

Analysis of deprivation distribution in New Zealand by ethnicity, 1991–2013

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ABSTRACT

AIMS: To compare the distribution of Māori and New Zealand (NZ) European populations in Aotearoa New Zealand by neighbourhood deprivation, for the five censuses between 1991 and 2013, and to identify changes in the distribution pattern over time.

METHODS: Geographical meshblock data from the 1991–2013 New Zealand censuses, by NZDep Index deprivation score, and by prioritised ethnic group population, were combined to analyse ethnic population counts by deprivation decile and deprivation score. Trends over time were analysed.

RESULTS: Māori were over-represented in the more deprived NZDep deciles and under-represented in the least deprived deciles for all census periods. The NZ European population were over-represented in the least deprived deciles, and under-represented in the more deprived deciles. In each census, over 40% of the Māori population have been living in the two most deprived deciles, compared to less than 15% for NZ European.

CONCLUSION: The patterns of inequity in socio-economic deprivation between Māori and NZ Europeans have remained virtually unchanged since 1991, despite various Government commitments to reduce inequity. Socio-economic deprivation for Māori is a key determinant of health inequity, and bolder Government measures prioritised for Māori are needed to change this socio-economic gradient if health equity goals are to be met.

Socio-economic deprivation has a significant influence on health.^{1,2} In Aotearoa New Zealand, there are persisting inequities in health between the Indigenous Māori population and other groups. In 2017–2019, Māori life expectancy at birth was 7.5 years shorter for males and 7.3 years for females, compared to non-Māori.³ Previous analyses of census data show that Māori are over-represented in the poorest areas of New Zealand, as measured by the New Zealand Index of Deprivation (NZDep), and that the New Zealand (NZ) European population are over-represented in the richest areas.^{4,5} Socio-economic disadvantage has been found to explain approximately half of ethnic inequity in mortality for Māori adult males, and just over 40% for Māori adult females, and this percentage increases as more variables of socio-economic position are included in the model, suggesting that these estimates are likely to be an underestimate of the true influence of socio-economic position on health inequity.^{6,7} The inequitable distribution of socio-economic resources is therefore a major and modifiable cause of health inequities in New Zealand.

Addressing health inequities is considered a matter of social justice^{8,9} and is an objective of many governments, including New Zealand.¹⁰ In addition, legal provisions for equity are made through New Zealand's founding document, Te

Tiriti o Waitangi—an agreement made in 1840 between the British Crown and Māori. Te Tiriti establishes a partnership that recognises Māori as Indigenous people with ongoing sovereignty.¹¹ It guarantees Māori the same rights and privileges as British subjects, and therefore the right to benefit equitably from society.¹² Obligations of government agencies, including health, are in this regard enshrined in New Zealand legislation.

In 2020, an editorial by Crampton was published in the *New Zealand Medical Journal*¹³ presenting that very little change had occurred in the distribution of deprivation by ethnicity between the 1991 and 2018 New Zealand censuses. Given the importance of socio-economic position as a determinant of health inequities, and the recognised weaknesses with the 2018 Census,¹⁴ this analysis explores in more depth the distribution of the Māori and NZ European ethnic populations by deprivation, over the five population censuses conducted between 1991–2013. In addition to the editorial by Crampton, this research builds upon analyses of earlier censuses,^{5,13} and applies a Kaupapa Māori lens to the analysis.

Methods

The setting of research questions, analysis and interpretation of data were conducted using a

Kaupapa Māori informed positioning. This recognises the complexity of historical and contemporary realities of Māori, as well as acknowledging and challenging the power dynamics that have created and maintained the unequal position of Māori.^{15,16}

The NZDep Index is a small, area-based index providing a measure of neighbourhood deprivation by looking at the comparative socio-economic positions of small areas—“meshblocks”—based on nine socio-economic variables from the census (see Table 1). Meshblocks are geographical units defined by Statistics New Zealand, containing a median of approximately 81 people in 2013.¹⁷ The NZDep Index is presented as both a scale of deciles from 1 (least deprived) to 10 (most deprived) and a continuous score. Further methodological details for the calculation of each NZDep are publicly available from the University of Otago.¹⁷⁻²¹

Population counts by prioritised ethnicity for each meshblock, using the meshblock boundaries at the time of each census, were obtained from Statistics New Zealand for the 1991, 1996, 2001, 2006 and 2013 New Zealand censuses of Population and Dwellings. The 2018 Census was conducted in a very different way to earlier censuses and consequently, time series comparisons with regard to ethnicity cannot reliably be made for Māori using 2018 data.¹⁴ Therefore, this analysis does not include the 2018 Census. Datasets listing geographical meshblock by NZDep deprivation decile and score (according to the formula at the time of each census) for each census year were obtained from the University of Otago,²³ and the datasets were combined to analyse Māori and NZ European ethnic population counts by deprivation decile and deprivation score for each census. A small number of meshblocks were unable to be assigned a NZDep score due to low population numbers, and these meshblocks were excluded from the analysis. The total percentage of the Māori and NZ European population excluded from analysis because of this was very small (0.77%, 0.16%, 0.15%, 0.13% and 0.40% for the 1991, 1996, 2001, 2006 and 2013 censuses, respectively). Māori, however, are more likely than non-Māori to be missed by the census. Statistics New Zealand undertakes post-enumeration surveys after each census to provide an estimate of any undercounting. For Māori, the estimated undercount was 3.7% in 1996, 4.4% in 2001, 3.1% in 2006 and 6.1% in 2013, compared to an undercount for the total population of 1.6% in 1996, 2.2% in 2001, 2% in 2006 and 2.4% in 2013.²⁴

Data were analysed based on prioritised ethnicity. In the New Zealand census questionnaire, a person can belong to more than one ethnic group. In prioritised output, each respondent is allocated to a single ethnic group using a prioritisation system that ensures ethnic groups, of policy importance or of small size, are not swamped by the numerically dominant NZ European ethnic group.²⁵ According to this system, every respondent who lists Māori as one of their ethnicities will be classified as Māori. A respondent will be classified as NZ European only if they do not list any other ethnicities (except for “New Zealander” or “Kiwi”, which are classified as NZ European for the purposes of these analyses). The NZ European ethnic group was used as the comparator in this analysis, instead of non-Māori, or non-Māori non-Pacific, because it gives a clearer picture of the impact of advantage or privilege alongside disadvantage.²⁶ The non-Māori group is also a less consistent comparator over time due to changing ethnic composition—in 1991, the non-Māori category was 91.3% NZ European, 5.3% Pacific and 3.2% Asian, whereas in 2013 it was 78.1% NZ European, 7.2% Pacific and 13.3% Asian.

Trends in the distribution of NZDep score and decile by ethnicity are presented graphically. The odds ratio for Māori being in each NZDep decile compared to NZ Europeans is presented and trends over time were calculated using OpenEpi, Version 3. Ethics approval was provided by The University of Auckland Human Participants Ethics Committee (ref: 022513).

Results

The Māori population is consistently and markedly over-represented in the more deprived NZDep deciles, and under-represented in the least deprived deciles for all census periods between 1991–2013 (Figure 1). For the same period, the NZ European population has been over-represented in the least deprived deciles, especially 1–3, and under-represented in the more deprived deciles, especially 8–10. This pattern of inequitable distribution has been virtually unchanged between 1991–2013. In every census since the inception of NZDep in 1991, over 40% of the Māori population have been living in the two most deprived deciles, compared to less than 15% for NZ Europeans (see Table 2). In 2013, over a quarter of the NZ European population lived in the two least deprived geographic deciles, compared to 7% of Māori.

Table 1: NZDep variables, and weights given to each variable in calculating overall NZDep score, for the 1996–2013 New Zealand censuses.

| Dimension of deprivation | Variable | 1996 | 2001 | 2006 | 2013 |
|-----------------------------------|---|-------|-------|-------|-------|
| Income | People aged 18–64* receiving a means tested benefit | | 0.361 | 0.371 | 0.364 |
| | People living in equivalised households with income below a threshold | 0.351 | 0.350 | 0.356 | 0.356 |
| Employment | People aged 18–64* unemployed | 0.358 | 0.353 | 0.332 | 0.338 |
| Education | People aged 18–64* without any qualifications | 0.327 | 0.319 | 0.326 | 0.332 |
| Home ownership | Not living in own home | 0.295 | 0.312 | 0.334 | 0.322 |
| Social support | People aged <65 living in single parent family** | 0.345 | 0.325 | 0.333 | 0.317 |
| Living space | Living in household below equivalised bedroom occupancy threshold | 0.228 | 0.309 | 0.318 | 0.303 |
| Transport | People with no access to a car | 0.348 | 0.332 | 0.311 | 0.286 |
| Communication*** | People aged <65 with no access to a telephone** | 0.363 | 0.336 | 0.314 | |
| | People aged <65 with no access to the internet at home** | | | | 0.372 |
| Total % of variance explained**** | | 57.4% | 57.7% | 55.4% | 60.7% |

Source: Tobias et al,⁵ Atkinson et al¹⁷ and Crampton et al.²¹

Notes: *Prior to 2006, the age range for these variables was 18–59 years to reflect the eligibility threshold for old age pensions at the time.

**Prior to 2006, these variables were calculated for people <60 years.

***In 2013, access to a telephone was replaced with internet access for the communication dimension. Variable weights for NZDep1991 are available on request from the authors of NZDep1991, and are broadly similar to the years 1996–2013.²²

****This refers to the degree to which each set of chosen NZDep variables accounted for the overall variation in the data, using a principal components analysis.

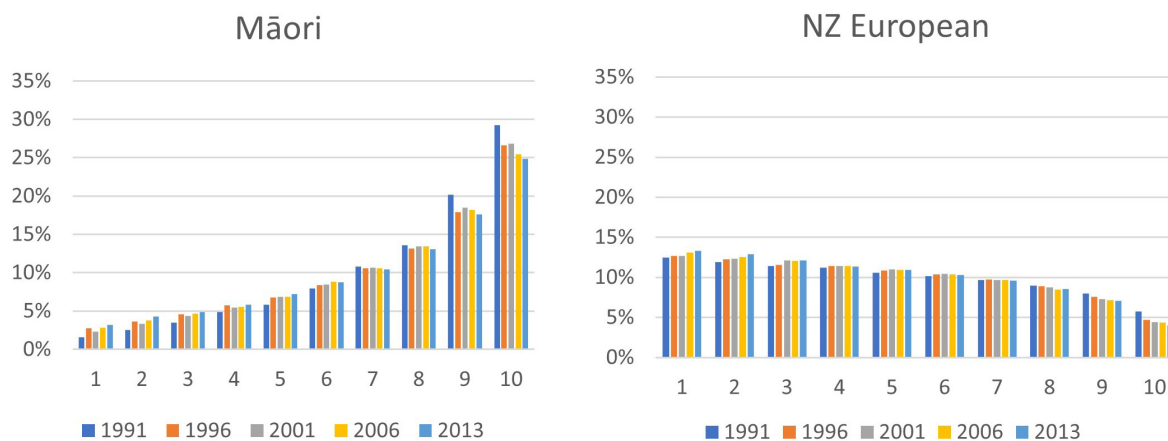
Figure 1: Māori (left) and NZ European (right) population distributions by NZDep decile, 1991–2013.

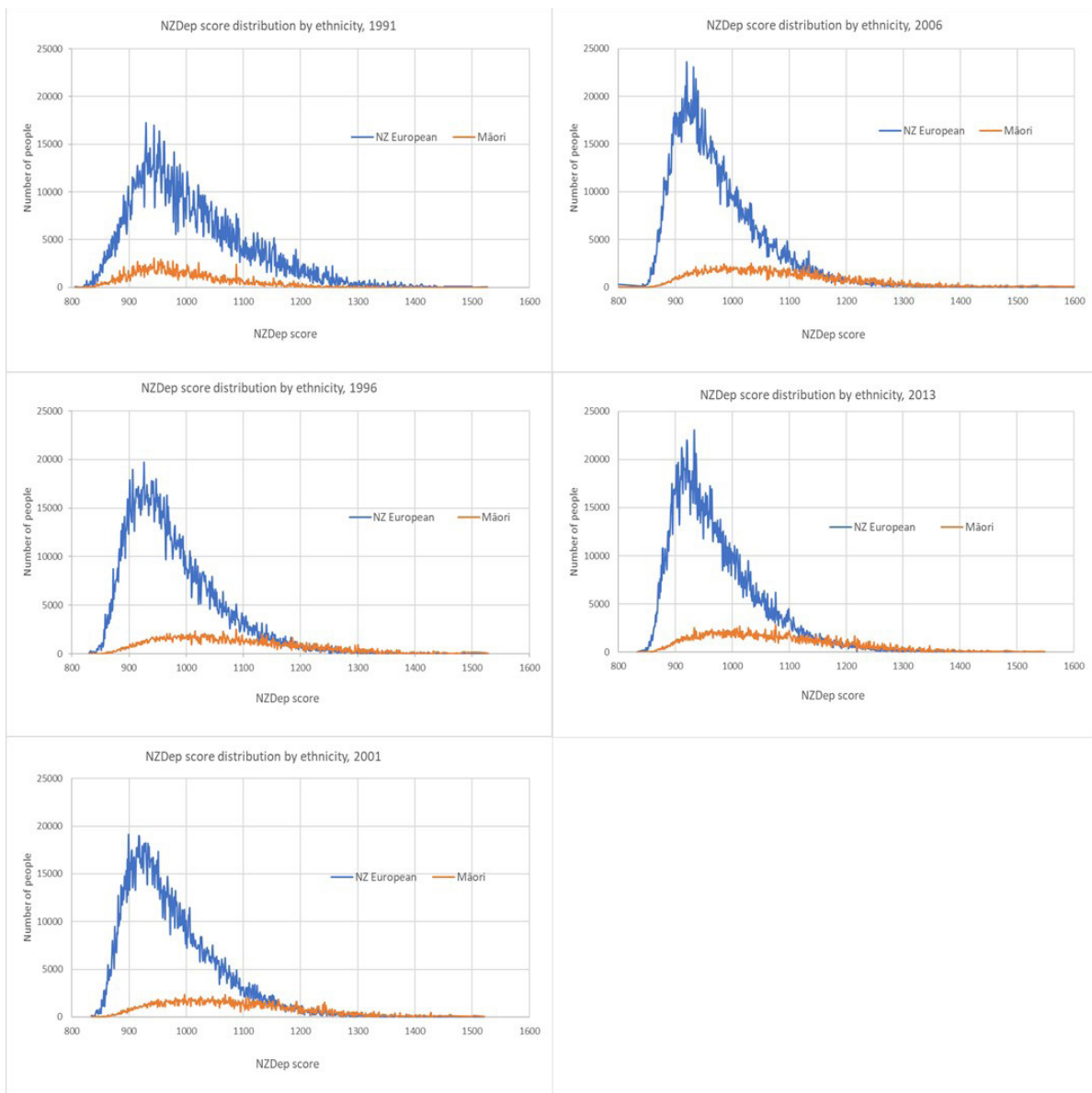
Table 2: Percentage of Māori and NZ European population in each NZDep decile, 1991–2013.

| NZDep decile | % of Māori | | | | | % of NZ European | | | | |
|--------------|------------|-------|-------|-------|-------|------------------|-------|-------|-------|-------|
| | 1991 | 1996 | 2001 | 2006 | 2013 | 1991 | 1996 | 2001 | 2006 | 2013 |
| 1 | 1.6% | 2.8% | 2.3% | 2.8% | 3.2% | 12.5% | 12.7% | 12.7% | 13.1% | 13.3% |
| 2 | 2.5% | 3.6% | 3.4% | 3.8% | 4.3% | 11.9% | 12.2% | 12.3% | 12.5% | 12.9% |
| 3 | 3.5% | 4.6% | 4.3% | 4.7% | 4.8% | 11.4% | 11.6% | 12.1% | 12.0% | 12.1% |
| 4 | 4.9% | 5.7% | 5.4% | 5.5% | 5.8% | 11.2% | 11.4% | 11.4% | 11.4% | 11.3% |
| 5 | 5.9% | 6.8% | 6.8% | 6.8% | 7.2% | 10.6% | 10.9% | 11.0% | 10.9% | 10.9% |
| 6 | 8.0% | 8.4% | 8.5% | 8.8% | 8.7% | 10.2% | 10.4% | 10.4% | 10.3% | 10.3% |
| 7 | 10.8% | 10.6% | 10.6% | 10.5% | 10.5% | 9.6% | 9.7% | 9.6% | 9.7% | 9.6% |
| 8 | 13.6% | 13.1% | 13.4% | 13.4% | 13.1% | 8.9% | 8.9% | 8.7% | 8.5% | 8.6% |
| 9 | 20.2% | 17.9% | 18.5% | 18.2% | 17.6% | 8.0% | 7.6% | 7.3% | 7.1% | 7.0% |
| 10 | 29.2% | 26.6% | 26.8% | 25.4% | 24.8% | 5.7% | 4.7% | 4.4% | 4.4% | 4.0% |
| | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

Table 3: Odds ratios for Māori being in each NZDep decile, compared to NZ Europeans, 1991–2013.

| Decile | 1991 | | 1996 | | 2001 | | 2006 | | 2013 | |
|--------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|
| | OR | 95% CI | OR | 95% CI | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| 1 | 0.11 | 0.11–0.11 | 0.20 | 0.19–0.20 | 0.16 | 0.16–0.16 | 0.19 | 0.19–0.19 | 0.21 | 0.21–0.22 |
| 2 | 0.19 | 0.19–0.20 | 0.27 | 0.26–0.27 | 0.25 | 0.24–0.25 | 0.28 | 0.27–0.28 | 0.30 | 0.30–0.31 |
| 3 | 0.28 | 0.27–0.28 | 0.37 | 0.36–0.37 | 0.33 | 0.32–0.33 | 0.36 | 0.35–0.36 | 0.37 | 0.36–0.37 |
| 4 | 0.41 | 0.40–0.41 | 0.47 | 0.47–0.48 | 0.45 | 0.44–0.45 | 0.45 | 0.45–0.46 | 0.48 | 0.48–0.49 |
| 5 | 0.53 | 0.52–0.53 | 0.60 | 0.59–0.61 | 0.59 | 0.58–0.60 | 0.60 | 0.59–0.61 | 0.63 | 0.63–0.64 |
| 6 | 0.76 | 0.76–0.77 | 0.79 | 0.78–0.80 | 0.80 | 0.79–0.80 | 0.84 | 0.83–0.85 | 0.84 | 0.83–0.84 |
| 7 | 1.14 | 1.13–1.15 | 1.10 | 1.09–1.11 | 1.11 | 1.10–1.13 | 1.10 | 1.09–1.12 | 1.10 | 1.09–1.11 |
| 8 | 1.60 | 1.58–1.61 | 1.54 | 1.53–1.56 | 1.62 | 1.60–1.63 | 1.67 | 1.66–1.69 | 1.61 | 1.60–1.63 |
| 9 | 2.91 | 2.89–2.94 | 2.66 | 2.64–2.68 | 2.87 | 2.85–2.90 | 2.90 | 2.87–2.92 | 2.81 | 2.79–2.84 |
| 10 | 6.76 | 6.71–6.82 | 7.34 | 7.28–7.40 | 8.00 | 7.93–8.07 | 7.47 | 7.41–7.54 | 7.97 | 7.90–8.04 |

All P-values <0.05

Figure 2: Distribution of NZDep scores for Māori and NZ European populations, 1991–2013.

For both Māori and NZ European populations, there appears to be a slight trend for increasing percentages of the population living in the less deprived areas, and for decreasing percentages of the population living in the most deprived deciles. However, when compared, there is little change in the relative inequity between the two groups (see Table 3), especially when it comes to living in the most deprived areas. For example, in 2013 Māori were 7.97 times more likely than NZ Europeans to be living in the most deprived decile, compared to being 6.76 times more likely in 1991. In other words, the NZ European population is still just as privileged compared to the Māori population in 2013 as in 1991, in terms of living in areas of low socio-economic deprivation.

The distribution of the raw NZDep scores of individuals in Figure 2 shows a markedly different pattern of distribution for the Māori population compared to the NZ European population, with a consistent pattern over all census periods. The NZ European population shows a narrower distribution, skewed towards the least deprived scores, where the Māori population has a much wider distribution, strongly skewed to the deprived end of the scale, with a long tail of the population distributed in the most deprived scores.

Discussion

Implications for public health

The difference in the deprivation distribution between Māori and NZ Europeans is stark and inequitable. The over-representation of the NZ European population in the least deprived areas suggests that this group benefit from an inequitable share of socio-economic resources in New Zealand. This privilege contrasts with the even more marked disadvantage experienced by Māori—despite over 170 years of Te Tiriti o Waitangi commitments to equity, most Māori in 2013 (75%) were still living in the more socio-economically deprived half of the country. This indicates a substantial failure of the Crown's Te Tiriti o Waitangi obligations to provide equal benefits of citizenship, including equitable access to health and the social determinants of health.

Of even more concern, is the fact that the pattern and magnitude of relative inequity in deprivation between Māori and NZ European has shown almost no change since measurement began in 1991. This demonstrates that processes of both privilege and disadvantage are being perpetuated in New Zealand and are not changing.

This indicates a failure of any policy efforts over the last two decades to make any substantive difference to the relative inequity in deprivation between Māori and NZ Europeans.

From a public health perspective, this has significant implications for efforts to reduce health inequities. Efforts to address health inequities in New Zealand have focused on the health system, in terms of improving access to and outcomes from health services—and these are areas where work still needs to be done.^{27,28} Modest improvements in the life expectancy gap between Māori and NZ Europeans have been made but are still unacceptable (narrowing from a gap of 8.9 years for men and 7.5 years for women in 2005–2007 to 7.5 years for men and 7.3 years for females in 2017–2019).³ Socio-economic position is not the only cause of health inequities for Māori, with gaps in health outcomes still existing after controlling for deprivation.^{4,29} However, given that NZDep explains at least half of the mortality gap,^{6,7} large scale progress towards achieving health equity, a key objective of the 2022 health reforms in New Zealand, is unlikely to be made without addressing the persisting inequities in socio-economic privilege and disadvantage, or “the unequal distribution of power, money and resources”.¹

The stark differences in shape of the deprivation distribution of Māori and NZ European populations also demands a different style of public health response. The traditional public health approach to population-based prevention, that seeks to introduce policies benefitting the whole population and to shift the entire curve to the left,³⁰ is of limited value here. The curve is so flat for Māori, and with such a long tail, that the population could shift a long distance to the left without any significant improvement for the Māori in the tail. This is supported by a significant body of evidence that universal policies for the total population are often not equitable unless associated with additional measures proportionate to the level of disadvantage³¹ and a combination of approaches are required.³² Policies are needed that will compress the distribution for Māori—this will mean prioritising socio-economic policies that disproportionately benefit Māori living in high deprivation areas. Policies that will fail to do this will fruitlessly perpetuate the current patterns of inequity, and the erroneous belief that benefits for the whole population will equally benefit the Māori and NZ European populations.

Availability of routinely collected ethnicity

data and a stable metric for monitoring socio-economic disadvantage is an asset in New Zealand, but it is clear that this has not been sufficient to produce the expected level of alarm or action. This is a sobering message for public health researchers and practitioners, and asks the question: what else can be done to communicate alarming public health data in ways that creates a sense of outrage and urgency in policy makers and the public? NZDep deciles by ethnicity have been reported on in a number of New Zealand health reports over the last 20 years,^{7,27,33,34} and the shape of the graphs would be familiar to many in the health and social policy sector. The lack of action in the face of such widely available data suggests a normalisation or acceptance of disparity and privilege in New Zealand.

Socio-economic deprivation for Māori has its causes in historical and present day processes, both relating to racism and colonisation. Our analysis shows that the pattern of inequitable distribution of resources has remained unchanged for at least two decades—since measurement of deprivation began. The ongoing structural racism maintaining this pattern needs to be named, and more explicitly acknowledged and addressed if real, sustainable changes are to be made to the distribution of socio-economic resources, and health outcomes, in New Zealand. To understand the persistence of Māori disadvantage across multiple domains, we need to view ethnic discrimination as a broader system that is reciprocal and reinforcing.³⁵ Policies and initiatives to address ethnic discrimination in parts of the system (e.g., health) will have limited success until the “uber-discrimination” is unpacked and addressed from a systems perspective, including identifying the leverage points and interventions that will work simultaneously across subsystems.³⁵

Limitations

It is important to remember that the NZDep is a relative measure, so this analysis does not assess any absolute changes in material deprivation, nor their impacts on ethnic inequities in life expectancy. The focus of this analysis is on inequity between Māori and the dominant NZ European ethnic group privileged through colonisation, and from this standpoint the relative inequity between these two groups is virtually unchanged over all census periods measured. This relative inequity will need to be addressed to achieve health equity between these groups in New Zealand.

The NZDep Index is only a partial or proxy

measure for socio-economic deprivation³⁶ and does not capture all dimensions of socio-economic position. NZDep alone has been estimated to capture only 50% of the effect socio-economic position on health compared to when individual measures are included.³⁷ This analysis is not able to examine changes in the ethnic distribution of other important social determinants of health, such as educational outcomes, employment and wealth.

As a neighbourhood measure, there are many things that NZDep does not tell us about the level of socio-economic deprivation experienced by individuals or households living in that neighbourhood. Even at meshblock level, the degree of heterogeneity of socio-economic position is large, and Māori and NZ Europeans living in the same decile, for example, should not be assumed to have the same level of socio-economic resources. At each deprivation decile, Māori life expectancy is shorter than NZ European.²⁹ After controlling for neighbourhood deprivation, part of this gap could be explained by NZ Europeans within a given neighbourhood having a greater share of the socio-economic resources, but it also points to other forms of ongoing structural racism, such as access to, and experience within, health services.

Analysing ethnic distribution of NZDep at an aggregate level also does not reveal the degree of mobility between deciles. An analysis of mobility between deprivation deciles³⁸ found that, at an individual level, Māori are much less likely to stay in low deprivation areas, and that NZ Europeans in high deprivation areas are much more likely to move out of them. Other research³⁹ has found that Māori children, other young people, and sole parents are more likely than other groups in New Zealand to experience *persistent* deprivation, indicating that the cumulative “duration of exposure” to high deprivation over a lifetime is also an inequitable burden for Māori.

Another consideration that this analysis is unable to examine is the different gender and age profiles of populations living in high deprivation areas—the Māori population overall has a much younger age structure than the NZ European population, and sole parent families are over-represented in deprived deciles. This means there is likely to be an over-representation of Māori women and children in the most deprived deciles, and that inequity in deprivation in New Zealand has intersecting ethnic, gender and age dimensions.

There are some limitations in using the NZDep

for each census as a time series. There have been some modifications to the NZDep index between 1991 and 2013—thresholds for individual variables have changed and the crowding and communication variables have been modified. These modifications are considered necessary to maintain consistency over time, and they are not considered to be significant sources of bias.⁵ There have been some changes to the ethnicity question in the census over time, and in the classification of some responses. As noted above, the ethnic composition of the non-Māori category has also changed substantially since 1991. The impact of these changes is minimised by analysing based on prioritised ethnicity and using the NZ European ethnic group (including “New Zealander” type responses) as the comparator group. Meshblock boundaries have also changed slightly over time. The meshblock boundaries used for each census were correct at the time of each census, but this means there is some inconsistency between census periods. Most meshblocks have not experienced boundary shifting, so the bias

from this is small. This was tested by repeating the same analysis (not shown here); using the meshblocks for each census coded with the 2013 meshblock boundaries.

Conclusion

The stark patterns of inequity in socio-economic deprivation between Māori and NZ Europeans have remained virtually unchanged since measurement began over two decades ago. We are facing a normalisation or acceptance of ethnic disadvantage and privilege in New Zealand. Socio-economic deprivation for Māori is a key determinant of health inequity. The ongoing structural racism maintaining this pattern needs to be named and explicitly addressed if real changes are to be made to the distribution of socio-economic resources, and health outcomes, in New Zealand. Changing this socio-economic gradient will require bolder and more socially just Government action prioritised towards Māori.

COMPETING INTERESTS

Nil.

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