactly as follows:

$$\Delta MLD = \underbrace{\sum_{a=1}^{A} \overline{\pi_a} \Delta MLD_a}_{\substack{aggregate\ change\ in\ within-age-group\ inequality\ for\ given\ age\ shares \\ C1}} + \underbrace{\sum_{a=1}^{A} \overline{MLD_a} \Delta \pi_a}_{\substack{aggregate\ change\ in\ within-age-group\ inequality\ due\ to\ changing\ age\ shares \\ C2}} + \underbrace{\sum_{a=1}^{A} \overline{\log\left(\frac{1}{r_a}\right)} \Delta \pi_a}_{\substack{aggregate\ change\ in\ between-age-group\ inequality\ due\ to\ changing\ age\ shares \\ C3}} + \underbrace{\sum_{j=1}^{J} \overline{\pi_a} \Delta \log\left(\frac{1}{r_a}\right)}_{\substack{aggregate\ growth\ in\ age-group\ relative\ income\ for\ given\ age\ shares \\ C4}}$$

in which a bar over an expression represents the simple arithmetic average of the variable over the two periods; i.e. $\overline{x} = \frac{1}{2}(x_{t-1} + x_t)$.

Component $C4$ in equation (3) represents the aggregate impact on inequality of growth (the change in natural logarithmic values) in age-group-specific mean incomes, but *relative* to overall mean income. Mookherjee and Shorrocks (1982) argue that it is more natural to think of growth in the *levels* of age-group-specific mean incomes rather than growth in relative incomes. For this reason, they replace equation (3) by a decomposition that holds only approximately, but which explicitly includes age-specific mean income growth:[15]

$$\Delta MLD \approx \underbrace{\sum_{a=1}^{A} \overline{\pi_a}\Delta MLD_a}_{\substack{aggregate\ change\ in\ within-age-group\ inequality\ for\ given\ age\ shares \\ C1}} + \underbrace{\sum_{a=1}^{A} \overline{MLD_a}\Delta\pi_a}_{\substack{aggregate\ change\ in\ within-age-group\ inequality\ due\ to\ changing\ age\ shares \\ C2}}$$

$$+ \underbrace{\sum_{a=1}^{A} (\overline{r_a} - \overline{logr_a})\Delta\pi_a}_{\substack{aggregate\ change\ in\ between-age-group\ inequality\ due\ to\ changing\ age\ shares \\ C3'}}$$

$$+ \underbrace{\sum_{a=1}^{A} (\overline{\pi_a r_a} - \overline{\pi_a})\Delta \log \mu_a}_{\substack{aggregate\ growth\ in\ age-group\ mean\ income\ for\ given\ age\ shares \\ C4'}}$$

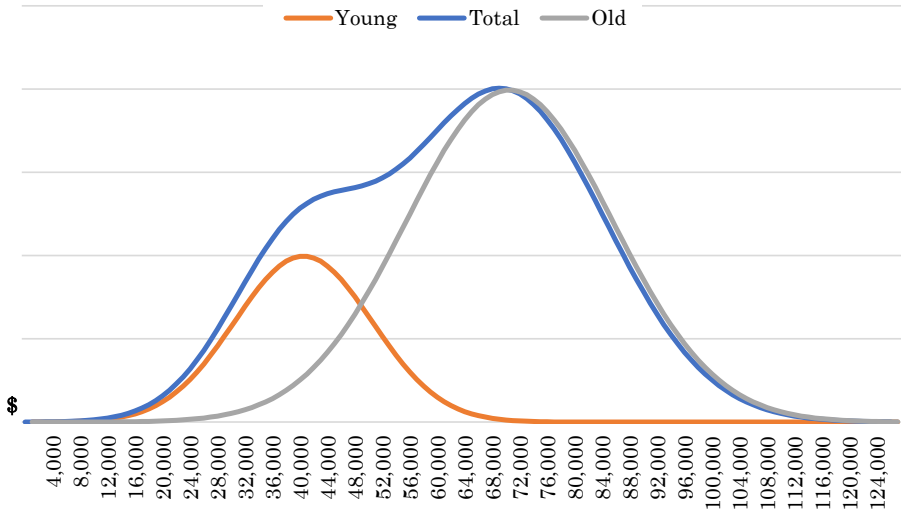
In the next section we will report results by using this approximate decomposition given in equation (4).

The second decomposition method considers the income distribution as a density which may have a different shape for different age groups. Inequality is quantified by a dispersion measure applied to a given distribution of income of individuals or households. Besides the MLD measure of inequality described above, common alternative dispersion measures are the Gini coefficient, Theil index, the Coefficient of Variation, etc. We can quantify the effect of any change in the shape of the distribution of income by any of these inequality measures. DiNardo et al. (1996) consider it useful to decompose overall change in inequality into a contribution from *within-group* inequality change, calculated for a counterfactual income distribution in which population composition is assumed to have stayed the same, and a contribution from *between-group*

change, calculated for a counterfactual income distribution at which inequality within groups is assumed to remain the same.

One advantage of this approach is that it provides in our context a visual representation of the roles of the age-composition effect and the age-specific distribution effect, respectively. Let $f_Y(y;x) = \int f_{Y|X} dF_X$ represent the general distribution of income with respect to personal characteristic $X$. The integral sign is used to depict aggregate income with respect to attribute $X$ that can be quantified by continuous variables. When $X$ is a discrete variable, such as an age group, the corresponding expression is $f_Y(y;x) = \sum f_{Y|X}\, \varphi_X$ where $\varphi = Prob(X = x)$.

**Figure 1: Hypothetical income distribution in an urban area U, showing total and age-specific distributions for young and old people**




The impact of age structure on change in the overall distribution of income in $U$ could be through a composition effect; i.e. through changes in $Prob(A = a)$ or through changes in the age-specific conditional distribution of income $f^U_{Y|A}$. To calculate both effects, we employ a benchmarking approach. To proceed we will need to introduce some notation and keep in mind the application to New Zealand Census data from 1986 until 2013. The beginning census year of the study (1986) will be compared with the last census year (2013).

We now define:

- $f_Y^{N86|N86} = \sum f_{Y|A}^{N86}\, \pi_a^{N86}$ represents the actual 1986 national distribution of incomes based on the 1986 conditional age-specific distributions $f_{Y|A}^{N86}$ and the 1986 shares of people in each age group $\pi_a^{N86}$. Similarly, $f_Y^{N13|N13} = \sum f_{Y|A}^{N13}\, \pi_a^{N13}$ represents the corresponding 2013 distribution of income.
- $\check{f}_Y^{N13|N86} = \sum f_{Y|A}^{N13}\, \pi_a^{N86}$ represents a 2013 counterfactual distribution, based on the 2013 age-specific conditional distribution of incomes but 1986 shares of people in each age group; i.e. $\check{f}_Y^{N13|N86} = \sum f_{Y|A}^{N13}\, \pi_a^{N86} = \sum f_{Y|A}^{N13}\, \pi_a^{N13}.\frac{\pi_a^{N86}}{\pi_a^{N13}}$.

Changes in inequality over time can either be attributed to changes in the age composition effect or due to changes in the age-specific conditional distribution of income. The role of changes in age composition between 1986 and 2013 can be calculated by comparing the 2013 original distribution $f_Y^{N13}$ with the counterfactual distribution $\check{f}_Y^{N13|N86}$ which is based on 2013 age-specific conditional distribution of incomes but 1986 shares of people in each age group; i.e. the difference is $f_Y^{N13} - \check{f}_Y^{N13|N86}$. The $\check{f}_Y^{N13|N86}$ holds changes in the age-specific conditional distribution over the period constant so any differences between the actual 2013 distribution and this counterfactual distribution are due to the changes in age composition. Since the population aged between 1986 and 2013, this will estimate the effect of the ageing of the population on the income distribution.

The effect of changes in the age-specific conditional distribution between 1986 and 2013 will be calculated by comparing the counterfactual distribution $\check{f}_Y^{N13|N86}$ with the 1986 original distribution; i.e. by calculating $\check{f}_Y^{N13|N86} - f_Y^{N86}$. Since $\check{f}_Y^{N13|N86}$ is based on the 1986 age structure, any difference between this distribution and the 1986 distribution is due to the changes in the age-specific conditional distribution.

This benchmarking approach provides an alternative way of decomposing the change in inequality measured by the MLD index. Here we can write changes in income inequality between 1986 and 2013 as:

$$\Delta MLD_{13-86} = MLD(f_Y^{N13}) - MLD(f_Y^{N86})$$
$$= \underbrace{\left[MLD(f_Y^{N13}) - MLD\left(\check{f}_Y^{N13|N86}\right)\right]}_{Age\ composition\ effect}$$
$$+ \left[\underbrace{MLD\left(\check{f}_Y^{N13|N86}\right) - MLD(f_Y^{N86})}_{Age-specific\ distribution\ effect}\right]$$

This is a very simple way of decomposing the change in the *MLD* index into two parts: the first part shows the contribution of the changing age composition for given age-specific conditional inequality while the second component shows how much, for a given age distribution, the change in age-specific conditional inequality contributed to the overall change.

Finally, it should be noted that the calculation of the effect of the changing age composition on inequality can be done separately for every urban area. Of particular interest is, then, the extent to which the age composition effects play a greater or lesser role in explaining inequality change in certain areas and whether the sign of the age composition effect (positive or negative) is the same in all areas. Here we simply consider the distinction between metropolitan and non-metropolitan areas.

There are certain limitations to the density decomposition approach. Firstly, it follows a partial equilibrium analysis: we calculate the effect on inequality if the population composition changes but age-specific distributions remain the same, or vice versa. Hence this approach ignores the *interaction* between these two effects: changes in population composition can in general equilibrium of the economy also affect the age-specific distribution of income, and vice-versa, through migration and labour market adjustments.

Another limitation, which is a characteristic of all decomposition methods, is that such methods do not contribute to understanding the various economic mechanisms through which ageing affects inequality. Instead, decomposition provides simply an accounting framework that allows us to quantify the relative magnitude of the impact of compositional change.

## Data and results

### *Data on personal income*

All data used are from the six New Zealand Censuses of Population and Dwelling from 1986 to 2013. The population is limited to people aged 15 and above who are earning positive incomes. Age data are available by single year of age. However, because we are interested in the broad trend of structural population ageing and to allow for a description of change that does not become too unwieldy, we collapse all ages into four age groups: 15–24, 25–44, 45–64 and those 65 years and over.[16]

The income data represent total personal income before tax of people earning positive income in the 12 months before the census night.[17] It consists of income from all sources such as wages and salaries, self-employment income, investment income and superannuation. It excludes social transfers in kind, such as public education or government-subsidised health care services. Instead of recording actual incomes, total personal incomes are captured in income bands in each census with the top and bottom income bands open ended. For example, the top band in the 2013 census data captures everybody earning $150,000 and over. An important issue with the open-ended upper band is the calculation of mean income in the open-ended band. At the national level this is not a problem as Statistics New Zealand publishes an estimate of the midpoint of the top band for the country based on Household Economic Survey (HES) estimates. However, HES top-band mean incomes for subnational areas are not reliable due to sampling errors. To resolve this problem, Pareto distributions have been fitted to the upper tail of the urban-area specific distributions. We use the Stata RPME command developed by von Hippel et al. (2016).

### *Changes in the age distribution of the population*

Population ageing is a key feature of the changes in the New Zealand age structure between 1986 and 2013. Jackson (2011) identified increasing longevity and declining birth rates as the main drivers of this trend. The patterns of ageing have been well described nationally and sub-nationally. Plenty of studies have examined the implications of an ageing population on the labour force, government revenues and economic growth (see

Jackson, 2011; Stephenson & Scobie, 2002; McCulloch & Frances, 2001). Spatially, attention has been given to examining the impact of accelerated ageing of the rural areas and the role of rural-urban migration in driving this change. Here we focus on differences between metropolitan and non-metropolitan areas in ageing. Table 1 shows the trends in population composition by age groups for metropolitan and non-metropolitan areas, and for all urban areas combined, from 1986 to 2013.

The ageing of the population between 1986 and 2013 is very clear. Nationally (all urban areas combined), the proportion of the population in the youngest age group 15–24 declined from 22 per cent in 1986 to 14 per cent in 2013, while for the oldest age group, 65+, the proportion increased from 15 per cent to 18 per cent. By 2013, the proportion of the population in the oldest age group exceeded that in the youngest age group.

There is disparity across urban areas in the patterns of ageing. Non-metropolitan areas age more rapidly. In 1986, metropolitan and non-metropolitan had almost the same proportion of people in the youngest age group, 15–24, (around 22 per cent), but by 2013 the proportion in non-metropolitan areas had fallen by about 9 percentage points while in metropolitan areas it fell by only 7 percentage points. The disparity is even starker when comparing the changes in the oldest age group 65+: the proportion in this group increased by about 2 percentage points in metropolitan areas, compared with a 6-percentage point increase in non-metropolitan areas. Non-metropolitan areas have undergone more rapid ageing and were older on average than metropolitan areas by 2013.

**Table 1: Structural population ageing in New Zealand from 1986 to 2013 (%)**

| Age group | 1986 | 1991 | 1996 | 2001 | 2006 | 2013 |
|---|---|---|---|---|---|---|
| **Metropolitan Areas** | | | | | | |
| 15–24 | 22 | 20 | 19 | 17 | 17 | 15 |
| 25–44 | 39 | 41 | 41 | 41 | 39 | 36 |
| 45–64 | 24 | 24 | 25 | 28 | 30 | 32 |
| 65+ | 14 | 15 | 15 | 14 | 14 | 16 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |
| **Non-Metropolitan Areas** | | | | | | |
| 15–24 | 21 | 18 | 17 | 14 | 14 | 12 |
| 25–44 | 37 | 38 | 38 | 36 | 33 | 30 |
| 45–64 | 25 | 25 | 26 | 30 | 32 | 34 |

| Age group | 1986 | 1991 | 1996 | 2001 | 2006 | 2013 |
|---|---|---|---|---|---|---|
| 65+ | 17 | 18 | 19 | 20 | 20 | 23 |
| All | 100 | 100 | 100 | 100 | 100 | 100 |
| **All Urban Areas Combined** | | | | | | |
| 15–24 | 22 | 19 | 18 | 16 | 16 | 14 |
| 25–44 | 39 | 40 | 40 | 40 | 38 | 35 |
| 45–64 | 24 | 24 | 26 | 29 | 30 | 33 |
| 65+ | 15 | 16 | 16 | 16 | 16 | 18 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

### *Changes in the Mean Log Deviation measure of income inequality*

As noted in the introduction, New Zealand stands out among the developed countries as having seen the relatively fastest growth in inequality in recent decades, particularly during the 1980s and early 1990s. Across all urban areas, inequality grew by about 18 per cent between 1986 and 2013 (see Table 2). It increased in all intercensal periods apart from between 1986 and 1991, and between 2001 and 2006 (see Figure 2). Like the changes in age structure, the changes in income inequality are not the same everywhere. Much like what has been found in other countries, inequality increased more rapidly in metropolitan areas.[18] The metropolitan and non-metropolitan divide had been highlighted in previous New Zealand studies by Karagedikli et al. (2000, 2003), Pool et al. (2005), and Alimi et al. (2016). They found the highest rates of income and inequality growth in the metropolitan areas of Auckland and Wellington. Table 2 shows that metropolitan areas saw a 25 per cent increase in the MLD, as compared with only 2 per cent growth in non-metropolitan areas. It is clear that most of the growth in inequality that happened in New Zealand between 1986 and 2013 was driven by the changes in the metropolitan areas.

**Table 2: Metropolitan versus non-metropolitan growth rates in income inequality**

| | 1986 (MLD) | 2013 (MLD) | Growth 1986–2013 (%) |
|---|---|---|---|
| Metropolitan | 0.3607 | 0.45 | 25 |
| Non-Metropolitan | 0.3563 | 0.3623 | 2 |
| All urban areas combined | 0.3509 | 0.4153 | 18 |

Note: Income inequality is measured by the Mean Log Deviation (MLD) index. To calculate the MLD for all urban areas combined, the Statistics New Zealand Household Economic Survey estimates of national-level mean income in the open-ended top bracket were used, not the estimates of mean income derived from fitting Pareto distributions to the top end of the distribution. This implies that the MLD for all urban areas combined does not perfectly decompose into within-group and between-group contributions equivalent to equation (2).

The 1986–2013 change in MLD displayed in Figure 2 is disaggregated in tabular form into changes in the inequality index for each age group in Table 3. Focusing on the aggregate patterns, but with the same conclusions also true for metropolitan and non- metropolitan areas, within-age-group inequality increased the most between 1986 and 2013 in the 65+ group, closely followed by the 15–24 age group. The within-group measure of inequality for these two groups rose across all urban areas by around 68 per cent and 35 per cent, respectively. The 25–44 group was the only age group to experience a decline in within-group inequality, at around 10 per cent.

**Figure 2: Mean Log Deviation index of income inequality, New Zealand 1986–2013**

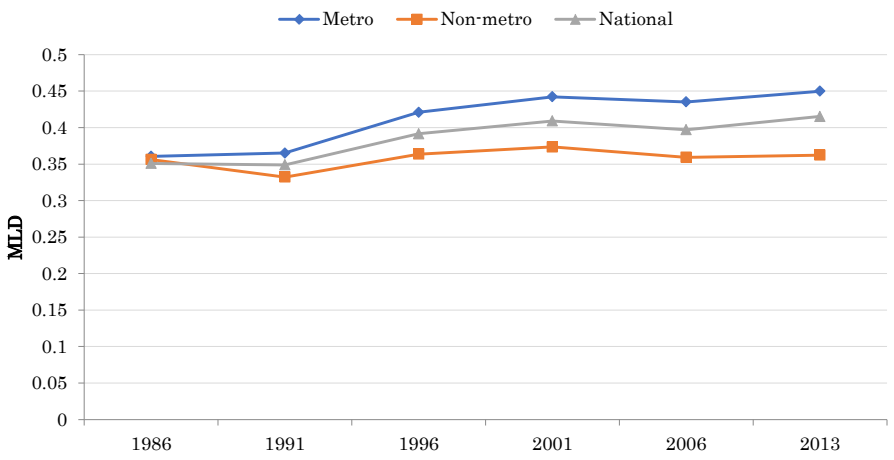


**Table 3: New Zealand income inequality by type of area and age group, 1986–2013**

| | 1986 | 1996 | 2001 | 2006 | 2013 | Change (1986–2013) (%) | Mean |
|---|---|---|---|---|---|---|---|
| **Metropolitan** | | | | | | | |
| **15–24** | | | | | | | |
| MLD | 0.3708 | 0.4305 | 0.4672 | 0.4879 | 0.51 | 38 | 0.4389 |
| *r (%)* | 69 | 50 | 45 | 43 | 39 | −30 | 51 |
| *π (%)* | 22 | 19 | 17 | 17 | 15 | −7 | 18 |
| **25–44** | | | | | | | |
| MLD | 0.3697 | 0.3463 | 0.3528 | 0.3267 | 0.3414 | −8 | 0.3473 |
| r (%) | 119 | 121 | 120 | 117 | 113 | −5 | 119 |
| π | 39 | 41 | 41 | 39 | 36 | −3 | 40 |
| **45–64** | | | | | | | |
| *i* | 0.3197 | 0.3958 | 0.403 | 0.3749 | 0.3972 | 24 | 0.3706 |
| *r (%)* | 117 | 126 | 124 | 127 | 129 | 12 | 123 |
| *π (%)* | 24 | 25 | 28 | 30 | 32 | 8 | 27 |
| **65+** | | | | | | | |
| *i* | 0.1638 | 0.2024 | 0.2352 | 0.2743 | 0.2929 | 79 | 0.2235 |
| *r (%)* | 68 | 60 | 60 | 63 | 70 | 2 | 64 |
| *π (%)* | 14 | 15 | 14 | 14 | 16 | 2 | 15 |
| **Non-metropolitan** | | | | | | | |
| **15–24** | | | | | | | |
| MLD | 0.3805 | 0.4032 | 0.4322 | 0.456 | 0.4881 | 28 | 0.4183 |
| *r (%)* | 73 | 55 | 50 | 52 | 49 | −24 | 57 |
| *π (%)* | 21 | 17 | 14 | 14 | 12 | −9 | 16 |
| **25–44** | | | | | | | |
| MLD | 0.3908 | 0.3191 | 0.3158 | 0.2896 | 0.3083 | −21 | 0.3272 |
| *r (%)* | 118 | 121 | 118 | 116 | 112 | −6 | 118 |
| *π (%)* | 37 | 38 | 36 | 33 | 30 | −7 | 36 |
| **45–64** | | | | | | | |
| MLD | 0.3166 | 0.3559 | 0.3612 | 0.3278 | 0.3274 | 3 | 0.333 |
| *r (%)* | 115 | 123 | 125 | 126 | 126 | 11 | 122 |
| *π (%)* | 25 | 26 | 30 | 32 | 34 | 10 | 29 |
| **65+** | | | | | | | |
| MLD | 0.1498 | 0.1626 | 0.1797 | 0.2044 | 0.2152 | 44 | 0.176 |
| *r (%)* | 71 | 67 | 67 | 67 | 73 | 2 | 70 |
| *π (%)* | 17 | 19 | 20 | 20 | 23 | 7 | 20 |
| **All urban areas combined** | | | | | | | |

| | 1986 | 1996 | 2001 | 2006 | 2013 | Change (1986–2013) (%) | Mean |
|---|---|---|---|---|---|---|---|
| **15–24** | | | | | | | |
| MLD | 0.3733 | 0.4206 | 0.4554 | 0.4779 | 0.5022 | 35 | 0.432 |
| *r (%)* | 71 | 52 | 47 | 46 | 42 | −29 | 53 |
| *π (%)* | 22 | 18 | 16 | 16 | 14 | −7 | 18 |
| **25–44** | | | | | | | |
| MLD | 0.3678 | 0.3303 | 0.3349 | 0.3088 | 0.3309 | −10 | 0.3354 |
| *r (%)* | 119 | 122 | 120 | 119 | 115 | −4 | 119 |
| *π (%)* | 39 | 40 | 40 | 38 | 35 | −4 | 39 |
| **45-64** | | | | | | | |
| MLD | 0.3057 | 0.3617 | 0.3683 | 0.3328 | 0.3559 | 16% | 0.3399 |
| *r (%)* | 116 | 123 | 123 | 124 | 126 | 10 | 121 |
| *π (%)* | 24 | 26 | 29 | 30 | 33 | 8 | 28 |
| **65+** | | | | | | | |
| MLD | 0.1522 | 0.1805 | 0.2069 | 0.2374 | 0.2562 | 68 | 0.1982 |
| *r (%)* | 69 | 62 | 62 | 64 | 70 | 2 | 66 |
| *π (%)* | 15 | 16 | 16 | 16 | 18 | 3 | 16 |

Note: $r$ is relative income and $\pi$ is age-group share of population for given year and area. Both are expressed as percentages in the table.

One factor explaining these trends in within-group income inequality is labour force participation. Among the 15–24 age group, the proportion of those attending tertiary education, and therefore only working part-time and at low wages, has been increasing. Among those aged 65+, labour force participation has been increasing, thus leading to a larger number receiving income over and above New Zealand superannuation. Both trends increase inequality. The proportion of the 65+ age group participating in the labour force full-time in urban areas rose from 3 per cent in 1986 to 11 per cent in 2013. This change led to an increase in the dispersion of income between those mostly relying on superannuation (plus perhaps some income from investments or private pensions) and those still in paid work. The opposite effect happened at the other end of the scale where those in the 15–24 age group experienced a reduction in labour force participation. This is due to an increasing proportion of this group spending more time in education and formal training. The reduction in labour force participation in this group,

especially the reduction in those working full time, contributed to an increase the dispersion of income within the 15–24 age group.[19]

In terms of the life course, inequality is higher within the 15–24 age group than at other ages. Apart from the high inequality in the first age group, and excluding 1986 and 1991, inequality does follow the usual life course pattern suggested in the literature, with increases in income inequality as a specific age cohort ages, until the public pension (New Zealand superannuation) becomes available at age 65.[20]

With respect to relative mean income, the 15–24 age group have seen the biggest drop, irrespective of urban location. Across all urban areas, the relative income of this age group dropped by 29 percentage points, falling from 71 per cent of average income in 1986 to around 42 per cent of 2013 average income. In contrast, the 45–64 and 65+ age groups increased their relative incomes by 10 and 2 percentage points, respectively.

Using equation (2), Table 4 shows how each age group contributes to income inequality measured by the MLD index: within-group inequality makes the largest contribution to total inequality (varying between 83.7 per cent in 2006 and 91.5 per cent in 1986). However, between-age-group inequality is becoming a bigger share of total inequality: its contribution increased from around 8.5 per cent in 1986 to 15.7 per cent in 2013. This is primarily due to the increased divergence in relative mean incomes across age groups.

From 1986 to 2006, the 25–44 age group made the biggest contribution to within-group inequality. The large population share of this group was responsible for this effect (see Table 3). By 2013, however, within-group inequality of the 45–64 age group made the greatest contribution to total inequality, reflecting the combined effect of population ageing and growing inequality within this group. The trends for those aged 15–24 and those aged 65+ provide an interesting contrast. In the 15–24 age group, within-group inequality rose very fast but the diminishing population share of this group reduced their contribution to aggregate within-group inequality over time, whereas for the 65+ group, both within-group inequality as well as population share increased, thereby increasing this group's impact on overall inequality.

The combined effect of changing age-specific relative incomes and changed age-group shares of population can be clearly seen in the middle

panel of Table 4. Incomes in the 25–44 and 45–64 age groups are above average, thereby yielding negative between-group contributions to MLD. The most striking trend is the contribution of declining relative incomes of the young (see also Table 3) to growing overall inequality measured by the MLD.

### *Changes in the density of the income distribution*

We will now proceed with a visual approach to present the contribution of each age group to the overall change in the distribution of income across all urban areas between 1986 and 2013.

**Table 4: Decomposition of MLD into between-age-group and within-age-group components: all urban areas combined**

| | 1986 | 1991 | 1996 | 2001 | 2006 | 2013 |
|---|---|---|---|---|---|---|
| **Within-Age-Group Contribution to MLD:** $\pi_j MLD_j$ | | | | | | |
| **Age group** | | | | | | |
| 15–24 | 0.0816 | 0.0705 | 0.0758 | 0.0729 | 0.0775 | 0.0724 |
| 25–44 | 0.1421 | 0.1372 | 0.1328 | 0.133 | 0.1162 | 0.1147 |
| 45–64 | 0.0744 | 0.0761 | 0.0932 | 0.1051 | 0.101 | 0.1167 |
| 65+ | 0.0231 | 0.025 | 0.0289 | 0.0326 | 0.0375 | 0.0464 |
| Sum | 0.3212 | 0.3088 | 0.3307 | 0.3436 | 0.3322 | 0.3502 |
| **Between-Age-Group Contribution to MLD:** $\pi_j \log(\frac{1}{r_j})$ | | | | | | |
| 15–24 | 0.0749 | 0.0929 | 0.118 | 0.1208 | 0.1244 | 0.1258 |
| 25–44 | -0.0662 | −0.0785 | −0.0788 | −0.0739 | −0.0653 | −0.0485 |
| 45–64 | -0.0358 | −0.0352 | −0.0536 | −0.0579 | −0.0652 | −0.0761 |
| 65+ | 0.0568 | 0.061 | 0.0752 | 0.0765 | 0.0709 | 0.0638 |
| Sum | 0.0297 | 0.0402 | 0.0609 | 0.0655 | 0.0649 | 0.0651 |
| **All Urban Areas Combined MLD** | | | | | | |
| Between as a percentage of total (%) | 8.5 | 11.5 | 15.5 | 16.0 | 16.3 | 15.7 |
| Within as a percentage of total (%) | 91.5 | 88.5 | 84.5 | 84.0 | 83.7 | 84.3 |
| Total | 0.3509 | 0.349 | 0.3916 | 0.4091 | 0.3971 | 0.4153 |

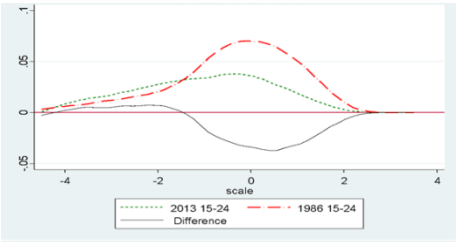
Figure 3 presents the standardised 1986 and 2013 log income distribution for each age group and all urban areas combined. The densities diagrams are standardised by de-meaning all income data by overall average income. The areas under the curves represent the population shares of the age groups. Hence, the overall income distribution in panel E is the sum of the densities A to D and has total density equal to one (as in the stylised example of Figure 1). Overlaying the density diagrams for 1986 and 2013 provides a visual appreciation of the changes in the distribution over time.

Focusing on age groups, the 2013 distribution of the 15–24 age group is wider than the 1986 distribution (see Figure 3, panel A) and this is due to an increase in the number and/or share of people in the bottom of the distribution and a reduction in the middle and top. Panel B shows that changes in the income distribution of those aged 25–44 group have been relatively minor (although they have, given the size of this group, still a major impact on the overall distribution). Panels C and D show the changes in the 45–64 and 65+ age groups, respectively. The distributions for these groups are wider in 2013 than in 1986. The increase in inequality for these groups is predominantly due to an increase in the number of people in the middle and top of the distributions. Panel E pools all age groups together and shows that the overall distribution is wider in 2013 compared with 1986. This change is driven by a 'hollowing out' of the middle of the income distribution, due to more people at both the bottom and top ends of the distribution. Panel F graphs the difference between the 2013 and 1986 distributions by age group.[21] This figure shows clearly how the younger age groups (15–24 and 25–44) have been predominantly responsible for the 'hollowing out at the middle of the distribution.[22]

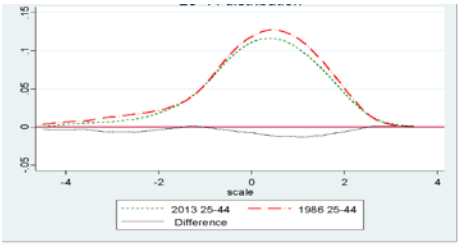
Similar to disaggregating inequality changes by the MLD index, changes in the aggregate income distribution density are due to the combined effect of changes in the number of people at the various age groups and changes in the age-group-specific densities. We will therefore now proceed with calculating the counterfactual densities as outlined in the previous section. Given the counterfactual densities, the change in inequality between 1986 and 2013 can be decomposed by means of the MLD index as given in equation (5).

**Figure 3: A comparison of the 1986 and 2013 income distributions by age group: all urban areas combined**

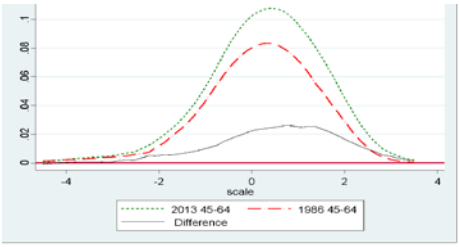
**A. 15-24 distribution**



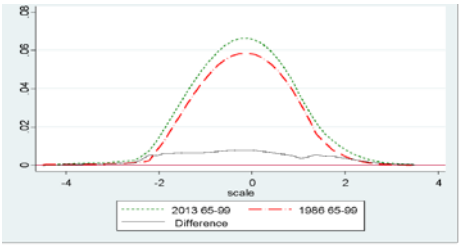

**B. 25-44 distribution**



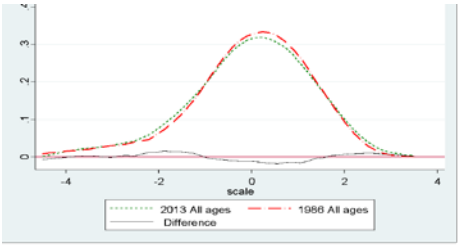

**C. 45-64 distribution**



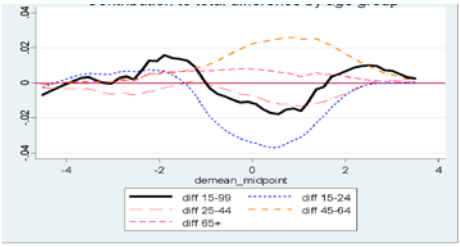

**D. 65+ distribution**




**E. Total**




**F. Contribution to total DIFFERENCE by age group**




Note: Difference = 2013 distribution – 1986 distribution.

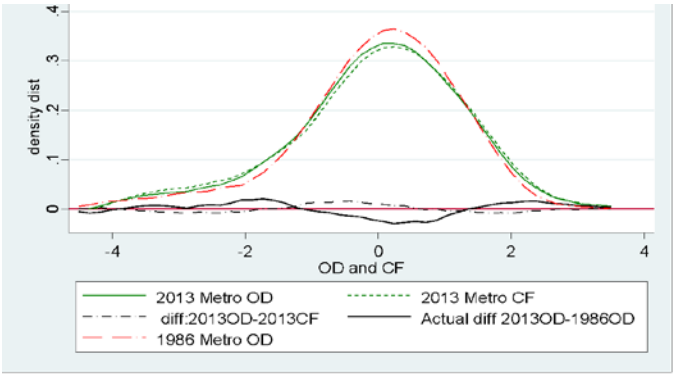
Figure 4 presents the 2013 and 1986 original distributions, the counterfactual distribution (with age distribution fixed at the 1986 shares and within-age-group inequality as in 2013), as well as the differences between them for metropolitan, non-metropolitan and the combined areas.

It shows that the age-composition effects are a very small component of the overall difference between 1986 and 2013. There are only small differences in the shape of the original distribution and the counterfactual distribution. Visually, it is difficult to tell these distributions apart, although the age composition effect in metropolitan areas appears larger and is driven by more people at the top of the distribution in comparison to non-metropolitan areas. In other words, the difference between the original distribution and the counterfactual distribution in metropolitan areas shows a bigger bump at the top of the distribution than for non-metropolitan areas. To quantify the effect of age composition, we report the MLD of the original and counterfactual distribution and the differences between them. Table 5 presents these results.

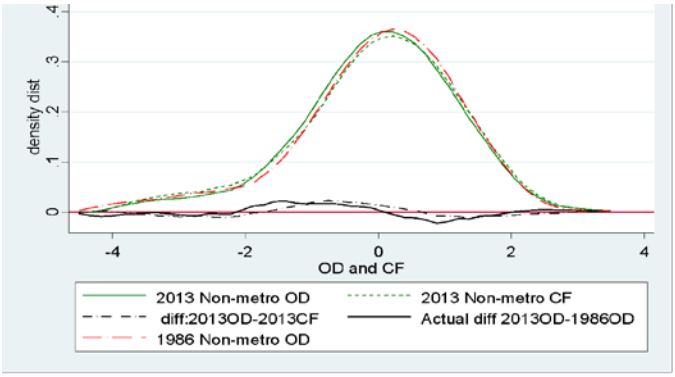
The actual MLDs are of course identical to those in Table 2. In line with the graphical evidence, Table 5 shows that the age-share effect has been relatively small but negative. Hence, had age-specific distributions been the same in 1986 as in 2013, the changes in the age structure from 1986 to 2013 would have led to lower income inequality. Across all urban areas, the changes in the age structure (ageing of the population) reduced the MLD by about 0.0295. In contrast, the age-specific distribution effect was positive and much larger, leading to an overall 1986–2013 increase in the MLD of 0.0939 for all urban areas combined.

**Figure 4: Original and counterfactual income distributions and their differences**

A. 1986 OD, 2013 OD and 2013 CF, Metropolitan Areas




B. 1986 OD, 2013 OD and 2013 CF, Non-Metropolitan Areas




C. 1986 OD, 2013 OD and 2013 CF, National

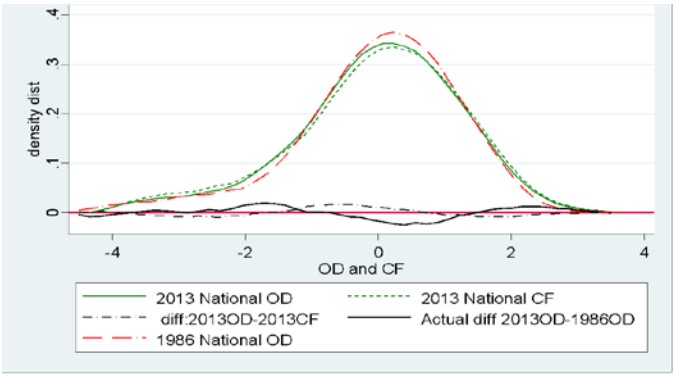


**Table 5: Estimates of age-share and age-specific distributional effects, measured by MLD, using the density decomposition approach**

| | Metropolitan | Non-metropolitan | All urban areas combined |
|---|---|---|---|
| 2013 Distribution (OD) | 0.45 | 0.3623 | 0.4153 |
| 2013 Counterfactual distribution (CF) | 0.4765 | 0.3937 | 0.4448 |
| 1986 Distribution (OD) | 0.3607 | 0.3563 | 0.3509 |
| Total change = 2013OD − 1986OD | 0.0893 | 0.006 | 0.0644 |
| Age share effect = 2013OD − 2013CF | −0.0265 | −0.0314 | −0.0295 |
| Age specific distribution effect = 2013CF − 1986OD | 0.1158 | 0.0374 | 0.0939 |

While ageing has had an inequality-reducing effect overall, the magnitude of this effect varies spatially. This is not surprising giving the spatial variation in the rates of ageing. The faster ageing of the non-metropolitan areas contributed to a larger inequality-reducing age composition effect (−0.0314, compared with −0.0265 in metropolitan areas).

We see from Table 5 that the difference in inequality growth between metropolitan areas and non-metropolitan areas is not fully accounted for by the difference in age composition. The results show that most of the difference in the inequality trends of metropolitan and non-metropolitan areas is due to the much greater age-group-specific inequality growth in the former.

It is easy to reconcile the results based on the MLD decomposition approach with those based on the density decomposition approach. This can be seen from Table 6, which compares the MLD decomposition of equation (4) with the density decomposition of equation (5). Both methods show that population ageing has had income-inequality-reducing effect. The effects are similar, but somewhat smaller in absolute value with the MLD decomposition approach. Had the age-specific income distributions remained the same, the MLD would have decreased by −0.0223 for all urban areas combined (the sum of effects $C2$ and $C3'$ in Table 6). The corresponding quantity from the density decomposition approach is −0.0295. Examination by age group shows that this inequality- reducing effect is driven by the negative contributions of the two younger age

groups. The youngest age group (15–24) has seen rapidly rising within-group inequality but a reduction in the share of this group has contributed negatively to the change in within-group inequality.

**Table 6: Contribution to changes in Mean Log Deviation between 1986 and 2013 by age group**

| | Components of change (see equation 4) | | | | Total Change |
|---|---|---|---|---|---|
| **Age group** | ***C*1** | ***C*2** | ***C*3′** | ***C*4′** | |
| | **Metropolitan areas** | | | | |
| 15–24 | 0.026 | −0.0309 | −0.084 | 0.0248 | −0.0641 |
| 25–44 | −0.0107 | −0.0101 | −0.0286 | 0.0137 | −0.0357 |
| 45–64 | 0.0219 | 0.0289 | 0.0826 | 0.0248 | 0.1583 |
| 65+ | 0.0198 | 0.0041 | 0.0189 | −0.0146 | 0.0282 |
| Sum | 0.0569 | −0.008 | −0.0111 | 0.0488 | 0.0866 |
| | **Non-metropolitan areas** | | | | |
| 15–24 | 0.0181 | −0.0381 | −0.0985 | 0.0123 | −0.1063 |
| 25–44 | −0.0279 | −0.0255 | −0.0737 | 0.007 | −0.12 |
| 45–64 | 0.0032 | 0.0307 | 0.0973 | 0.0178 | 0.149 |
| 65+ | 0.0131 | 0.0119 | 0.0684 | −0.0119 | 0.0816 |
| Sum | 0.0065 | −0.021 | −0.0065 | 0.0252 | 0.0042 |
| | **All urban areas combined** | | | | |
| 15–24 | 0.0234 | −0.0326 | −0.0873 | 0.0209 | −0.0756 |
| 25–44 | −0.0135 | −0.0138 | −0.0401 | 0.0134 | −0.0541 |
| 45–64 | 0.0143 | 0.0279 | 0.0862 | 0.0206 | 0.1491 |
| 65+ | 0.0173 | 0.006 | 0.0313 | −0.0136 | 0.0411 |
| Sum | 0.0415 | −0.0124 | −0.0098 | 0.0413 | 0.0604 |

**Table 6 cont.: Contribution to changes in Mean Log Deviation between 1986 and 2013 by age group**

| | Age-specific distribution effect | Age share effect ($C2 + C3'$) | Density (DFL) age share effect | Contribution to within-equality changes ($C1 + C2$) | Contribution to between-equality changes ($C3 + C4'$) |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| | | | **Metropolitan areas** | | |
| 15–24 | 0.0508 | −0.1149 | | −0.0049 | −0.0592 |
| 25–44 | 0.003 | −0.0387 | | −0.0208 | −0.0149 |
| 45–64 | 0.0467 | 0.1115 | | 0.0508 | 0.1074 |
| 65+ | 0.0052 | 0.023 | | 0.0239 | 0.0043 |
| Sum | 0.1057 | −0.0191 | −0.0265 | 0.0489 | 0.0377 |
| | | | **Non-metropolitan areas** | | |
| 15–24 | 0.0304 | −0.1366 | | −0.02 | −0.0862 |
| 25–44 | −0.0209 | −0.0992 | | −0.0534 | −0.0667 |
| 45–64 | 0.021 | 0.128 | | 0.0339 | 0.1151 |
| 65+ | 0.0012 | 0.0803 | | 0.025 | 0.0565 |
| Sum | 0.0317 | −0.0275 | −0.0314 | −0.0145 | 0.0187 |
| | | | **All urban areas combined** | | |
| 15–24 | 0.0443 | −0.1199 | | −0.0092 | −0.0664 |
| 25–44 | −0.0001 | −0.0539 | | −0.0273 | −0.0267 |
| 45–64 | 0.0349 | 0.1141 | | 0.0422 | 0.1068 |
| 65+ | 0.0037 | 0.0374 | | 0.0233 | 0.0177 |
| Sum | 0.0828 | −0.0223 | −0.0295 | 0.0291 | 0.0315 |

The 25–44 age group experienced a narrowing of their within-group distribution as well as a reduction in their population share. Both have a negative effect on overall within-group inequality. Table 6 shows that the age-specific distribution effect ($C1+C4'$ in equation (4)) and the age share effect ($C2+C3'$) are indeed mostly negative for the 25–44 age group. Interestingly, the metropolitan areas form the exception. In these areas, growth in the mean income of this group relative to growth in overall mean income ($C4'$) more than offsets the reduction in within-age group inequality ($C1$).

The contributions of the 45–64 and 65+ groups are in the opposite direction: changes in both groups contribute to growing inequality. This is because within-group inequality, relative income, as well as population

share increased for both groups between 1986 and 2013. Thus, for both age groups, most components of inequality change are positive. The only exception is the negative component $C4'$ for those aged 65+, despite the growth in this group's mean income.[23]

Taking a spatial view by comparing metropolitan areas to non-metropolitan areas, Table 6 confirms the smaller inequality-reducing age-composition effect in metropolitan areas. This is as expected due to the less rapid rates of population ageing in the metropolitan areas. The population decomposition by subgroup approach shows that the 1986–2013 changes in the age structure in metropolitan areas reduced MLD by about 0.0191, compared with 0.0275 in non-metropolitan areas. As with the national results, we find that most of the growth in inequality is due to changes in the age-specific distribution effect.

Age composition only explains a small part of the difference between the changes in inequality between metropolitan areas and non-metropolitan areas. The increase in the age-specific distribution effect on MLD has been greater in metropolitan areas (0.1057, about three times the corresponding effect in non-metropolitan areas). The almost equal counteracting age-specific and age-composition effects in non-metropolitan areas explain the very small inequality growth in these areas. If the changes in the age-specific income distribution remain relatively small in non-metropolitan areas in the years to come and ageing there accelerates due to continuing net migration to metropolitan areas, then we may expect inequality to decrease or remain constant in non-metropolitan areas in the foreseeable future.

## Conclusion

In this paper, we examined the relationship between age structure and income inequality in New Zealand using two approaches that have proven popular in the literature. We focused on differences between metropolitan and non-metropolitan areas in the two ways in which age structure can affect inequality: an age-composition effect and an age-specific distribution effect. We found that the 1986 to 2013 increase in inequality has been mostly due to the changes in the age-specific income distributions. In fact, the age-composition effect has been negative. Population ageing has served to reduce inequality. However, at the same time, age-specific mean

incomes diverged, at least until 2001, leading to an increasing share of between-group inequality to overall inequality.

In line with previous analyses on inequality and age structure in New Zealand, we found a notable disparity between metropolitan and non-metropolitan areas in the trends in inequality and age structure. Metropolitan areas have experienced rapid growth in inequality but slower rates of ageing (mostly due to net inward migration rather than greater fertility), while non-metropolitan areas have had slow growth in inequality and faster ageing. We also found that the inequality-reducing effect of population ageing (resulting from the declining shares of younger people) varies across areas and is smaller in metropolitan areas. Notwithstanding this differential age-composition effect, our results show that most of the difference between metropolitan and non-metropolitan areas in inequality growth is due to the much greater age-specific income distribution widening in metropolitan areas.

We complemented the decomposition of changes in the MLD index of inequality with a visualisation of changes in density along the income distribution. This revealed a thinning of the density in the middle of the overall distribution, for which the 15–24 and 25–44 age groups were mostly responsible. At the same time, the age group 45–64 added more density to the upper end (right tail) of the distribution, while those aged 15–24 contributed to an increase in density at the lower tail. Together, these changes led to a hollowing out of the distribution.

In this research, we have simplified the analysis of spatial differences in income inequality by adopting a metropolitan versus non-metropolitan dichotomy. In future work, we intend to use a more refined spatial disaggregation of areas, as well as examine the role of other population composition effects on inequality, such as effects due to country of birth and migrant status, household type and education. Jointly, this may provide further in-depth insights into how population ageing impacts on mean incomes and income inequality across regions and cities.

Finally, the approach adopted in this paper is a cross-sectional one, comparing four different age groups over time and across areas. Our analysis did not follow a cohort approach in which income inequality within age groups is measured over their life course by means of successive censuses. For example, in Table 3 we can compare the MLD of those aged 25–44 in 1986 with the MLD of those aged 45–64 in 2006, who are largely

the same people (except for the effects of mortality and migration). Such an approach to income inequality has been remarkably rare in the literature (but see, for example, Osberg, 2003). There is also at present considerable interest in the extent to which the current generation of young persons may not be able to accumulate wealth over a lifetime to the extent that their parents did, due to the former facing lower real income growth and lesser access to homeownership (e.g. O'Conner, 2018). It is clear that a cohort approach to income inequality in a spatial setting will be a fruitful avenue for further research.[24]

### Disclaimer

Access to the data used in this study was provided by Statistics New Zealand (SNZ) under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. All frequency counts using Census data were subject to base three rounding in accordance with SNZ's release policy for census data.

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## Notes

1 See, for example, Hyslop and Maré (2005) and Ball and Creedy (2015).

2 For example, studies like Deaton and Paxson (1994) and Cameron (2000) found that population ageing increases inequality.

3 See, for example, Castells-Quintana, Ramos, and Royuela (2015) for a review of the literature of the trends and determinants of income inequality in Europe.

4 See, for example, Cameron (2000), Zhong (2011) and Peichl, Pestel, and Schneider. (2012).

5 See Evans et al. (1996) for a description of these reforms.

6 See Perry (2014, 2015), Karagedikli, Maré, and Poot (2000, 2003), Martin (1998, 2000), Pool et al. (2005) and Alimi, Maré and Poot (2016).

7 See OECD (2016).

8 See Hyslop and Maré (2005) and Ball and Creedy (2015).

9 A 2016 OECD report that examines 153 metropolitan areas in 11 countries finds that inequality in metropolitan areas is higher than the national average in all countries apart from Canada (OECD, 2016 p. 33).

10 It is acknowledged that there are likely to be considerable differences in the income distribution of persons aged 65–74 as compared with those aged 75+. One reason for this is the increasing labour force participation of persons aged 65–74. However, the inequality measurement applied in this paper is best suited to rather broad age groups. In our analysis, we will therefore consider all those aged 65 and over as belonging to one age group. A more refined analysis of income inequality among older persons would a fruitful topic for further research.

11 Given that migrants are predominantly young, net inward migration contributes to the relative youthfulness of the big cities. However, a study of the effects of migration on the income distribution would need to take into account the differential effects of net permanent and long-term migration (which is, on average, more skilled than the local labour force and, like student migration, disproportionally towards the metropolitan areas) and temporary migration (which is less skilled and more attracted to non-metropolitan areas). The explicit analysis of the effects of migration on income inequality is beyond the scope of the present paper.

12 See Lam (1997) for a review of the literature that examines the role of demographic variables (including changes in age structure) on income inequality.

13 See, for example, Mookherjee and Shorrocks (1982), Cameron (2000), Zhong (2011), Peichl et al. (2012) and Lin et al. (2015).

14 Metropolitan areas are defined here as urban areas that make up the six largest New Zealand cities (in order of size) of Auckland, Wellington, Christchurch, Hamilton, Tauranga and Dunedin. All other urban areas are considered non-metropolitan areas.

15 Mookherjee and Shorrocks (1982) note that this approximation appears sufficient for computational purposes (p. 897). It is clear that C3′ – C3 = $\sum_{a=1}^{A} \bar{r}_a \Delta\pi_a$. Experimentation with a range of changing income distributions shows that the sign of $C3$ can be sometimes different from that of $C3'$ and, similarly, the sign of $C4$ can be different from that of $C4'$. This may lead to slightly different interpretations. In this paper, we follow Mookherjee and Shorrocks (1982) and use the approximate decomposition. Results for the exact decomposition are available upon request.

16 We acknowledge that the process of population ageing is not a smooth trend. Instead, age group sizes and shares are affected by large changes in fertility and migration in the past. Such fluctuations can impact on changes in absolute and relative incomes of age groups. The presence of disordered cohorts can have significant policy implications (see, for example, Pool, 2005). However, the effects of such disordered cohorts on metropolitan and nonmetropolitan income inequality are beyond the scope of the present paper.

17 Hence people not in paid employment and business owners reporting a loss have been excluded.

18 See OECD (2016).

19 The labour force participation rate for those aged 15 to 24 declined from 76 per cent in 1986 to 61 per cent in 2013, with full-time employment falling by even more at 40 percentage points.

20 New Zealand Superannuation is the public pension paid to all residents over the age of 65 (immigrants must have resided in the country for 10 years or longer). Any eligible New Zealander receives NZ Super regardless of how much they earn through paid work, savings and investments, what other assets they own or what taxes they have paid. NZ Super is indexed to the average wage. The after-tax NZ Super rate for couples (who both qualify) is based on 66% of the 'average ordinary time wage' after tax. For single people, the after-tax NZ superannuation rate is around 40 per cent of that average wage.

https://www.workandincome.govt.nz/eligibility/seniors/superannuation/payment-rates.html

21 The graphs in panel F are scaled. To calculate the scaled age group contribution to total difference, the density of each age group in each year is scaled by their respective income share.

22 This hollowing out of the income distribution is not necessarily evidence of a 'vanishing middle class' phenomenon that has been reported for the USA and other developed countries (e.g. Foster and Wolfson, 2010). To investigate a vanishing middle-class phenomenon would require a comparison of lifetime income across population groups rather than a comparison of age-specific income. This is beyond the scope of the present paper.

23 This is due to the approximation method. For this age group, $(\overline{\pi_a r_a} - \overline{\pi_a}) < 0$. See equation (4).

24 We are grateful to an anonymous referee for suggesting this extension to the research presented in this paper.

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# Te Pae Mahutonga and the Measurement of Community Capital in Regional Aotearoa New Zealand

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## Abstract

Regionally, iwi and hapū have limited influence over structural changes such as population decline, proximity to labour markets and ageing, and to some extent economic cycles. However, there is still considerable value in thinking about how relevant indicators might point to the regeneration and overall well-being of Māori communities. In this paper we present an exploratory framework that links Durie's Te Pae Mahutonga model of Māori well-being to the measurement of community capital. We use Te Pae Mahutonga as the basis for developing a number of key indicators for understanding Māori well-being in the regions and apply the framework and indicators to three regional settlements in Aotearoa New Zealand: Pōkeno, Huntly and Ōpōtiki.

The rural-to-urban migration of indigenous peoples during the twentieth century has been recognised as a worldwide phenomenon (Del Popolo et al., 2007; United Nations, 2007, 2010). Factors influencing this migration have included the dispossession of traditional lands, lack of employment opportunities in rural communities, mechanisation of agriculture, deterioration of traditional livelihoods and perceived better living opportunities in cities. However, many of those who move to urban areas also face significant disadvantages such as lack of employment, inadequate housing, racial discrimination and erosion of language, culture and identity (Gandhi & Freestone, 2008; Pestieau & Wallace, 2003; Robson & Harris, 2007; Sandercock, 2003).

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For Māori, the migration from rural to urban areas accelerated following World War 2 and has been recognised as one of the most rapid internal migrations by a population globally (Barcham, 1998; Kukutai, 2011, 2014). This was partly due to concerted efforts by the New Zealand government to encourage Māori to move to urban centres to boost employment for post war industry. Policies and incentives included offers of accommodation, employment and additional social assistance (Barcham, 1998; Meredith, 2000). Both rural and urban Māori experienced significant disadvantage as a result of this migration and this disadvantage was compounded by government policies that had the effect of dispersing Māori families and discouraging Māori from speaking te reo in schools and workplaces. Such policies resulted in "the atrophy of traditional Māori social structures such as whānau (extended family) and led to a profound degradation of cultural, social and physical living environments" (Waa et al., 2014, 5). Today, both urban Māori and rural Māori experience poorer health outcomes compared with other New Zealanders, disproportionately feel the effects of economic recession, receive poorer education, and are less able to access quality housing (Robson & Harris, 2007).

As Ryks, Waa, and Pearson (2016) show, any discussion of the spatial distribution of the Māori population would not be complete without a deeper understanding of the distribution of mana whenua and mātāwaka. *Mana whenua* are those iwi (tribe) or hapū (sub-tribe) that traditionally inhabited an urban area and who retain mana (traditional authority) over the whenua (land). Mana whenua are often incorporated as legally recognised *rūnanga* (iwi councils), and in larger cities and across regions there may be more than one mana whenua iwi. *Mātāwaka* are non-mana whenua Māori migrants (and descendants) who have moved away from their traditional homes. Mātāwaka can be further disaggregated into those who continue to actively associate with their iwi (often called *taura* here) and those who, through decision or circumstance, no longer do so.

The mana whenua experience has largely been one of disenfranchisement from the material, social and political resources that enabled them to determine how to live and thrive in their communities. Over recent decades there has been some redress of these injustices and in many cases resources have been returned, although only a small proportion of what was held in pre-colonial times.

## Towards an exploratory framework

Much has been written about the decline of smaller settlements and the factors affecting regional growth in Aotearoa New Zealand. (For a recent overview, see Spoonley, 2016.) Less has been written about how Māori are affected by regional-level change (although see Simmonds, Kukutai & Ryks, 2016), and how Māori well-being might be measured across different social, economic, environmental and cultural domains. While regionally, iwi and hapū have limited influence over structural changes such as population decline, proximity to labour markets, ageing and, to some extent, economic cycles, there is still considerable value in thinking about how relevant indicators might point to the regeneration and overall well-being of Māori communities. In this paper we present an exploratory framework that links Durie's Te Pae Mahutonga model of Māori well-being to the measurement of different types of community capital and infrastructure. We use this framework as the basis for developing a number of key indicators for understanding Māori well-being in the regions and apply the framework and indicators to three regional settlements in Aotearoa New Zealand: Pōkeno, Huntly and Ōpōtiki.

This project is part of a stream of research activities being undertaken within the National Science Challenge 11: Building Better Homes, Towns and Cities (Ministry of Business, Innovation and Employment, 2016). While it is beyond the scope of this paper to discuss the wider research stream in detail, two other research projects complement the indicator work introduced here – one qualitative project where we are working closely with iwi groups in the Pōkeno, Huntly and Ōpōtiki regions to understand iwi and community-level priorities for regional development, and the other the development of a data visualisation platform for iwi, where customised iwi and population-level data (the focus of which is decided by iwi) is able to be utilised by iwi groups to assist them in their decision-making. Combined, these three projects aim to give voice to how Māori well-being is measured regionally, something that is important at a time when the New Zealand government is exploring different approaches to understanding and measuring well-being (The Treasury, 2018) and the collection of Māori-specific data through official statistics is being questioned (Te Mana Raraunga, 2018).

In this way, our work is at the intersection of different interests and priorities in the measurement of Māori well-being.

## Indigenous indicator frameworks and Taylor's (2008) recognition space

In 2004, the United Nations Permanent Forum on Indigenous Issues (UNPFII) highlighted that the United Nation's Millennium Development Goal (MDG) indicators should be assessed with a view to incorporating greater recognition of indigenous concerns, interests and interpretation of development and well-being (United Nations, 2004). The UNPFII went on to convene a series of workshops that focused on the need for a conceptual framework for rights-based indicators to ensure that data collected would be relevant to indigenous peoples. One of the issues identified in these workshops was the difficulty in identifying single indicators, given the diversity of indigenous societies. This work is separate to, but aligned with, work undertaken as part of the United Nations Declaration on the Rights of Indigenous People (UNDRIP) Indigenous Navigator project, which is specific to the documenting of violations and scheduled implementation of UNDRIP and uses structural, process and outcome indicators to determine the well-being of indigenous communities (UNSDN, 2016).

Taylor (2008) suggests that the UNPFII's concern with the appropriateness of the MDG indicators needs to extend to the potentially negative consequences of mainstream measures of indigenous well-being and that it "illustrates that a range of indigenous views on the appropriateness of various indicators are likely to exist and that, in all probability, these will stand outside, and therefore be excluded from more mainstream frameworks" (p. 112). In response to the single indicator issue identified at the UNPFII workshops and the potentially negative consequences of mainstream measures of indigenous well-being, Taylor (2008, p. 116) calls for a "recognition space" where policy makers and indigenous people can seek to build meaningful engagement and measurement (Figure 1).

**Figure 1: Taylor's recognition space**


Source: Taylor, 2008, p. 116

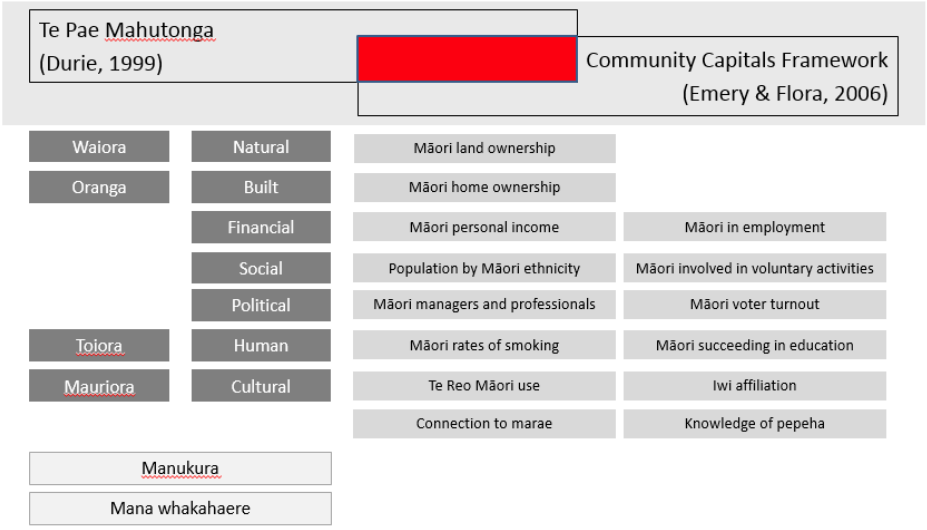
Taylor's recognition space provides a useful mechanism for thinking about how a measurement framework and appropriate indicators could be developed to understand Māori well-being. The development of these indicators could draw on relevant kaupapa Māori frameworks, but also be informed by government reporting frameworks and the collection of official statistics. This novel recognition space potentially provides a more accurate understanding of Māori well-being than either type of framework on its own.

Kukutai and Taylor (2012) suggest that there are ways where this recognition space can be further enhanced and give examples of where official social statistics can be 'indigenised' to better meet the needs of indigenous communities and organisations. They argue that research that attempts to operationalise the recognition space offers the opportunity for the 'historically fraught relationships between demography and indigenous development to be productively re-forged when indigenous peoples are placed at the centre, rather than the periphery, of the research process' (Kukutai & Taylor, 2012, p. 10).

This is where our exploratory research finds its place. Much like Kukutai and Taylor (2012), in which a city-specific framework for Tamaki Makaurau (Auckland), underpinned by five core Māori values, is presented,[1] we propose a regional-level framework that uses Durie's (1999)

Te Pae Mahutonga model of Māori well-being and Emery and Flora's (2006) Community Capitals Framework (CCF), to present indicators for three smaller settlements. These models not only recognise Māori, but also place Māori at the centre through the use of indigenised social statistics. We propose aligning Te Pae Mahutonga and CCF to create a recognition space for Māori and wider community perspectives of well-being, and as a starting point for indicator development. Figure 2 shows how the domains of Te Pae Mahutonga might be mapped onto different levels of community capital and how both frameworks might be used to inform the development of relevant indicators (introduced in more detail later in this paper).

**Figure 2: Aligning Te Pae Mahutonga and the Community Capitals Framework**




## Te Pae Mahutonga

Durie (1999) developed Te Pae Mahutonga as a framework for mental health, and health promotion, utilising Māori perspectives of well-being that were set against the imagery of the constellation known as Te Pae Mahutonga, or the Southern Cross. As a constellation, Te Pae Mahutonga is known for its use as a navigational aid, and as a tool to guide thinking about community well-being from a Māori perspective.

Te Pae Mahutonga consists of six stars: four forming a cross, and two pointing toward the cross formation. As a model of Māori well-being,

this depicts four goals of health promotion and two pointers that orient actors toward the four goals.

The four goals of Te Pae Mahutonga represent the aspirations and outcomes of mauriora, waiora, toiora and te oranga. *Mauriora* represents inner strength, vitality and identity, and recognises that there are many factors that determine cultural identity as a prerequisite to well-being. Consequently, deculturation is associated with poor health and acculturation with good health (Durie, 1999). *Waiora* represents external well-being in connection with the physical and spiritual environment (Durie, 1999). *Toiora* refers to lifestyles, and health and safety so that people have the capacity to live a full human experience. Unlike the previous two goals, toiora is largely dependent on personal behaviours and choices but recognises that environmental factors can affect these choices (Durie, 1999). *Te Oranga* acknowledges the sociocultural elements of well-being, as well as the goods and services that people use that contribute to well-being. Durie (1999) states this more succinctly as well-being being 'dependent on the terms under which people participate in society' (p. 6), but also having equitable access to those goods and services. Kearns, McCreanor and Witten (2005) posit that these four goals 'loosely map into ideas of place as being a recursive relationship between places (Waiora and Toiora) and place-in-the-world (Mauriora and Te Oranga)' (p. 197). While we do not explore this further, we highlight and acknowledge that this relates to other research that explores the distinctly Māori (and indigenous) philosophical notions of orienting oneself in relation to the environment (for example, see Mika, 2017; Panelli & Tipa, 2007; Smith, 2004; Spiller et al., 2017).

Durie (1999) describes ngā manukura and mana whakahaere as prerequisites that cut across all Te Pae Mahutonga domains. He describes *ngā manukura* as a combination of skills and influences exhibited by professionals and community leaders. Kearns et al. (2005, pp. 198–9) extend this further to acknowledge the responsibility of certain actors to work towards aspirations in health and well-being. *Mana whakahaere* refers to autonomy, or the ability of a population or community to have a level of autonomy and self-determination in promoting their own health. This is reflected in their ability to set their own priorities and aspirations (Durie, 1999). Table 1 explains each Te Pae Mahutonga domain in more detail.

**Table 1 - Te Pae Mahutonga domains**

| Domain | Includes |
|---|---|
| **Goals** | |
| **Mauriora**<br>Secure cultural identity | Access to language and knowledge<br>Access to culture and cultural institutions<br>Access to Māori economic resources<br>Access to social resources<br>Access to societal domains |
| **Waiora**<br>Environmental protection | Water free from pollutants<br>Clean air<br>Abundant vegetation<br>Healthy noise levels<br>Opportunity to experience natural environment |
| **Toiora**<br>Healthy lifestyles | Harm minimisation<br>Targeted interventions<br>Risk management<br>Cultural relevance<br>Positive development |
| **Te oranga** Participation in society | Participation in the economy, education, employment, knowledge society and decision-making |
| **Pointers** | |
| **Ngā manukura**<br>Leadership | Community, health and tribal leadership<br>Communication<br>Alliances and collaboration |
| **Mana whakahaere**<br>Autonomy | Control<br>Recognition of group aspirations<br>Relevant processes<br>Sensible measures and indicators<br>Capacity for self-governance |

*Source*: Durie (1999, pp. 6–7).

## Community Capitals Framework (CCF)

Emery and Flora (2006) introduce CCF as an analytical tool to understand community and economic development. It identifies seven components of community capital that, when balanced against each other, generate an upward, self-reinforcing, positive spiral of community and economic development, or a cumulative causation effect where assets grow or decline in self-reinforcing cycles (Emery & Flora, 2006; Flora et al., 2004;

Gutierrez-Montes, 2005). Consequently, where a negative spiral occurs (e.g. loss of jobs) and inadequate investment in capitals, then there is a self-reinforcing negative or downward spiral, highlighted by symptoms such as population decline, poor social cohesion and deteriorated infrastructure (Emery & Flora, 2006). This systems view of community development resonates with thinking about virtuous cycles of development, where human and economic development goes together to create positive regenerative development (Ranis, Steward, & Ramirez, 2007).

In a Māori development context, Smith et al. (2015) highlight divergent trajectories between Māori well-being and Māori development that echoes what Ranis et al. (2007) would call lopsided development (strong economic growth and negative human development).

The CCF comprises seven capitals: natural, financial, built, human, social, political and cultural. Three of these capitals make up the physical and material capitals – natural, financial and built. *Natural capital* includes the environment, natural beauty, landscape, waterways and air. *Financial capital* includes money, grants, philanthropy, funding and wealth. *Built capital* includes buildings, infrastructure, schools, roads, water systems and sewage systems.

The remaining four capitals are human, social, political and cultural. *Human capital* refers to people's skills, abilities, leadership and ability to access resources. Health is often included as a form of human capital as health is a key component of an individual's welfare and standard of living and has a direct influence on human capability and behaviour (Becker, 2007). *Social capital* refers to groups, organisations, networks, sense of belonging and bonds between people. *Political capital* includes connections to people in power, access to resources, leverage and influence. *Cultural capital* includes ethnicity, generations, histories, traditions, spirituality and heritage.

## A place-based approach

To ground the development of our indicator framework and our use of Te Pae Mahutonga and CCF, our exploratory study is focused on three settlements in the North Island of Aotearoa New Zealand: Pōkeno, Huntly and Ōpōtiki. These settlements were chosen as they represent communities that are in different stages of economic and social

development, have a diverse and changing population, and continue to be important to Māori. All three settlements have changes or proposed changes to their economic infrastructure: Pōkeno has new housing development and business infrastructure; Huntly has the proposed decommissioning of its power station and the building of a nationally significant motorway; and Ōpōtiki has a proposal for harbour development.

Furthermore, all three settlements are within the rohe (boundaries) of iwi that have well-established iwi authorities: Pōkeno and Huntly have Waikato-Tainui, while Ōpōtiki has Te Whakatohea Māori Trust Board.

Pōkeno was an important site during the New Zealand Wars of the 19th century. The settlement later became a small rural hub, and then as a township that was bypassed from the country's main state highway in 1992, was held up as an example of a declining rural Aotearoa New Zealand. Since then, Pōkeno has been transformed with the development of a Chinese milk-processing plant and large-scale housing subdivisions as the Auckland commuter zone has extended to the area.

The impact of this transformation is clearly seen by the substantial change in Pōkeno's population size and structure. Although relatively small, Pōkeno has grown significantly over the past decade from a population of 1770 in 2006/07 to 2780 in 2016/17, an increase of 57 per cent (Statistics New Zealand, 2017a). Its population is projected to increase to around 5800 in 2028 (Statistics New Zealand, 2017a). The Māori ethnic group (MEG) residing in Pōkeno comprises nearly 15 per cent of the town's total residents.

Huntly is positioned in the central part of the Waikato District. Aotearoa New Zealand's main highway, State Highway 1, currently cuts through Huntly, making it a thoroughfare to Auckland city (approximately 95 kilometres) or Hamilton city (approximately 32 kilometres). However, population growth and economic development within the "golden triangle" has seen the Government invest heavily in the transport corridor through the development of the Waikato Expressway that aims to enhance the connection between Auckland, Waikato and Bay of Plenty. This transport corridor will eventually bypass Huntly with construction of the Huntly bypass, expected to be completed in 2020.

The Waikato River naturally delineates two demographically and socio-economically distinct communities within Huntly: Huntly West and

Huntly East. Together, Huntly's estimated resident population grew by 14.1 per cent between 2006/07 and 2016/17, from 7070 to 8070 (Statistics New Zealand, 2017a). The MEG represents nearly 45 per cent of Huntly's population.

Ōpōtiki is a small coastal town in the Eastern Bay of Plenty and serves as the main hub for the district of the same name. The town is also a vital link to one of the most remote areas of the North Island, the East Cape (State Highway 35), and to Gisborne via Waioeka Gorge (State Highway 2). In recent years, Ōpōtiki has seen greater investment in kiwifruit, harbour development and the commercialisation of a mussel farm (Whakatōhea Māori Trust Board, 2017). Overall, the population of Ōpōtiki district has declined, though somewhat irregularly over the past decade, from 9160 in 2006/07 to 9010 in 2016/17 (Statistics New Zealand, 2017a). Over half (approximately 55 per cent) of the population are Māori.

Like many other areas in New Zealand, all three settlements are ageing numerically, as more people survive to older ages, and structurally, as falling birth rates and reducing numbers at key reproductive ages deliver fewer babies into the base of the age structure. Our focus on Pōkeno, Huntly and Ōpōtiki as places of research interest extends to the wider research stream described earlier, where qualitative interviews are being undertaken with iwi and hapū groups, and a data visualisation platform is being developed alongside the indicator work presented here.

## Selecting and using indicators

By using a conceptual framework that aligns Durie's (1999) Te Pae Mahutonga and Emery and Flora's (2006) CCF, it was possible to think about how relevant and available data could be mapped against the framework. The development of a suite of indicators required that several criteria be met. For this research, we employed a range of criteria to ensure that our approach was robust and reliable. Indicators needed to be:

- relevant to the social outcome or domain of interest– the indicator should be the most accurate statistic for measuring both the level and extent of change in the social outcome of interest, and it should adequately reflect what it is intended to measure (i.e. it should be valid)
- grounded in research– there should be sound evidence on key influences and factors affecting outcomes

- able to be disaggregated – ideally, it should be possible to break the data down by age, sex, socio-economic status, ethnicity, family or household type and region, so we can compare outcomes for different population groups
- consistent over time – the indicator should be able to be defined and measured consistently over time to enable the accurate monitoring of trends
- statistically sound – the indicator uses high-quality data and the method used to construct it is statistically robust
- timely– data should be collected and reported regularly to ensure indicators are providing up-to-date information (Ministry of Social Development, 2010).

More specifically, our selection of indicators needed to adequately represent and connect with all the domains of our conceptual framework. In some instances, such as the mauriora/cultural capital domain, there was sufficient available data to work with. In other outcome domains such as waiora/natural capital, there was less relevant data available, resulting in fewer indicators in these domains. This is something that we have identified as an area for future development.

The development of indicators is an iterative process. As new information becomes available and new data is released it may be possible to refine the type and number of indicators used. For this research it was expected that data from the 2018 New Zealand Census of Population and Dwellings would be used when available but as Te Mana Raraunga (the Māori Data Sovereignty Network) have pointed out, there are concerns about the validity and reliability of the results of the census for the Māori population and that Census 2018 may yet turn out to be the poorest quality enumeration of Māori in recent history due to the fact that "full or partial information has only been received for about 90 percent of individuals, compared with 94.5 percent for the 2013 Census" (Te Mana Raraunga, 2018). With these issues in mind, Table 2 presents our exploratory framework and shortlisted indicators. The table also illustrates the source of information for the data and the rationale for why each indicator was chosen.

## Approach used to populate framework

Data used to populate the framework came from four sources; a Geographic Information Systems (GIS) shapefile of Māori land ownership was obtained from the Ministry of Justice; data on voter turnout in the Māori electorates of Hauraki-Waikato and Waiariki was obtained from the Electoral Commission; information about Māori knowledge of pepeha and connection to marae in the Waikato and Bay of Plenty regions came from Statistics New Zealand's first survey on Māori well-being, Te Kupenga; and data for all other indicators was sourced from the 2006 and 2013 censuses.

**Table 2: Exploratory framework and shortlisted indicators**

| Te Pae Mahutonga Domain | Community capitals domain | Indicator (Source) | Why use this indicator? |
|---|---|---|---|
| Waiora - environmental protection | Natural capital | Māori land ownership (Ministry of Justice) | An increase in land owned by Māori may reflect land accorded through Treaty Settlements and therefore a new resource/asset for iwi and hapū at a regional level. Not likely to show major change over time. |
| Te Oranga - participation in society | Financial capital | Māori personal income (Census) | An increase in personal income for Māori may represent the opportunity to deliver a better quality of life and standard of living to individuals and whānau, and the community more widely. |
| | | Māori in employment (Census) | Paid work is a primary determinant of living standards for the great majority of New Zealanders. Paid work is also an important way for people to participate in society, attain social status and enjoy a sense of social connectedness. |
| | Built capital | Māori home ownership (Census) | Home ownership is a good measure of wealth accumulation and housing is |

| Te Pae Mahutonga Domain | Community capitals domain | Indicator (Source) | Why use this indicator? |
|---|---|---|---|
| | | | also shown to provide a range of social benefits. |
| | Social capital | Population by Māori ethnic group (Census) | An increase in the Māori population for a region could suggest natural growth or Māori returning to the regions. |
| | | Māori involved in voluntary/ unpaid activities (Census) | An increase in participation in voluntary and unpaid activities is an indicator of increasing social capital. It may also relate to cultural obligations. |
| | Political capital | Māori managers and professionals (Census) | Shows that Māori are influential in business and decision making. |
| | | Māori voter turnout (Electoral Commission) | Shows willingness to engage and participate in civil society. |
| Toiora - healthy lifestyles | Human capital | Māori rates of smoking (Census) | Smoking is measured because of its negative effects on health and because it is a major risk factor for many cancers and for respiratory and cardiovascular disease. Historically, rates of smoking for Māori are twice as high as the average overall. This indicator is a good proxy for Māori health in the region. |
| | | Māori succeeding in education (Census) | Māori success in tertiary education is an important indicator of skill and knowledge acquisition. |
| Mauriora - secure cultural identity | Cultural capital | Te reo Māori use (Census) | Māori language is central to Māori culture and an important aspect of cultural participation and identity. |
| | | Connection to marae (Te Kupenga) | Indicates knowledge of ancestral marae and |

| Te Pae Mahutonga Domain | Community capitals domain | Indicator (Source) | Why use this indicator? |
|---|---|---|---|
| | | | connection to it. |
| | | Knowledge of iwi affiliation (Census) | An important measure of Māori identity |
| | | Knowledge of pepeha (Te Kupenga) | Provides a good indicator of Māori identity by measuring knowledge of marae tipuna; maunga; awa, moana; hapū; tipuna, tupuna; waka |

Unfortunately, the above data were not all available at the same spatial extent. Voter turnout information covered the Hauraki-Waikato and Waiariki Māori electorates, data from Te Kupenga covered the Waikato and Bay of Plenty regions, and Māori land ownership data and census data is available at Census Area Unit (CAU) level. While our analysis primarily focuses on the CAU level, it also incorporates this regional-level data. It must be noted that actual rates of voter turnout, knowledge of pepeha, and connection to marae is not specific to Pōkeno, Huntly and Ōpōtiki but rather the regions within which they are located.

The first Te Kupenga survey was carried out in 2013, so there is no 2006 comparison available for the indicators based on this data. The Māori land ownership indicator represents 2017 levels of Māori-owned land, and the change in size of Māori-owned land between 2006 and 2017. It does not measure change in ownership amongst Māori or whether Māori landowners in each area are mana whenua or mātāwaka. Although data on Māori voter turnout are available for the past two elections, they do not align with the dates of the past two censuses and so the results of this indicator in relation to other indicators should be interpreted with caution. The communities of Pōkeno and Ōpōtiki are located within a single CAU. However, Huntly is divided into Huntly East and Huntly West, so for the purposes of this study, we have combined census data from these two CAUs in order to represent Huntly as one settlement. While our framework can be used for the fine-grained analysis of settlements at the CAU level in most instances, results should be treated with caution in

areas where the MEG population is small. For these areas, regional analyses may be more accurate until additional data is made available or issues of undercounting are resolved. Appendix 1 provides more detailed information about how each indicator was used and the limitations of each indicator.

In terms of future reporting, the lack of a regular data series across most of the reported indicators means that it is not possible to update the indicators on a more frequent basis. Of the 14 reported indicators, 12 can be updated later this year through the release of the 2018 New Zealand Census of Population and Dwellings (albeit affected by the issues already mentioned), while voter turnout can be updated in 2020. It is unclear when information about Māori land ownership will be updated.

## Limitations of the framework

The measurement framework presented here is an "environmental" or "state" indicator framework rather than representing an approach for measuring or evaluating specific initiatives. The framework is not a tool for measuring specific regional initiatives or policies and programmes. This is because there will be a number of other drivers contributing to Māori well-being in the regions, including the actions of Māori as individuals, whānau, hapū and iwi, and a wide range of social, economic and international factors.

There are limitations with our alignment of Te Pae Mahutonga and CCF. Te Pae Mahutonga was formulated as a high-level approach to understanding the health and well-being of Māori, whereas CCF was developed as an analytical tool to understand community development. We believe that this difference in purpose is a strength of our approach as both have a focus and interest in understanding and measuring community well-being. The use of Te Pae Mahutonga offers a Māori-specific focus on well-being while the use of CCF offers a fine-grained analysis of community development and regeneration.

Our alignment of Te Pae Mahutonga and CCF in Table 2 is not exact. For example, it could be argued that while the Māori rates of smoking indicator can be mapped to the Toiora domain of Te Pae Mahutonga, it is not an indicator of human capital. However, others (e.g. Becker, 2007) have long argued that health should be considered a form of

human capital alongside education, training and migration. In this sense, the Māori rates of smoking indicator is a good fit for our exploratory framework. There is also potential for other indicators to be added to the Toiora/human capital domain as new data becomes available. In other parts of the framework where we have stated that there is an absence of quality data for a particular indicator, we see this as a potential (and valid) gap in the collection of relevant information rather than a limitation of the combined frameworks.

## What the indicators show

The results for all indicators and their change over time is displayed in Table 3. It shows change across each indicator between different time periods for Māori in each of our three case-study communities, as well as the overall national average for Māori. For Pōkeno, the population of Māori (in the MEG) increased from 2006 to 2013 (17.4 per cent compared with the national average increase of 5.9 per cent), and there was an increase in Māori reporting high levels of personal income (a 13.6 percentage point increase from 2006 to 2013 compared with an increase of 7.9 per cent increase nationally over the same period). In fact, more than half of the indicators in the Te Oranga domain (incorporating built, financial, social and political capital) showed an increase on 2006 levels. However, there have also been decreases in Māori home ownership (−12 per cent from 2006 to 2013 compared with −2 per cent nationally over the same period) and volunteering (−7.7 per cent from 2006 to 2013 compared with 0.4 per cent nationally over the same period). Furthermore, there was a decrease in more than half of the Toiora (human capital) and Mauriora (cultural capital) indicators during the same period – although it must be noted that for the knowledge of pepeha and connection to marae indicators, only 2013 data are currently available. Overall, of the indicators with 2006 and 2013 data available, less than half showed positive change which suggests that while some aspects of Te Oranga may have increased for Māori in Pōkeno, there has also been a decline across several key indicators between 2006 and 2013.

**Table 3 – Indicators for Pōkeno, Huntly and Ōpōtiki compared with the national average**

| Indicator | Pōkeno | Huntly | Ōpōtiki | Aotearoa New Zealand |
|---|---|---|---|---|
| **Te Pae Mahutonga domain: Waiora** | | | | |
| Community Capital domain: Natural | | | | |
| Māori land ownership (hectares) * | 2483 | 3767 | 17,720 | 1,413,403 |
| % change between 2006 and 2017 | 1.5 | 3.4 | 0.07 | 5.0 |
| **Te Pae Mahutonga domain: Te Oranga** | | | | |
| Community Capital domain: Built, financial, social, political | | | | |
| Population of Māori ethnicity | 243 | 3021 | 2121 | 598,602 |
| % change between 2006 and 2013 | 17.4 | 6.7 | −11.4 | 5.9 |
| Māori personal income (% in top bracket) ** | 27.1 | 12.0 | 9.7 | 18.1 |
| % point difference between 2006 and 2013 | 13.6 | 5.0 | 4.9 | 7.9 |
| Māori home ownership (%) | 36.7 | 20.6 | 29.1 | 28.2 |
| % point difference between 2006 and 2013 | −12.0 | −4.1 | −3.6 | −2.0 |
| Māori involved in volunteer activities (%) | 16.7 | 25.7 | 24.9 | 19.8 |
| % point difference between 2006 and 2013 | −7.7 | 1.0 | −0.5 | 0.4 |
| Māori managers and professionals (%) | 22.6 | 20.9 | 27.4 | 29.5 |
| % point difference between 2006 and 2013 | 3.3 | 1.1 | 1.1 | 3.9 |
| Māori voter turnout *** | 67.3 | 67.3 | 68.9 | 71.1 |
| % point difference between 2014 and 2017 | 3.2 | 3.2 | 4.2 | 3.5 |
| **Te Pae Mahutonga domain: Toiora** | | | | |
| Community Capital domain: Human | | | | |
| Māori who have never smoked (%) | 48.0 | 37.1 | 37.4 | 44.2 |
| % point difference between 2006 and 2013 | −2.0 | 1.1 | 2.4 | 5.5 |
| Māori in employment (%) | 89.2 | 74.8 | 81.7 | 84.4 |
| % point difference between 2006 and 2013 | −7.2 | −6.5 | 0.1 | −4.6 |
| Māori succeeding in education (%) | 8.2 | 9.1 | 11.8 | 16.3 |
| % point difference between 2006 and 2013 | 0.3 | 0.9 | 3.1 | 3.2 |

| Indicator | Pōkeno | Huntly | Ōpōtiki | Aotearoa New Zealand |
|---|---|---|---|---|
| **Te Pae Mahutonga domain Mauriora** | | | | |
| Cultural | | | | |
| Iwi affiliation (%) | 70.9 | 86.4 | 93.2 | 82.9 |
| % point difference between 2006 and 2013 | −8.1 | −0.8 | −0.9 | −0.5 |
| Te reo Māori use (%) | 15.0 | 32.3 | 31.7 | 21.3 |
| % point difference between 2006 and 2013 | −5.3 | −2.5 | −0.5 | −2.4 |
| Knowledge of pepeha (%) ※ | 89.0 | 89.0 | 91.4 | 89.0 |
| % point difference between 2006 and 2013 | n/a | n/a | n/a | n/a |
| Connection to ancestral marae as tūrangawaewae – very strong (%) ※ | 71.6 | 71.6 | 73.0 | 67.1 |
| % point difference between 2006 and 2013 | n/a | n/a | n/a | n/a |

***** Hectares of Māori owned land within 20 km of each CAU.
****** Results should be treated with caution as although incomes have increased with inflation and a higher minimum wage, the top income bracket has remained static across the 2006 and 2013 censuses.
******* Indicator is at the regional level (Hauraki-Waikato and Waiariki electorates) and for the 2014 and 2017 general elections.
※ Indicator is at the regional level (Waikato and Bay of Plenty regions) and based on results from the 2013 Te Kupenga survey.

In Huntly, the majority of indicators showed positive change. Five of the seven indicators in the Te Oranga domain increased, with the proportion of Māori involved in volunteer activities increasing 1 per cent from 2006 to 2013, and for 2013 being significantly higher than the national average (25.7 per cent versus 19.8 per cent, respectively). Two of the three indicators showed positive change from 2006 to 2013 in the Toiora domain, although 2013 levels were lower for all three indicators compared with the national average. Although rates of iwi affiliation and te reo use did decrease, this was at a similar level to national changes, and rates of both iwi affiliation and te reo use are higher in Huntly than the national average.

In Ōpōtiki, there was an increase in personal income levels from 2006 to 2013 (an increase of 4.9 per cent), the proportion of Māori managers and professionals (an increase of 1.1 per cent), and Māori voter turnout (an increase of 4.2 per cent for the region). However, most

indicators in Te Oranga decreased, and Ōpōtiki is the only of our case-study communities where the population of Māori in the MEG declined (by11.4 per cent). There was positive change in all Toiora indicators, with improved Māori success in education (an increase of 3.1 per cent from 2006 to 2013), a slight increase in rates of employment (up 0.1 per cent from 2006), and an increase in the proportion of Māori who had never smoked (an increase of 2.4 per cent). Although there were very small decreases in rates of iwi affiliation and te reo use (less than 1 per cent) in Ōpōtiki, both of these are above the national average. Overall, seven of the indicators for Ōpōtiki showed positive change.

For Aotearoa New Zealand generally, more than half of the selected indicators showed positive change. With the exception of Māori home ownership, all indicators in Te Oranga have increased, as have the education and non-smoking indicators in the Toiora domain. The proportion of Māori in employment nationally dropped by 4.6 per cent between 2006 and 2013 and this is also reflected in decreases in the employment indicators for each community. The decrease in Māori home ownership reported regionally for Pōkeno, Huntly and Ōpōtiki is higher than the national average decrease and is part of a wider trend in falling home ownership for Māori that Goodyear (2017) discusses in more detail for the period 1986–2013.

## Conclusion

The development of our indicator framework has provided new insights into the well-being of Māori in Pōkeno, Huntly and Ōpōtiki and, when considered as part of the wider programme of research described, has the potential to inform both iwi and government decision-making. Much of the data presented in this paper are regularly and individually reported elsewhere, but it is the combination of indicators presented across multiple domains and against national averages that provides a useful snapshot of Māori well-being, and points to the trajectory and change occurring within each community.

There are interesting differences and similarities across the three communities that will be explored further in the wider research programme and the planned spatial analyses. For example, from 2006 to 2013, Pōkeno had an increase in its Māori population, those earning in the top income bracket, and the number of Māori managers and professional;

these increases were all higher than for Huntly and Ōpōtiki. However, Huntly and Ōpōtiki had much higher participation in voluntary activities, te reo use and knowledge of iwi affiliation than Pōkeno and when compared with the national average. The next phase of our work will be to use the framework, indicators and data presented here as the basis for further analysis to understand such differences, and to query potential spatial relationships at the local, regional and national level in order to understand more about the possible regeneration and reconfiguration of communities.

The framework presented in this paper is exploratory and is intended to be the first step in developing a suite of indicators that can point to the well-being of Māori in smaller settlements such as Pōkeno, Huntly and Ōpōtiki. The further refinement of indicators and the release of new data will improve the reliability of results across Te Pae Mahutonga and community capital domains, albeit with some concerns noted about the release of data from the 2018 New Zealand Census of Population and Dwellings. The research has shown that there is potential to align different measurement frameworks to create a recognition space, where indigenous frameworks are given voice and official statistics are made more relevant to iwi and hapū.

## Notes

1 The framework is underpinned by five core Māori values (whanaungatanga – relationships; rangatiratanga – autonomy and leadership; manaakitanga – to protect and look after; wairuatanga – spirituality and identity; and kaitiakitanga – guardianship).

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## Appendix 1: Notes on the indicators and the data limitations of each indicator

- The change in Māori land ownership from 2006 to 2017 was determined by identifying the size of land parcels that had been recorded by the Māori Land Court after 2006, compared with the size of all Māori-owned land in each area.
- Data from Te Kupenga were derived from a single year so this indicator shows no change over time.
- The change in the rate of Māori voter turnout was assessed in each Māori electorate by subtracting the 2014 turnout rate from the 2017 rate.
- The population of Māori descent in 2006 and 2013 was compared and the percentage change between these two years is displayed in Table 3.
- The Māori personal income indicator is based on the number of Māori earning in the top income band ($50,001 or more) divided by the total number of Māori who answered the income question in the census. This gives the proportion of Māori earning in the top income band. The rate of percentage change since 2006 in Table 3 represents the difference between the 2006 and 2013 levels of each indicator.
- The Māori home ownership indicator represents the proportion of Māori who owned or partly owned their usual residence.
- The Māori involved in volunteer activities indicator represents the proportion of Māori involved in "Other helping or voluntary work for or through any organisation, group or marae".
- The Māori managers and professionals indicator represents the number of Māori managers plus the number of Māori professionals compared with the total number of working-age Māori who answered this census question.
- The Māori rates of smoking indicator represents the proportion of Māori who have never smoked.
- The Māori in employment indicator is based on the total number of Māori employed divided by the total number of Māori in the labour force for each CAU.
- The Māori succeeding in education indicator represents the proportion of Māori with qualifications at level 5 and above.
- The iwi affiliation indicator represents the proportion of Māori affiliated with at least one iwi.
- The te reo Māori use indicator represents the proportion of Māori speaking te reo Māori.

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# Beyond the RSE: Systems of Pacific Labour Migration to New Zealand

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## Abstract

The Recognised Seasonal Employer Scheme (RSE) has brought almost 70,000 Pacific workers to New Zealand since its launch in 2007, mainly to work in agricultural sectors such as horticulture and viticulture. Despite the prominence of the RSE as an employment option for Pacific workers, greater numbers of workers have arrived over the same period on other kinds of work visas, but these movements have had relatively little academic or media attention paid to them. Fiji, which was excluded from the RSE until recently, is the largest source of non-RSE workers in the Pacific, but for Tonga and Samoa, the non-RSE visas are also important, comprising similar numbers to the RSE visas. Smaller countries, such as Kiribati and Tuvalu, have also contributed both RSE and non-RSE workers to the New Zealand labour force. The conditions of the two work permit options are markedly different, with the RSE visas being highly constrained in terms of occupation, time period, location and employer, while the other permits have a diverse range of occupations and conditions. Furthermore, while the RSE is explicitly constructed by the New Zealand government as part of its Pacific development agenda, the other types of work permits do not generally have this stated objective. This research note considers the history and characteristics of New Zealand's temporary work migration system in relation to Pacific workers, focusing on non-RSE movements, since the RSE is already well documented.

In recent decades, academic literature studying migration has increasingly focused on the acceleration of migration globally, the increased diversity and complexity of mobility types, and the widespread implementation of temporary work migration schemes (Bedford & Hugo 2008; Collins 2012; Castles, Haas, & Miller, 2014). In the 1990s, most attention paid to migration in New Zealand by policymakers, academics, the media and the public was paid to permanent residence and related issues of migrant commitment, adaptation and diversification. Into the 21st century, the focus started to shift towards temporary workers and

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work visa schemes; the numbers of temporary workers rose rapidly, while permanent residence numbers and policy remained relatively static. While a considerable amount of academic, media and policy attention in relation to Pacific work mobility has been paid to the RSE scheme since its implementation in 2007 (see overview in Underhill-Sem and Marsters, 2017), less attention has been paid to the participation of Pacific workers in non-RSE work schemes in New Zealand, which have involved significant numbers of workers from Pacific nations.

The nature and conditions of temporary work schemes in New Zealand generally have been the subject of academic study, and the issues raised have relevance for Pacific workers. The relationship of temporary labour migration to foreign policy goals is considered by Barker (2010) focusing on the RSE, the Working Holiday Visa Scheme, and temporary migration provisions within free trade agreements. The first of these is highly relevant to Pacific workers, but the other two are not, since the working holiday maker programme applies to bilateral agreements with 45 countries but none in the Pacific islands, and Pacific countries are not part of any of the relevant bilateral free trade agreements. Collins (2017a) reviews the move from a permanent (settler) residence (PR) focused immigration system to one emphasising temporary mobility in which the visas of workers are tied to specific employers (as in the RSE, but for other visas as well), and the rights and services available to migrants are less than is the case for PR migrants. The precarity of temporary migrant workers is the subject of several studies in relation to potential abuses related to employer control of visas, excessive working hours, underpayment of wages, physical abuse, and in a more general sense, the exploitation of migrant desire for permanent residency which contrasts with the reality of 'permanent temporariness' for most workers deemed 'less skilled' (Collins 2017a, 2017b; Friesen 2017; Stringer 2016).

This paper presents data and interpretation for non-RSE temporary work migration schemes involving Pacific workers. It focuses on the last two decades, a period in which temporary labour movements from the Pacific to New Zealand, have been accelerating. The paper also shows that these schemes are not totally new, since there were predecessors, with some of the same characteristics, going back more than a half century.

## Temporary Pacific–New Zealand labour mobility before 1987

In the first half of the twentieth century, there were small numbers of migrants arriving in Aotearoa New Zealand from the Pacific, some as circular migrants and others with the intention of staying longer term. In the 1945 Census, there were just under 1000 'Pacific Polynesians' enumerated in New Zealand. However, it was not until after World War 2 that the main migration flows from Pacific countries started to accelerate. Initially this movement was from those countries that had access rights as territories of New Zealand, namely (Western) Samoa, Cook Islands, Niue and Tokelau, but from the 1950s onwards, also from Tonga and Fiji. In differentiating labour migration from other types of movement, it is not possible to present data for Cook Islands, Niue and Tokelau, since visas for work or residence were not required, and are still not required, since residents of these places are New Zealand citizens.

Many, or even most, of the migrants from Polynesia during the 1950s and 1960s can be considered to be labour migrants, often as a result of the labour demands of an expanding manufacturing sector and shortages in the agricultural sector (Spoonley & Bedford, 2012, pp. 126–129). However, most of these migrants were not initially part of formal temporary labour schemes, with the exception of those from Fiji. Small numbers of Fijian and Indo-Fijian workers came to New Zealand in the 1950s, but this accelerated rapidly in the 1960s, so that by 1966 there were over 10,000 migrants on work permits from Fiji (Spoonley & Bedford, 2012, p. 129). The Fiji Rural Work Permit scheme was initiated in 1969 (Levick & Bedford, 1988, p. 45), and most of those who came on that scheme were employed in jobs in rural New Zealand such as scrub cutting and other agricultural activities. Between 1964–65 and 1973–74, a total of 41,770 persons on temporary work permits were recorded as originating from Fiji, (Western) Samoa and Tonga, comprising about 36 per cent of all temporary workers over that decade, with Australia being included in these data at that time (de Bres & Campbell, 1975, p. 447). Fijian workers comprised the largest group, at 44 per cent of Pacific workers, with Samoans at 38 per cent and Tongans at 18 per cent, with the latter rising significantly towards the end of that period (de Bres & Campbell, 1975, p. 447). These data are considered to be underestimates of the real number of workers coming from the Pacific, since large numbers came as tourists, on business,

and on 'working holidays', and many of these also worked (de Bres & Campbell, 1975, pp. 446–448).

The oil crisis and resulting economic downturn, and election of a new Labour Government in 1974, resulted in significant immigration reforms, including more stringent border regulation of Pacific migrants. In negotiation with the governments of Fiji, Tonga and Samoa, the South Pacific Work Permit Scheme (SPWPS) was established in 1976, replacing individual country schemes existing before that (Levick & Bedford, 1988). The SPWPS actually resulted in the reduction in the number of Tongan workers coming on work permits, apparently because of the bureaucratic requirements, which many bypassed by working on visitors' visas and using their networks to find employment (Levick & Bedford, 1988). Samoans almost totally ignored the SPWPS since they had the options of the quota for residency, and visitors' visas. It was mainly Fijian workers who used the scheme, but even then, numbers were modest. The average annual numbers from each country between 1976 and 1986 were: Fiji, 405; Tonga, 91; and Samoa, 8 (Spoonley & Bedford, 2012, p.132). Some of the conditions of the earlier Fiji Rural Work Scheme were maintained so that those coming under this part of the new scheme were still restricted to rural employment and could undertake a maximum of four months' employment before returning to Fiji for a year (Levick & Bedford, 1988, p. 15). In some ways, this scheme might be seen as a forerunner of the RSE scheme of the twenty-first century. In the 1980s 'urban' employment was also possible under the SPWPS, with demand for halal slaughtermen for the export meat trade being filled by Indo-Fijian Muslims, and work employment in market gardening involving (peripheral) 'urban' work (Levick & Bedford, 1988, p. 16).

## The Immigration Act 1987 and after

The year 1987 was a critical year for Fijian migration, including labour migration into New Zealand in two ways. Two essentially anti-democratic coups in that year led by Colonel Sitiveni Rabuka resulted in the New Zealand government imposing sanctions on Fiji, which included restrictions on migration from that country, and this resulted in the cessation of temporary labour migration. Furthermore, the Immigration Act 1987 removed 'preferred country' status as a qualifying criterion for immigration, and Pacific countries that were in this category entered a

new era in which they had to compete with the rest of the world for migration access to New Zealand, with some exceptions. Nevertheless, the coups generated a high level of residence migration from Fiji, especially of skilled Indo-Fijians, some of whom came to New Zealand as refugees or asylum seekers, but most came under the new skill provisions of the new Immigration Act.

For Pacific populations in New Zealand, 1987 was also the year of visa waivers in which many 'overstayers' received permanent residence in that year and the next. In the decade after the immigration reforms of 1987, the acquisition of permanent residence (PR) by Pacific migrants remained significant, although the more notable changes were the increase in PR migration from other countries, especially in Asia. During this period, the number of temporary work permits was relatively low, with the total from all countries being less than 40,000 in the year 1997/98 and for the Pacific, only about 2000.[1]

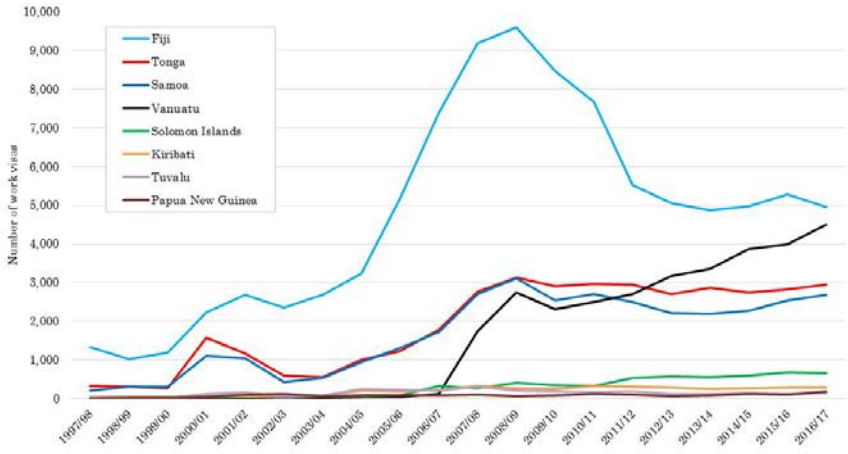
As noted above, the political debates about migration in the 1990s revolved around the degree of commitment of new 'permanent' migrants, the costs and benefits for the host country's economy and society of this migration, and issues of ethnic diversification. From the late 1990s onwards, the targets for PR migration were in the range of 40,000 to 50,000 and these were largely adhered to through to 2018. At the same time, labour force shortages that were not being served by PR migration became apparent in some sectors, and this shifted the focus to temporary work migration possibilities.

## Temporary work visas 1997 to 2017

The number of work visas granted over a 20-year period to workers from Pacific nations is shown in Figure 1. For the first half of this period, before the RSE scheme was implemented, Fiji was the dominant source of workers from the Pacific, with Tonga and Samoa also being significant. This was a period when New Zealand immigration policy was increasingly focusing on temporary work visas, with a steady rise each year from 1997/98 into the early twenty-first century (New Zealand Immigration Service, 2004). Fiji became increasingly dominant as a source of temporary Pacific labour from 2003/04 onwards, peaking in 2008/09; the decline after that was partly an outcome of the Global Financial Crisis and a general

decrease in the number of temporary workers arriving in New Zealand, but also may have resulted from the exclusion of Fiji from the RSE scheme as a consequence of the military coup in 2006.

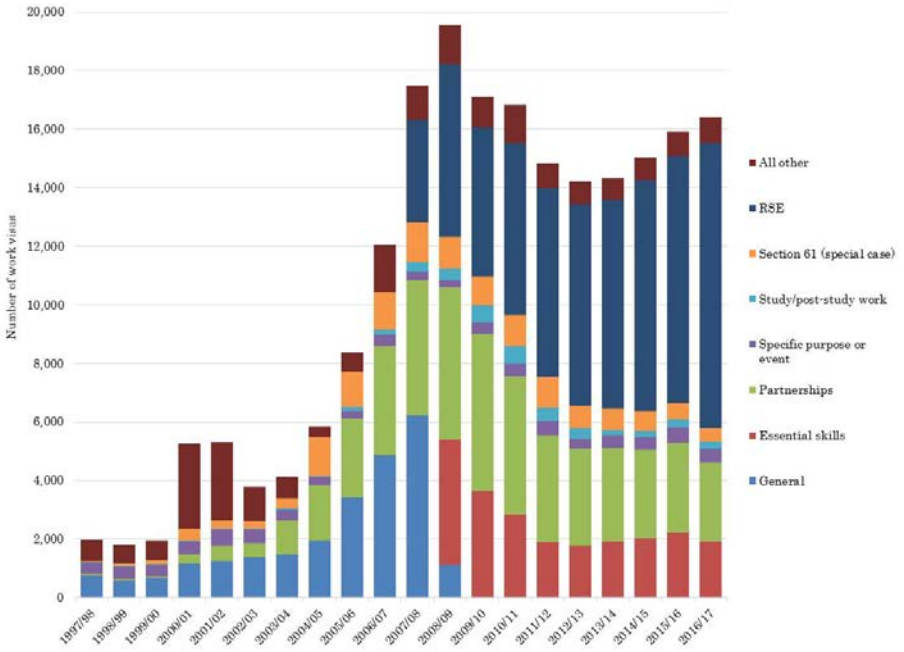
**Figure 1: Work visas approved for selected Pacific countries 1998 to 2017 (June years)**




Data source: New Zealand Immigration Service database W1

The generalised types of work visas over the same 20-year period is shown in Figure 2. As shown, the largest single category of admission in the earlier period was the 'general' category, of which skilled migrants were a significant part. From 2008/09 onwards, 'essential skills' became a separate category and the general category was absorbed into this and other categories. Figure 2 shows the importance of the partnership category which allows the partners of primary migrants, mostly in the general and essential skills categories, to work as well.

**Figure 2: Temporary work visas approved by type for selected Pacific countries 1997/98 to 2016/17 (June years)**




Data source: New Zealand Immigration Service database W1

Figure 2 illustrates the significance of the RSE from 2007/08 onwards, with this type of work visa surpassing all other types combined from 2012/13. The implementation of the RSE accounts for the increase in work visas granted to workers from Samoa and Tonga (shown in Figure 1), as well as the rapid increase in visas granted to ni-Vanuatu, and to a lesser extent to workers from Solomon Islands, Kiribati, Tuvalu and Papua New Guinea. RSE workers do not qualify to bring family members into New Zealand with them, and this is reflected in the relative decline in partnership work visas shown in Figure 2.

Some of the types of work visas shown in Figure 2 have been aggregated from a number of more specific types. For example, 'specific purpose or event' includes visas specific to an occupation for which criteria do not fit into the 'essential skills' category, such as minister/religious worker or halal slaughterman, and workers admitted for an event or series of events, such as performers and sportspeople. The visas classified as 'study/post-study work' relate to policies implemented from about 2003 onwards, in which international students may work part time during their

study and full time for a period after study, often as a possible transitional move towards permanent residence. The category 'Section 61' relates to a section in the Immigration Act which gives the Minister of Immigration discretional authority to grant a visa to a person who may be in New Zealand illegally, often having overstayed an earlier visa, but may have some justification for staying. Not shown in Figure 2 is a work visa category that is important in the general work visa data: working holiday. While about 30 per cent of all New Zealand work visas issued in recent years have been for working holidaymakers, no Pacific countries are part of the bilateral arrangements for this visa type, typically for youth under 30 years of age to stay for a year and take part in a mix of holidaying and work. Originally this scheme was mainly available to young people from Europe, North America and Japan, but in recent years also from many other Asian countries and some South American countries. Considering that there are 45 countries involved in these bilateral schemes in 2018, it is not clear why Pacific youth are excluded.

In the period since the RSE has been operating, there has been great variability between Pacific countries in terms of the numbers and proportions of RSE and non-RSE workers sent to New Zealand over a decade, as shown in Figures 3 and 4. More than 67,000 Pacific workers participated in the RSE scheme between 2008 and 2017 (June years), with Vanuatu dominating these numbers with about 45 per cent of all RSE visas (Figure 3). Tonga (24%) and Samoa (20%) have also been significant participants in the RSE, with Solomon Islands increasing in recent years to represent 6 per cent of workers over the decade. A detailed overview of the trends, conditions and outcomes of the RSE within the 'triple win' paradigm (benefits/costs for source country, destination country and worker) are provided in Underhill-Sem and Marsters (2017).

Over the period since the RSE has been operating, non-RSE work visas have also been important for Pacific workers, with over 93,000 visas granted between 2008 and 2017 (June years) (Figure 4). The predominant source for non-RSE workers has been Fiji, with nearly 70 per cent of all visas in this category. Tonga and Samoa have also had a significant involvement, with about 13 per cent of the total non-RSE visas each. Although proportionately small, the involvement of I-Kiribati and Tuvaluan workers in RSE and non-RSE work should be noted. Between the two work options, nearly 2000 workers have originated from Kiribati

and over 1700 from Tuvalu, numbers that have a notable impact in these countries with relatively small populations and limited international employment options.

**Figure 3: RSE work visas by Pacific country 2008 to 2017 (June years)**

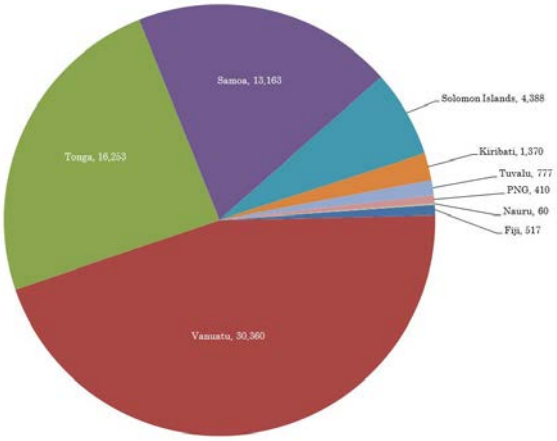
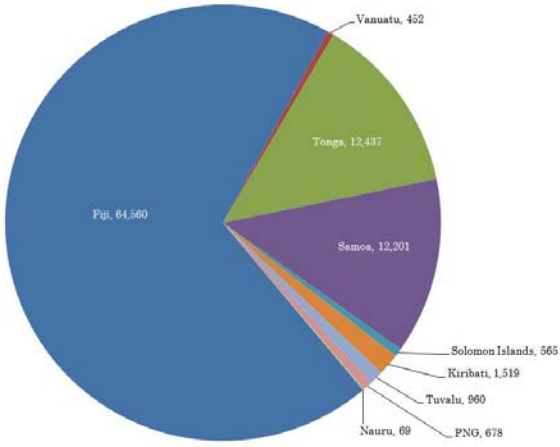



**Figure 4: Non-RSE work visas by Pacific country 2008 to 2017 (June years)**




Data sources: New Zealand Immigration Service database W1

## Non-RSE work visas

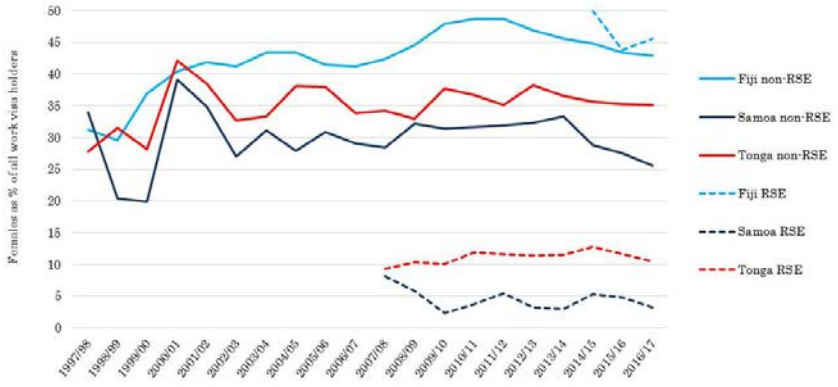
As we have seen, Fiji has been the source of the largest number of temporary workers from the Pacific over the last 20 years (Figure 1). Even after the initiation of the RSE, from which it was initially excluded, Fiji was still the dominant source of temporary workers overall. Tonga and Samoa have consistently been the second and third most important sources of workers both overall and in terms of RSE and non-RSE workers. These three countries together account for about 96 per cent of all Pacific non-RSE visas since 2007/08 (Figure 4) and in the decade before the RSE (1997/98 to 2006/07) for 91 per cent of all Pacific work visas, and so will be the focus of this section.

The New Zealand Immigration Service (NZIS) databases do not contain information on the length of visas granted to workers, and these data are not available even through the Official Information Act.[2] Visas for RSE workers are strictly limited to seven months for most countries, or nine months in the case of Kiribati and Tuvalu (as a result of cost of transport from those countries). Non-RSE visas may range from one to five years, with the shorter visas tending to be for less-skilled occupations and the five-year visas largely reserved for skilled professionals. Until 2017, visas for less-skilled workers could be renewed indefinitely within New Zealand, so many workers have had multiple renewals of short-term visas and continued in a state of 'permanent temporariness' (Collins, 2012). New regulations in that year mean that less-skilled migrants, measured by occupational status and/or wage level, must leave New Zealand after three years, and not reapply for a work visa for a further year. Other restrictions implemented for the same workers at that time restricted the right to bring dependent family members. The impacts of these visa changes are not shown in the data used in this paper but will affect the future flows and characteristics of Pacific work migrants to New Zealand.

When the age-sex structure of the RSE workers is compared with those of the non-RSE workers, there is a striking difference, especially in relation to the gendered nature of these movements. In its 10 years of existence, less than 10 per cent of RSE scheme visas for Fiji, Tonga and Samoa have been granted to females, with Figure 5 showing that Tonga has averaged a little over 10 per cent but Samoa has had less than half of this proportion.[3] In contrast, although still gendered, the non-RSE visa

possibilities do provide more opportunities for women. Fiji has the highest proportion of women, averaging 44 per cent of all non-RSE visas over 20 years, and approaching 50 per cent in some years. Of all Tongan non-RSE work visa holders, about 36 per cent were women, and for Samoa, about 31 per cent. These statistics may reflect gendered expectations in the countries of origins, but also the nature of the occupational labour market in New Zealand, as discussed further below.

**Figure 5: Percentage of work visa holders who were female; non-RSE and RSE visas for Fiji, Samoa and Tonga, by year**



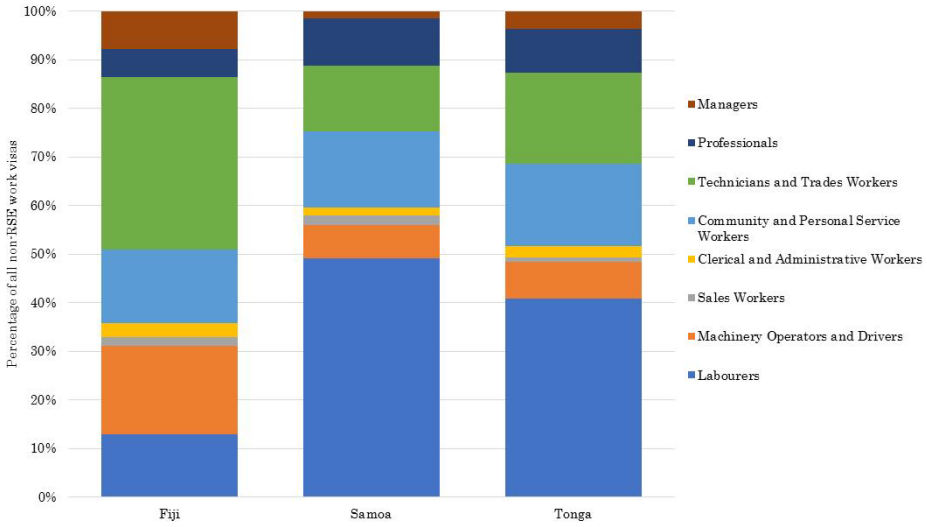

Data source: New Zealand Immigration Service database W1
Note: very small numbers for Fiji RSE.

Age distribution data for temporary work visas is relatively limited, with only 10-year age cohorts available. The modal age cohort for non-RSE workers from the three Pacific countries is 20–29, with 40 per cent of those from Fiji, 42 per cent of those from Samoa, and 45 per cent from Tonga in this cohort. The respective proportions aged 30–39 years were 32 per cent, 35 per cent and 34 per cent, with the 40–49–year cohort being 20 per cent, 15 per cent and 13 per cent. These age distributions are quite similar to those for the RSE workers, with the main exception for both Samoa and Tonga being 5 per cent more aged 20–29 among RSE workers, and very few over 50 years, versus about 5 per cent for non-RSE workers.

One of the main variables that differentiates the non-RSE workers between countries and within each national group is occupation.[4] A

comparison of non-RSE work visa holders from Fiji, Samoa and Tonga shows these occupational differences (Figure 6). For Fiji, the two largest Level 1 occupational groups are Technicians and Trades Workers and Machinery Operators and Drivers, with half of all workers in these skilled/semi-skilled occupational areas. In contrast, nearly 50 per cent of Samoans and over 40 per cent of Tongan workers were classified as labourers. For all three nationalities, Community and Personal Care Service Workers were smaller in number, but still significant.

**Figure 6: Occupational categories (Level 1) of New Zealand non-RSE work visa holders from Fiji, Samoa and Tonga 2004–2017 (June years)**




Data source: NZ Immigration Service database W3.

Within the national groups, there is considerable bifurcation of the labour force in relation to occupation. The more detailed occupational categories (Level 2) are shown in Tables 1 and 2. Table 1 shows the most important occupational categories for men, with many of the largest ones for Fiji being semi-skilled or skilled such at various types of Trades Workers but also some workers with less skills such as Factory Process Workers and Farm, Forestry and Garden Workers. For Samoan and Tongan men, the largest categories tend to be in the less-skilled sectors; for example, Factory Process Workers and various agricultural occupational sectors. For women from all three countries, Carers and Aides was the most important category (Table 2), a category which can be considered as

semi-skilled. However, the healthcare sector in New Zealand is becoming increasingly dependent on migrant labour to staff especially, for example, the growing need for aged or disabled carers, but also more skilled workers such as Health Professionals (Badkar, Callister, & Didham, 2009). For both men and women from these Pacific countries, there is a great range of occupational skill levels manifest within the non-RSE range of work visas, obviously much greater than is the case for successful permanent residence applications.

**Table 1 Occupations of male non-RSE work visa holders from Fiji, Samoa and Tonga, 2004 to 2017 (June years) (100+ workers)**

| Occupation (level 2) | Fiji | Samoa | Tonga | Total 3 countries |
|---|---|---|---|---|
| Road and Rail Drivers | 3466 | 81 | 40 | 3587 |
| Automotive and Engineering Trades Workers | 3342 | 101 | 68 | 3511 |
| Factory Process Workers | 1274 | 930 | 512 | 2716 |
| Metal and Machinery Trades Workers | 1832 | 59 | 38 | 1929 |
| Construction Trades Workers | 1464 | 156 | 236 | 1856 |
| Building Trades Workers | 1300 | 126 | 157 | 1583 |
| Farm, Forestry and Garden Workers | 1166 | 75 | 250 | 1491 |
| Electro-technology and Telecom Trades Workers | 1297 | 16 | 90 | 1403 |
| Market Oriented Agricultural and Fishery Workers | 347 | 449 | 330 | 1126 |
| Stationary Machine Operators and Assemblers | 811 | 227 | 201 | 1239 |
| Food Trades Workers | 1092 | 80 | 37 | 1209 |
| Sports and Personal Service Workers | 765 | 164 | 218 | 1147 |
| Other Associate Professionals | 539 | 220 | 300 | 1059 |
| Other Technicians and Trades Workers | 958 | 38 | 26 | 1022 |
| Farmers and Farm Managers | 890 | 7 | 40 | 937 |
| Machine and Stationary Plant Operators | 598 | 101 | 91 | 790 |
| Drivers and Mobile Machinery Operators | 616 | 53 | 26 | 695 |
| Personal and Protective Services Workers | 539 | 71 | 48 | 658 |
| Physical Science and Engineering Associate Professionals | 557 | 13 | 41 | 611 |
| Other Labourers | 186 | 115 | 80 | 381 |
| Labourers and Related Elementary Service Workers | 177 | 197 | 119 | 493 |
| Hospitality, Retail and Service Managers | 483 | 15 | 14 | 512 |
| Corporate Managers | 447 | 14 | 24 | 485 |
| Engineering, ICT and Science Technicians | 458 | 12 | 13 | 483 |

| Occupation (level 2) | Fiji | Samoa | Tonga | Total 3 countries |
|---|---|---|---|---|
| Other Craft and Related Trades Workers | 391 | 24 | 12 | 427 |
| Legal, Social and Welfare Professionals | 159 | 150 | 78 | 387 |
| Construction and Mining Labourers | 185 | 70 | 104 | 359 |
| Carers and Aides | 299 | 11 | 14 | 324 |
| Mobile Plant Operators | 295 | 8 | 43 | 346 |
| Physical, Mathematical and Engineering Science Professionals | 281 | 12 | 25 | 318 |
| Specialist Managers | 284 | 9 | 21 | 314 |
| Design, Engineering, Science and Transport Professionals | 203 | 22 | 41 | 266 |
| Other Professionals | 156 | 81 | 26 | 263 |
| Industrial Plant Operators | 179 | 39 | 29 | 247 |
| Protective Service Workers | 198 | 31 | 17 | 246 |
| Sales Assistants and Salespersons | 177 | 22 | 11 | 210 |
| Cleaners and Laundry Workers | 88 | 83 | 16 | 187 |
| Arts and Media Professionals | 142 | 42 | 8 | 192 |
| Building and Related Workers | 94 | 22 | 28 | 144 |
| ICT Professionals | 135 | 3 | 8 | 146 |
| Other Clerical and Administrative Workers | 116 | 15 | 7 | 138 |
| Health Professionals | 110 | 6 | 9 | 125 |
| Office Clerks | 75 | 29 | 30 | 134 |
| Business, Human Resource and Marketing Professionals | 123 | 3 | 8 | 134 |
| Education Professionals | 86 | 19 | 17 | 122 |
| Salespersons, Demonstrators and Models | 80 | 23 | 13 | 116 |
| Hospitality Workers | 84 | 28 | 2 | 114 |
| Sales Representatives and Agents | 91 | 11 | 3 | 105 |
| Office Managers and Programme Administrators | 98 | 2 | 2 | 102 |

## Brain drain, niche occupations, and the future of New Zealand Pacific labour flows

One of the main purposes of this research note has been to present non-RSE data that has been little used in comparison with data and analysis available for RSE work migrant flows. This is just the starting point for further analysis of these data in relation to a greater understanding of these temporary work migration processes and policies, and only some initial linkages to these broader issues are mentioned here.

The explicit objective of New Zealand's RSE scheme is a so-called 'triple win', for the host country, the source country and the migrant. Within this context, the New Zealand government considers the development of source countries to be a major objective of the RSE scheme, and a number of studies have assessed the impacts of remittances, skills return and costs/benefits of this scheme (see summary in Underhill-Sem and Marsters, 2017, pp. 13–38). However, less explicit attention has been paid to the development impacts of non-RSE temporary work migration, with the underlying assumption that these movements are more about fulfilling short-term or longer-term gaps in the labour force in New Zealand; nevertheless, some attention has been paid to the broader impacts on source countries in the Pacific.

In the period after the military coups in Fiji in 1987, a major concern among academics and policymakers was the loss of many professional workers from Fiji (Reddy, Mohanty, & Naidu, 2004), and concern for the brain drain that has been a phenomenon in many Pacific countries (Stahl & Appleyard, 2007). In the case of New Zealand, many of the professionals and semi-professionals who have arrived from the Pacific are likely to have come as permanent residents or transitioned later to this status, and in recent years, temporary work visas are a means of transitioning to permanent residence, an option actively promoted by the New Zealand immigration system for highly skilled migrants.

Concern for longer-term human capital loss (brain drain) from the Pacific has often focused on particular occupations and sectors. Considerable academic focus has been on the movement of medical personnel ranging from doctors to nurses to semi-skilled nurse aides, trained in the Pacific (mainly Fiji) but deployed to more wealthy countries, including Australia and New Zealand (e.g. Brown & Connell, 2004; Connell, 2014). Teachers are another form of brain drain that has especially affected Fiji (Iredale, Voigt-Graf, & Khoo, 2015; Voigt-Graf, 2003). In Tables 1 and 2, more than 300 education professionals from Fiji, Samoa and Tonga are shown to have been granted work visas in New Zealand over a 13-year period.

**Table 2: Occupations of female non-RSE work visa holders from Fiji, Samoa and Tonga, 2004 to 2017 (June years) (100+ workers)**

| Occupation (level 2) | Fiji | Samoa | Tonga | Total 3 countries |
|---|---|---|---|---|
| Carers and Aides | 2037 | 164 | 167 | 2368 |
| Personal and Protective Services Workers | 673 | 81 | 159 | 913 |
| Stationary Machine Operators and Assemblers | 508 | 66 | 40 | 614 |
| Food Trades Workers | 424 | 23 | 13 | 460 |
| Market Oriented Agricultural and Fishery Workers | 34 | 64 | 102 | 200 |
| Machine and Stationary Plant Operators | 347 | 19 | 10 | 376 |
| Hospitality, Retail and Service Managers | 319 | 10 | 17 | 346 |
| Other Associate Professionals | 165 | 70 | 56 | 291 |
| Health and Welfare Support Workers | 256 | 15 | 29 | 300 |
| Factory Process Workers | 98 | 76 | 130 | 304 |
| Health Professionals | 255 | 13 | 27 | 295 |
| Life Science and Health Professionals | 196 | 10 | 47 | 253 |
| Other Technicians and Trades Workers | 278 | 5 | 1 | 284 |
| Cleaners and Laundry Workers | 147 | 90 | 27 | 264 |
| Sports and Personal Service Workers | 180 | 36 | 19 | 235 |
| Labourers and Related Elementary Service Workers | 36 | 56 | 61 | 153 |
| Corporate Managers | 163 | 6 | 14 | 183 |
| Education Professionals | 134 | 27 | 34 | 195 |
| Hospitality Workers | 146 | 33 | 12 | 191 |
| Sales Assistants and Salespersons | 154 | 19 | 13 | 186 |
| Office Managers and Programme Administrators | 117 | 3 | 7 | 127 |
| Business, Human Resource and Marketing Professionals | 108 | 9 | 2 | 119 |
| Office Clerks | 93 | 16 | 9 | 118 |
| Engineering, ICT and Science Technicians | 109 | | 9 | 118 |
| Other Clerical and Administrative Workers | 86 | 13 | 12 | 111 |
| Response Outside Scope/Not Stated | 189 | 15 | 31 | 235 |

There are particular niche occupations that may not be considered to be highly skilled according to New Zealand or other countries' occupational skills classifications but which have resulted in significant labour emigration from the Pacific. For Fiji, this includes the international employment of contract workers in the military and security, a niche that has been established in the context of the development of a military which

is large by the standards of the Pacific islands region (Kanemasu & Molnar, 2017). Most of these military workers are deployed beyond the Pacific region, especially in the Middle East. Another occupational niche for Pacific workers is professional sports people, with players in various sports but especially rugby. This is the case for Fiji, Tonga and Samoa, and while the 'export' of these players is a source of pride for these nations, it is also potentially a lost opportunity in relation to the development of professional rugby (and other sports codes) in the Pacific islands (Kanemasu & Molnar, 2012, 2013).

Bedford and Hugo (2012) maintain that "the international migration debate has moved on from concerns about the 'brain drain' effect on the source countries" (p. iii). Their thesis is that these countries are now more concerned with rapid population growth, urbanisation, the youth bulge, and opportunities for a wider range of work opportunities within the Pacific Rim, especially in Australia and New Zealand (Bedford & Hugo, 2012, p. iii). A World Bank report on labour mobility in the Pacific praises the fact that New Zealand's temporary work visa system "has no skill threshold" and admits workers across all skill levels in contrast to Australia's work visa system which largely allows admission in the top three skill levels (Curtain et al., 2016, 17–22). This allows a wide range of workers into New Zealand, not only those who are considered as relatively less-skilled in the RSE scheme, but also in a number of non-RSE categories of admission. This, of course, may be seen as an advantage for Pacific workers, but also serves New Zealand's labour force requirements to fill the lesser-skilled gaps in the labour market such as those targeted by the Essential Skills short-term and long-term lists (especially the former).

The increased stratification of New Zealand's immigration policy and the resulting potential precarity of many temporary migrant workers from the Pacific, both in the RSE scheme and beyond, has been flagged in more general terms by a number of studies (Barker, 2010; Collins, 2017a, 2017b; Friesen, 2017; Stringer, 2016), but has not been adequately considered in this research note. These, and related questions, remain for further interrogation to allow greater understanding of New Zealand's evolving temporary work visa schemes, and in the development of policy related to these schemes, as well as informing broader development initiatives and trade agreements with Pacific countries.

## Notes

1 Unreferenced work migration data from 1997/98 onwards originate from the New Zealand Immigration Service's W1 database, and some data from 2003/04 onwards, especially on occupation, from their W3 database. These are/were anonymised unit record databases which were taken offline in January 2018.

2 These databases were no longer available online after January 2018, so the databases referred to here, and used throughout this paper, are those that were available in 2017.

3 The overall proportion of RSE visas granted to females is about 20 per cent, with higher proportions for Kiribati (47%), Tuvalu (37%), Solomon Islands (34%), and Papua New Guinea (23%). Vanuatu was 14 per cent.

4 In the New Zealand Immigration Service's W3 database, occupations for most RSE workers are not specified, presumably on the premise that most of them are 'labourers' but also that their eligibility for a visa does not generally depend on their occupational qualifications.

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# Census 2018 and Implications for Māori

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## Abstract

The population census is a universal tool of governance but has come under increasing pressure as governments look to reduce costs, gain efficiencies and counter declining response rates. In Aotearoa New Zealand, the census transformation strategy has a short-term focus on modernising the census and a long-term vision of a fully administrative census. The digital-first 2018 Census was an ambitious step towards modernisation but there are growing concerns that it may fail to deliver high-quality data, particularly for Māori and iwi. This research note considers the implications of lower response rates and reflects on the steps that might be taken to retain the trust and confidence of Māori in the census, including possibilities for Māori data governance across the official statistics system.

The population census is a universal tool of governance but has come under increasing pressure as governments look to reduce costs, gain efficiencies and counter declining response rates (Kukutai, Thompson, & McMillan, 2015; Poulain & Herm, 2013; Royce, 2011). Some believe that the census is an idea whose time has gone, with prominent demographer David Coleman (2013) suggesting that the census as we know it may be entering its "twilight". In Aotearoa New Zealand, as in many other countries, net coverage rates and response rates have also been on a downward trajectory (Statistics New Zealand, 2016a) and there is increasing pressure to deliver better value from the investment in official statistics. The census transformation strategy has a short-term focus on modernising the census and a long-term vision to move to a fully administrative census (Bycroft, 2015; Stats NZ, 2017a). The digital-first 2018 Census was an ambitious step towards modernisation (Stats NZ,

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2017a), with an online target of 70 per cent, more than double the online completion rate in the 2013 Census. While initial statements from Stats NZ noted that the target for online completion was exceeded (Stats NZ, 2018a, 2018b) and that the quality of online data was "very high" (Stats NZ, 2018b), a number of commentators and organisations were quick to identify possible problems with the 2018 Census in terms of the census approach, potential coverage and proposed methodologies for output (Manhire, 2018; Matthews, 2018; Williams, 2018).[1] Concerns were also raised about the potential impacts of lower response rates for Māori, including possible constitutional implications (Hopkinson, 2018; Te Mana Raraunga, 2018).

Stats NZ is now under considerable pressure to deliver first results from Census 2018 but it will be some months yet before it will be able to release any data, or specific details relating to the census coverage, response rate and data quality. The agency announced in July 2018 that the first release of Census 2018 data, scheduled for October 2018, would be postponed to March 2019. However, in November it reported that it could not meet the revised deadline and would not be announcing a new release date until April 2019 (Stats NZ, 2018c). It also noted that it would be working with iwi and Māori-focused organisations "as the impact of the lower response rate on Māori descent and iwi data becomes clearer".

A census external data quality panel has been appointed and will be publishing its own independent data quality report (Stats NZ, 2018d).[2] Independent reviewers are also undertaking a comprehensive review of the design, implementation, and operation of Census 2018, with a focus on census participation and coverage. Similar moves to involve independent experts were taken in relation to the 2011 Canada Census and 2016 Australia Census when attempts to modernise their census model also struck problems (Harding et al., 2017; Royce, 2011).

This research paper focuses specifically on the implications for Māori of a census with potentially unprecedented (in modern times) low response rates. The census is important to Māori for a number of reasons. Census data are crucial for the distribution of resources and for monitoring the impact of Crown policies and (in-)actions in relation to its obligations under Te Tiriti o Waitangi and international conventions. The census also provides information on Māori descent and iwi (tribal) affiliation which is necessary to fulfil legislative requirements (e.g. with regards to Māori

electorates) and is used by Māori collectives to realise their own self-determining aspirations (Bishop, 2016; Kukutai & Rarere, 2017; Walling, Small-Rodriguez, & Kukutai, 2009). More broadly, there are implications for Māori rights and interests in data, as articulated in the nascent but rapidly growing Indigenous data sovereignty and Māori data sovereignty literature (Carroll Rainie, Schultz, Briggs, & Palmanteer-Holder, 2017; Kukutai & Taylor, 2016; Te Mana Raraunga, n.d.; Walker et al., 2017). We consider the potential impacts of poorer response rates on these uses but first briefly consider the changing census context.

## The changing census context

The population census is the flagship of official statistics in many countries and is essential for many of the functions that underpin democracy. In the past decade, however, the census has faced increasing scrutiny due to increasing cost, declining response rates, concerns about privacy and confidentiality, and the need for more timely and frequent data. While these concerns, and official responses to them, have raised the question of whether the traditional footwork census is entering its "twilight" (Coleman, 2013), the empirical evidence is mixed. A recent study of global census practices for the period 1995 to 2014 found that the number of countries undertaking a census had increased over time to be nearly universal, but that the use of alternative census models (using administrative data, population registers, and/or sample surveys) had also increased substantially. Alternative models are mostly confined to Europe which has a long history of maintaining population registries and broader public acceptance of using personal data for statistical purposes (Kukutai, Thompson, & McMillan, 2015). Most of the countries adopting an alternative census model lack a political commitment to collecting ethnic-racial data and, in some cases, explicitly opposed it. This broader context is important because it highlights the complexities of census transformation in Aotearoa New Zealand where the structural advantages enjoyed by European countries with population registers is absent, and where there is the additional challenge of having to collect granular, high-quality ethnicity, Māori descent and iwi data (Cormack & Kukutai, 2016).

Aotearoa New Zealand has a long history of census enumeration and of ethnic data collection. The first census was held in 1851 and a census has been taken every five years since 1881 with just three

exceptions: during the Great Depression, World War 2 and after the 2011 Christchurch earthquake. The first Māori census was taken in 1857/58 and Māori continued to be separately enumerated until 1956 using a variety of state-imposed classifications including tribe (until 1901), lifestyle (until 1926) and racial blood quantum (until 1981). (For a detailed history of how Māori have been counted and classified in the census, see Kukutai, 2012; Pool, 1991). Despite a fraught history of state-controlled data collection, Māori and iwi now generally support and see value in the census, and there is a shared interest in ensuring that it is high quality (Te Mana Raraunga, 2018; Walling, Small-Rodriguez & Kukutai, 2009). Under the Statistics Act 1975, a census is required to be undertaken every five years and the collection of name, address, sex, age and ethnic origin details are mandatory.[3]

There are many uses to which census data are put but the primary purpose is to count everyone in the country on census night so as to provide accurate population and dwelling counts nationally, subnationally and for smaller geographic areas such as meshblocks. This is extremely important given the high rates of mobility in Aotearoa New Zealand and of migration-driven ethnic diversity, with about one-quarter of the usually resident population being overseas-born (Statistics New Zealand, 2014a). The census also provides the benchmark for national, subnational and ethnic group population estimates that,[4] in turn, are used as the denominators for rates; for example, fertility and mortality rates. Measured over time, these rates provide important insights into the ways in which Aotearoa New Zealand is changing and whether life is getting better or worse for particular groups, especially those with the greatest needs. The census is also the only extensive information source on the social and economic characteristics and conditions of local communities. By international standards, the New Zealand population census is considered to be excellent and delivers value far in excess of its cost (Bakker, 2014).

These favourable traits, however, have not insulated Stats NZ from political pressure to do more with less. As Bycroft (2015) noted, "Pressures on the sustainability of the current census model centre on the high costs" (p. 402). In 2012, the Government agreed to a two-pronged census transformation plan. In the short to medium term, the focus is on modernising the current census model and making it more efficient. A

detailed business case for the 2018 Census was approved by Cabinet in 2014 with objectives that included:

- undertaking a census that met statutory requirements
- at least maintaining the quality of census information compared with the 2013 Census
- improving the timeliness of census products compared with the 2013 Census, and
- reducing the average cost of the census. (Statistics New Zealand, 2016a, p. 6)

Long-term transformation involves investigating alternative ways of producing small-area population and social and economic statistics, notably the possibility of a fully administrative census (Bycroft, 2015; Gleisner et al., 2015). Stats NZ has undertaken a range of work including producing population estimates from linked administrative data (Stats NZ, 2017c) and comparing the quality of ethnicity data in administrative data sets with the census (Statistics New Zealand, 2016b).[5] Much like Canada (Royce, 2011), Aotearoa New Zealand currently lacks several key preconditions for moving to a register-based census including a central population register, national property register and unique personal identifier (Bycroft, 2015). As such, the focus thus far has been on applying statistical approaches to existing administrative data in the Integrated Data Infrastructure (IDI).[6]

## Census 2018

Census 2018 involved major changes in methodology (Stats NZ, 2017a, 2018a). This included a crucial shift in collection approach away from a primarily paper-based census to a digital census, with paper forms as a supplementary mode. Changes were also made to the way in which census field staff were recruited (Stats NZ, 2017a). Technical changes included changes to official classifications and variables, requiring mandatory completion of some variables on the online forms (including Māori descent and ethnicity), changes to the ways in which forms are processed, and an increased reliance on government administrative data and statistical methods of imputation (Stats NZ, 2017a, 2018a, 2018e, 2018f). Imputation is the process of replacing missing data with substituted values.

Interim figures for Census 2018 released by Stats NZ in July indicate that full or partial information has only been received for about 90

per cent of individuals, compared with 94.5 per cent for the 2013 Census (Stats NZ, 2018a).[7] It is important to highlight here that partial in this context means a partial-response dwelling rather than partial completion of an individual census form. More specifically, a partial-response dwelling is one where there is no individual form but the dwelling form or household summary page has a list of people at the dwelling on census night that includes their name, age, sex, location and relationship to the householder.

Table 1 shows how the various components of census non-response have changed over the last three censuses, drawing on the results from the relevant Post Enumeration Surveys (PES). The purpose of the PES is to provide an independent check of the accuracy of the census count and to provide information on the completeness of the census coverage. The proportion of partial-response households and fully non-responding occupied households (all-substitute households in Table 1) has increased since 2001.[8] Stats NZ has already confirmed that Census 2018 has more households where no one has responded than in previous censuses (Stats NZ, 2018a). This means that the 90 per cent "'full or partial" preliminary figure provided by Stats NZ will include a larger share of partial-response dwellings than in previous censuses. The 2018 PES has still to be processed with results expected to be released sometime in 2019.

**Table 1. Non-response in the Census of Population and Dwellings, 2001–2013 PES**

| | Percentage of estimated total | | | |
|---|---|---|---|---|
| | **2001** | **2006** | **2013** | **2018** |
| Forms received by the census (census response rate) | 95.0 | 94.8 | 92.9 | { 90? |
| ***Substitute individual records*** | | | | |
| *— in partly counted households* | *0.7* | *0.9* | *1.6* | |
| *— in all-substitute households* | *2.1* | *2.3* | *3.1* | |
| Total substitutes | 2.8 | 3.2 | 4.7 | |
| Census usually resident population | 97.8 | 98.0 | 97.6 | |
| Estimated net undercount | −2.2 | −2.0 | −2.4 | |
| PES estimated population | 100.0 | 100.0 | 100.0 | |

Source: Statistics New Zealand, 2014b, Table 5.

Given that a key goal of the census is to count all usual residents in the country on census night,[9] commentators are rightly concerned that the non-response rate is likely to be much higher than in recent censuses. For Māori, the extent of the problem will inevitably be worse. Like other Indigenous peoples in colonial settler states, Māori are much more likely to be missing from the census than other population groups. In 2013, the Māori net undercount was 6.1 per cent compared with just 1.9 per cent for Europeans (Statistics New Zealand, 2014b),[10] and the 2013 PES report suggests that the Māori net undercount was probably underestimated.[11] Among Māori, the probability of being missed in the census is higher for young adults, males and those living in particular areas. Thus, in 2013, the net undercount for Māori males aged under 30 years was just over 8 per cent (Statistics New Zealand, 2014b, Figure 8).[12] Given ethnic inequities in internet access, the digital-first approach of Census 2018 has almost certainly deepened the undercount problem for Māori and increased the number and proportion of partial-response and fully non-responding households. In the 2013 Census, Māori internet access at home was 67 per cent, compared with 85 per cent for 'European/Others' (Ministry of Social Development, 2016). For now, we can reasonably deduce that the Māori census response rate will be well below 90 per cent and perhaps as low as 80 or even 70 per cent in areas that have historically had lower coverage, such as Northland and the East Coast.

## Implications for Māori

Though Census 2018 and PES results are not yet publicly available, it is important to consider in advance the implications of reduced Māori response rates. One of the most important implications is constitutional. Under the Electoral Act 1993, census counts are used as part of the statutory formula to determine the boundaries and number of General and Māori electorates.[13] The calculation of the 2013 Māori Electoral Population (MEP) by Stats NZ is shown below:[14]

**Table 2. Calculation of 2013 Māori electoral population**

| Population | Source | Number |
|---|---|---|
| Census usually resident population count *(u)* | 2013 Census | 4,242,049 |
| Electoral Māori descent census usually resident population count *(d)* | 2013 Census | 755,598 |
| Māori on the Māori electoral roll *(m)* | Māori electoral roll | 256,212 |
| Māori on the general electoral roll *(g)* | General electoral roll | 203,640 |
| % of Māori choosing Māori electoral roll (Māori ratio, *r*) | $r = m/(m+ g)$ | 55.7 |
| Māori electoral population | $MEP = r \times d$ | 420,990 |

Source: Statistics New Zealand, 2013, Table 2.1

Because the calculation draws on both census and electoral data, the number of Māori electorates is thus influenced by population factors (population change since the last census, number of people included in the census, and how people answer the census Māori descent question) and by electoral factors (the level of enrolment by people who indicated Māori descent on the General or Māori roll, and the proportion of electors of Māori descent who are on the Māori roll).

A key point to note here is that the 2013 electoral Māori descent Usually Resident Population (URP) count of 755,598 was considerably higher than the actual number of individuals who reported being of Māori descent in 2013 ($n = 668,724$). This is because the figure also includes a proportion of those who did not provide a clear "yes" or "no" answer to the descent question (Statistics New Zealand, 2007).[15] In 2013, just over half a million New Zealand residents either answered "don't know" ($n = 87,237$) or did not provide a valid response to the Māori descent question ($n = 420,603$). Of significance, in Census 2018 the Māori descent question was made compulsory in the online form, which was a change to the method used in previous censuses. Stats NZ anticipated that this would result in an "increase in the proportion of the population answering 'no' to the Māori descent question" (Stats NZ, 2018e, p. 17). The potential impact on electorate calculations will thus come from both an increase in "no" responses due to the forced completion of this question in the online format, and the higher number of Māori descendants not being counted at

all due to issues with the census roll-out and follow-up. This could reduce the size of the Māori electoral population and potentially the number of Māori electorates. A reduction in the South Island electoral Māori descent URP could have implications for both Māori and general electorates.[16] Under the Electoral Act 1993, the number of South Island general electorates is fixed at 16 and the South Island quota (the South Island General Electoral Population (SI GEP) divided by 16) determines the mean size for the general electorates in the North Island and the Māori electorates. Hypothetically, a reduction in the South Island MEP, due to the forced responses in the e-census and/or lower Māori response rates, would increase the size of the SI GEP and the mean electorate population, with the potential to reduce the number of Māori and general electorates. Stats NZ is under time pressure as it works through these complex issues, with the Electoral Commission that oversees the electoral boundary review requiring the electoral population figures by September 2019 at the latest (Manch, 2018). The potential for a legal challenge of the electoral figures ahead of the 2020 general election has been suggested by some commentators (Cooke, 2018; Easton, 2018; Manch, 2018), but it is not yet clear what this would mean for Māori.

Beyond the more immediate concerns of electoral boundaries, there are a number of reasons why high-quality census data are crucial for Māori. One is to inform decisions about the resourcing of national, regional and community services and infrastructure – schools, housing, hospitals, GP services, superannuation and roads are just a few examples. Census data form the basis of national, subnational and ethnic population estimates and projections, all of which are essential for planning and policy, as is the ability to monitor changes in ethnic inequities over long time periods (e.g. mortality rates, income distribution, home ownership). The impacts of poor-quality data are more pronounced for Māori and Pacific peoples because of their smaller population share.[17] Issues with the quality of ethnicity data in vital registrations (births and deaths) and in health data sets is well documented, as are the impacts of poor ethnicity data quality on the ability to monitor health outcomes for Māori, and ethnic health inequities and trends over time (e.g. Cormack & Harris, 2009; Cormack & McLeod, 2010). For example, misclassification of Māori in births and deaths registrations historically led to significant underestimates of Māori rates of birth and death for many years (Ministry

of Health, 2001). If ethnicity data in the census are impacted by the lower response rates and the increased use of imputation, this has the potential to introduce numerator/denominator bias into the calculation of Māori rates and estimates of inequities, due to differential quality between numerators and denominators, as well as different methods of data collection. Where this creates the need for additional resources for Māori to compensate for data quality issues, it creates a further inequity in access to reliable timely data. The census is also the only source of data for some areas of interest. For example, the census question on number of children ever born alive is the only source of data on women who remain childless (an increasing trend for all New Zealand women, including Māori women (Didham & Boddington, 2011) and the proportion of women who have one, two, three or more children (Statistics New Zealand, 2009). The Government also has a number of policy priorities including improving housing, child well-being and poverty reduction, all of which disproportionately affect Māori and Pacific peoples, and which require access to accurate data.

In addition to ethnicity and descent data, the census is an important source of data about te reo Māori. While there does not appear to be an explicit legal obligation to collect census data on te reo, such data are needed by Te Taura Whiri i te Reo Māori (Māori Language Commission) to carry out its functions as set out in the Māori Language Act 1987. As such, Stats NZ has duties in relation to providing information on te reo Māori in its role as a Crown agency. The census is also the sampling frame for a number of important nationally representative surveys, including the survey of Māori well-being, Te Kupenga. It is not yet clear whether and how the quality of the census as a sampling frame may be compromised by lower than expected response rates, and whether this will also impact the accuracy of survey estimates.

## *Implications for iwi data*

Higher rates of non-response might also seriously compromise the quality and usability of iwi data. Stats NZ recognises that iwi are Treaty partners and that it has a responsibility to collect and disseminate high-quality iwi data (Gleisner, Downey, & McNally, 2015). For many iwi, the census is the only comprehensive source of data about their people. Iwi affiliation is collected in some administrative data sets but the quality of such data is

generally lacking. While most iwi maintain their own electronic registers of members, they do not have the resources or capacity to collect the extensive demographic, social and economic data captured by the census (Kukutai & Rarere, 2013, 2017). Stats NZ census iwi counts are also used in negotiations with the Crown and in other forms of decision-making affecting resource allocation.[18] Higher rates of census non-response for Māori not only have the potential to significantly decrease iwi census counts, but may also affect their composition such as age-sex structure and educational profile (Kukutai & Rarere, 2017). Iwi whose customary rohe encompass areas with higher undercounts will be even more severely affected by high non-response rates in Census 2018.

The problem is compounded by recent changes to the Iwi Standard and Classification.[19] The Standard provides guidelines for how to gather, organise and report iwi and iwi-related groups' information and statistics. The classification includes a list of 100+ iwi and iwi-related groups that are recognised for official statistical purposes. A review of the classification in 2016–2017 saw the inclusion of more than 20 additional iwi and iwi-related groups (Stats NZ, 2017b). These changes are important because Stats NZ's proposed solution for addressing missing information is to use individuals' data from 'alternative sources', specifically the 2013 Census and government administrative sources, along with imputation methods (see more below). For those iwi and iwi-related groupings that were recognised for the first time in Census 2018, no prior census data will exist. For those iwi that were in the classification at the time of the 2013 Census, there will still be problems with using earlier census data to fill missing information. This is because inconsistencies in how individuals report their iwi across censuses (Kukutai & Rarere, 2013, 2017) suggests that their iwi response in the 2013 Census may be a poor predictor of their likely response in 2018. In short, imputation methodologies and the use of alternative sources are unlikely to be a robust solution for addressing missing iwi information in Census 2018.

## The increasing use of alternative sources and statistical imputation

In addition to a higher level of non-response (for which final results are still to be announced), Census 2018 differs dramatically from previous censuses in the much wider use of imputation methods and the use of administrative data. This makes for a much higher degree of complexity, amplified by the inconsistent use of terminology by Stats NZ. In its initial census methodology papers Stats NZ used the term imputation broadly to include cases where information about the respondent in other datasets (eg health or education datasets) would be used to replace their missing data in the 2018 Census (Stats NZ, 2018a, 2018e). In a paper released in December 2018, Stats NZ redefined the term in a more limited sense to only refer to instances involving statistical imputation (Stats NZ, 2018f). Stats has already indicated that it will have to rely much more heavily on imputation for Census 2018 than in previous censuses: "If we do not impute, there will be large amounts of missing data that will affect the overall quality of the dataset" (Stats NZ, 2018b, p. 2). Each imputation method inevitably brings some bias and analytical limitations. Although the undertaking of the census is set out in some detail in legislation, there is no explicit guidance on what level of imputation is acceptable.

Prior to Census 2018, Stats NZ used a combination of unit imputation and item imputation to address missing data in the census. In previous censuses, *unit imputation* (formerly known as substitute records, Statistics New Zealand, 2014c) was used to add to the census count where there was sufficient evidence that a person existed, or a dwelling was occupied, but no individual form was received. Unit imputation was used for one member of the household or for the entire household. For Census 2018, Stats NZ has redefined unit imputation to exclude partially responding households. Instead, people who are listed on a household form will be 'treated as responses, even when no individual form has been received' (Stats NZ, 2018f, p. 5). In Table 1 such people would appear in the first row 'forms received by the census'. This change of designation is a major departure from prior census practice. In another key change, Stats will also make use of data from alternative sources to add people to the census count, calling this 'admin enumeration' (Stats NZ, 2018h, Figure 1). Taken together, these changes have the potential to make it very difficult

for data users to make sense of the data, particularly as it relates to Māori and other groups with higher census non-response.

For Census 2018 *item imputation* describes the process of imputation used where an individual form exists but not all questions were answered (Stats NZ, 2018b, p. 7), and it is not possible to use individuals' data from the 2013 Census or administrative sources. For past censuses, responses were only imputed for age, sex, place of usual residence meshblock and labour force status (Statistics New Zealand, 2014c). Māori descent was also imputed, but only for electoral counts. The previous item imputation method used information provided by census respondents and known variable distribution patterns (Stats NZ, 2018f). For Census 2018, Stats NZ will impute responses for a far wider range of variables. It will also use a different methodology for item imputation that 'fills in the missing variables by 'borrowing' information from similar people or similar households that have responded' (Stats NZ, 2018f, p. 5). Stats NZ has acknowledged that this approach is problematic when used in neighbourhoods with a relatively high share of non-responding households because they are unlikely to be missing at random (Stats NZ, 2018a). Māori are likely to be over-represented in such areas.

It is useful here to return to the use of Māori descent data for electoral purposes. Māori descent data are only reliably collected in the census (since 1991) and on birth registrations (since about 1995). Where possible, Stats NZ plans to use an individual's descent response from the 2013 Census or descent information from births registrations to fill missing data in the 2018 Census.[20] The assumption is that how individuals were identified in these sources is a robust indicator of how they would identify (or be identified) in 2018. This assumption is untested as, to our knowledge, there are no nationally representative studies exploring individual patterns of Māori descent identification over time. Studies of Māori ethnic and iwi affiliation in the census and in other surveys have shown that patterns of identification can be dynamic at the individual level (Didham, 2016; Kukutai & Rarere, 2013, 2017; Walling, Small-Rodriguez, & Kukutai, 2009). While descent may be a more stable indicator of identity than ethnicity, there is still a lack of information with which to make informed judgements. Where alternative data are not available, Stats NZ will use imputation methods to provide a Māori descent response. The statutory importance of Māori descent data calls for

a high duty of care and transparency over how descent data are derived, along with the limitations.

The wider use of data from the 2013 Census and administrative data to address missing data in Census 2018 also raises the need for a wider public conversation about how individuals' data are being used in the various administrative datasets that are part of the IDI.[21] Many individuals who participate in the census may be unaware that their names and addresses are retained (Stats NZ, 2018g), and that these details are used to link their census records to their previous census records, and to other Government administrative data about them held in the IDI.[22] While identifying information is always removed before it is made available for research and analysis as part of the "five safes" framework used by Stats NZ,[23] it important that New Zealanders are well informed about how their data are being used and are comfortable with it. This issue is particularly sensitive for Māori who have a long history of being surveilled by the State.

In addition to technical issues, imputation raises a bigger question about the right of Stats NZ, as a Crown agency, to make a determination about who is Māori or not, albeit statistically. This potentially undermines rights of Māori to self-identify, which includes the right to refuse, or choose not to, identify to the Crown. Stats NZ had already anticipated using more imputation well ahead of the Census, including imputation for both Māori descent and Māori ethnicity variables (Stats NZ, 2018a). This suggests that there were opportunities for Stats NZ to engage meaningfully with Māori about these proposed changes to methodology prior to Census 2018.

## Looking ahead

In a global context, Aotearoa New Zealand is unusual in being one of a very small number of countries that has multiple comprehensive sources of Indigenous statistical data, and Stats NZ is often looked to as best practice for the collection and dissemination of Indigenous data and statistics (Bishop, 2016). There are significant opportunities for census transformation in Aotearoa New Zealand to deliver real benefits for Māori through, for example, more frequent data, reduced respondent burden, and the ability to better track Māori migration. Official data are a strategic resource for both national and Māori development; there is a common

interest in ensuring that the census and other official data remain robust, relevant and trustworthy. However, missteps are likely to be made if Māori are not able to fully participate in decisions about the future direction of the census. To date, significant decision-making has occurred in the absence of any substantial Māori input.

The rise of Indigenous data sovereignty, as an Indigenous-led movement and as a field of research, has underscored the clear rights and interests that indigenous peoples, including Māori, have in relation to Indigenous data (Caroll Rainie et al., 2017; Kukutai & Taylor, 2016). These rights are supported by the United Nations Declaration on the Rights of Indigenous Peoples and have also been endorsed by the Special Rapporteur on the right to privacy (Cannataci, 2018). Rapid changes in data ecosystems, analytics and computing are opening up new ways of collecting, storing and analysing data. Internationally, there are a growing number of Indigenous-led data collections undertaken independently and in partnership with government.[24] Stats NZ recognises that it has responsibilities to meet the statistical and information needs of Māori and iwi as tangata whenua with distinctive rights and interests. A recent report noted that "The census must uphold Stats NZ's commitment to the Treaty of Waitangi by providing information needed by both Treaty partners – to work positively together, for mutual benefit, towards nation-building" (Gleisner, Downey, & McNally, 2015). Te Mana Raraunga, the Māori Data Sovereignty Network, has called for Māori data governance across the official data system, in part to provide clear lines of accountability back to iwi and Māori (Te Mana Raraunga, 2018). In late 2018, Stats NZ publicly announced that it would be committing to co-designing a Treaty-based Māori approach to data governance across the official data system (Stats NZ, 2018h). The co-design process will be jointly led by Stats NZ and the Data Iwi Leaders Group – the data expert group for the Iwi Chairs Forum, which provides a national platform for inter-tribal collaboration to advance shared aspirations. The coming years will be a real test of whether and how these commitments can be delivered on.

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views in our capacity as scholars, not as panel members. It draws heavily from the TMR statement on Census 2018, written primarily by the authors, and published online in July 2018. It does not contain references to any material circulated to the panel. We thank the reviewer for the helpful comments provided to us. Any errors or omissions are ours alone.

## Notes

1 Statistics New Zealand rebranded in 2016/17 to Stats NZ. For ease of reading, the organisation is referred to by its new name throughout the paper, although both names will be seen in the in-text citations and references depending on when each report was published.

2 The authors are both members of this panel. This paper does not represent our views as panel members, nor does it contain information circulated to the panel.

3 Statistics Act 1975, sections 23 & 24.

4 Population estimates for the national estimated resident population are produced quarterly and annually for Māori and subnational areas. Estimates adjust for census net undercount, the estimated number of usual residents temporarily overseas on census night, net migration and natural increase.

5 Stats NZ has developed experimental ethnic population estimates from linked administrative data in the IDI but has found important limitations (Stats NZ, 2018i). One is that administrative data, with the exception of birth registrations, tend to under-report people with multiple ethnicities. The method used to generate ethnic estimates also does not allow for changing ethnic self-identification over time.

6 For more on the IDI, see http://archive.stats.govt.nz/browse_for_stats/snapshots-of-nz/integrated-data-infrastructure.aspx

7 Most releases by Stats NZ have used around or *about* 90 per cent; however, at least one other paper refers to *at least* 90 per cent. See https://www.stats.govt.nz/news/2018-census-update-2

8 A substitute household is one in which there is sufficient evidence that a person exists, or a dwelling was occupied, but no individual form was received. Substitute records (now known as unit imputation) are raised for one member of the household or for the entire household. Partly counted households and substitute households have forms raised in the census and are thus counted in the usually resident population (URP) but not in the response rate.

9 The census also counts visitors in Aotearoa New Zealand on census night but not usual residents overseas.

10 The sampling error was +1.3 and +0.5 percentage points for Māori and European, respectively.

11 The report notes that many of the PES records matched to substitute records (which in 2013 did not contain ethnicity information) were from people who gave Māori as one of their ethnicities. Thus "the PES tends to

overstate coverage and underestimate undercount for some ethnic groupings" (Statistics New Zealand, 2014b, p. 48).

12 Stats NZ does not publish detailed net undercount rates for subnational sub-populations (e.g. Māori males in Northland) because of the large sampling errors.

13 The Representation Commission is convened every five years following receipt of a report from the Government Statistician on the New Zealand electoral population. The next boundary review will take place in 2019, with the new boundaries applying to the 2020 and 2023 General Elections.

14 The Act defines the Māori electoral population as "a figure representing both the persons registered as electors of the Maori electoral districts and a proportion of the persons of New Zealand Maori descent who are not registered as electors of any electoral district and a proportion of the persons of New Zealand Maori descent under the age of 18 years". Retrieved from http://www.legislation.govt.nz

15 This proportion takes account of respondents who answered "don't know", who provided a multiple response, or who did not provide any response to the Māori descent question (Statistics New Zealand, 2007, p. 11).

16 We thank the reviewer who identified this possible outcome.

17 New Zealand European/Pākehā are buffered somewhat by these changes because of their larger population share.

18 A key example is the allocation of fisheries quota in the Māori Fisheries Act 2004. The document *He Kawai Amokura* contained the methodology used by the Treaty of Waitangi Fisheries Commission to determine the notional population of the 57 recognised iwi, as set out in Schedule 3 of the Act. The notional iwi population figures provided the basis for the allocation of fisheries assets and were derived from iwi data from the 2001 New Zealand Census of Population and Dwellings.

19 Accessed from http://archive.stats.govt.nz/methods/classifications-and-standards/
classification-related-stats-standards/iwi.aspx

20 Stats NZ has indicated that imputation of Māori descent data will use, in order, the response to the 2013 Census, birth records, if the respondent answered the iwi question, and lastly if the respondent indicated Māori ethnicity in the 2018 Census (Stats NZ, 2018e, p. 17).

21 For more on the IDI, see
http://archive.stats.govt.nz/browse_for_stats/snapshots-of-nz/integrated-data-infrastructure.aspx

22 In cases where Māori descent and iwi variables are imputed (i.e. attached to an individual's data), this imputed data is included in the IDI with a flag to indicate its imputed status. This could mean that an imputed variable in the census could be linked to an individual's data over a long period of time.

23 For more on the "five safes", see
http://archive.stats.govt.nz/browse_for_stats/
snapshots-of-nz/integrated-data-infrastructure/keep-data-safe.aspx

24 See, for example, the work of the First Nations Information Governance Centre: http://fnigc.ca/first-nations-regional-health-survey.html and the Yawuru "Knowing our community" survey: http://www.yawuru.com/our-culture/knowing-our-community/

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