

Increasing geographical inequalities in health in New Zealand, 1980–2001

Jamie Pearce^{1*} and Danny Dorling²

Accepted 11 January 2006

Background Recent studies have noted widening health inequalities between rich and poor areas in a number of OECD countries. This paper examines whether health in New Zealand has become more geographically polarized during the period 1980–2001, a time of rapid social and economic changes in New Zealand society.

Methods Mortality records for each year between 1980 and 2001 were extracted for consistent geographical areas: the 21 District Health Boards operating in New Zealand in 2001 and used to calculate male and female life expectancies for each area. The geographical inequalities in life expectancy were measured by calculating the slope index of inequality for each year between 1980 and 2001.

Results Although overall life expectancy has increased during the period of study, New Zealand has experienced increased spatial polarization in health, with a particularly sharp rise in inequality during the late 1980s and early 1990s. Since the mid-1990s regional inequality has remained at stable but high levels. The polarization in mortality was mirrored by a growth in income inequality during the 1980s and 1990s.

Conclusions Health inequalities as expressed geographically in New Zealand have reached historically high levels and show little sign of abating. In order to tackle health inequalities, a greater commitment by the New Zealand government to a more redistributive social and economic agenda is required. Furthermore, issues of differentiated and health selective migration, emigration, and immigration need to be addressed as if these are important they should matter more for New Zealand than for almost any other developed nation-state.

Keywords Health inequality, geographical polarization, life expectancy, slope index of inequality, New Zealand

Background

A number of recent studies have demonstrated growing inequalities in health within many OECD countries.^{1–4} New Zealand is no exception to this trend as there is an increasing body of evidence of significant variations in health between different socioeconomic groups within the country.^{5–7} For example, using linked census-mortality records, it has been shown that relative inequalities in New Zealand have increased during the 1980s and 1990s.^{8,9} However, despite many years of health inequalities research in New Zealand, recognition by

policy makers of the growing disparities in health has only recently led to the debate moving up the political agenda.^{7,10,11} For example, recent policy initiatives by the present (Labour) government, including the New Zealand Health Strategy¹² and the New Zealand Disability Strategy,¹³ make explicit reference to prioritizing the reduction of health inequalities in New Zealand.

Despite the increasing interest in health inequalities in New Zealand, there has been surprisingly little work documenting the trends in inequalities over the past 20 years, a period of rapid social and economic change. The adoption of a neo-liberal social and economic agenda during this period resulted in major structural changes in New Zealand society, including economic restructuring in the 1980s and reforms of the welfare state, particularly in health, housing, and education, from 1991 onwards.^{14,15} It has previously been reported that these

¹ Department of Geography, University of Canterbury, Private Bag 4800, Christchurch 8020, New Zealand.

² Department of Geography, University of Sheffield, Sheffield S10 2TN, UK.

* Corresponding author. E-mail: jamie.pearce@canterbury.ac.nz

changes resulted in increases in income equality that were greater than those experienced in any other OECD country, including the UK under Thatcher and Reagan's administration in the US.^{16,17}

Despite the high levels of geographical inequalities in health within New Zealand, the trends in spatial inequalities in health have received very little attention. This omission is perhaps surprising given the unwanted legacy of growing social inequalities in New Zealand, which has left an estimated 16.3% of the children living in high relative poverty (in households with income <50% of the national medium income), the fourth highest child poverty rate of all the 24 OECD countries.¹⁸ It is not always recognized that different social inequalities are often manifest geographically in different ways, educational inequalities will differ from health inequalities and so on—although they are connected. For example, it is easier to maintain gross educational inequalities in urban areas where all children do not need to travel to the same school. In contrast, in rural areas educational inequalities tend to be lower, but health inequalities usually persist as people are sorted in space as they age.¹⁹ Social inequalities, expressed through inequalities in the housing market usually play a large part in transferring inequalities measured between ethnic groups to those recognized between areas in terms of population health. Because of this, area is often used as a proxy for deprivation.

One of the few studies of health in New Zealand to consider the trend in socioeconomic health inequalities during the 1980s and 1990s examined participants of sample surveys juxtaposed with population life table data at two points in time and found that between 1981/82 and 1992/93 there was a widening socioeconomic gap in health expectancy between different social groups.²⁰ These results were supported by a separate study, which found that although there was a decrease in overall male mortality rates among New Zealand men (aged 15–64) between the periods 1975–77 and 1995–97, the relative inequalities in the premature mortality rate between social classes grew between these years.²¹ More recently, researchers have noted that although the levels of health inequality in New Zealand persist at internationally high levels, there is some evidence to suggest that the trend may have plateaued. Tobias *et al.*²² examined the polarization of life expectancy between 1995 and 2000 and found that the difference in health between the least and most deprived quintiles is ~9 years for males and 7 years for females, yet the gradient remained stable during this time period. Thus in New Zealand much higher rates of regional inequalities are being experienced between deciles of the population sorted by area than say, in England where differences between extreme deciles are reported to be roughly half as large (5.9 years of life for men and 3.2 for women).²³ The growing realization of just how unequal New Zealand society and the consequent health of its members appears now to be is of wider international interest given New Zealand's unique position in the history of healthcare and its pioneering approach to reducing socioeconomic inequalities in the past.

New Zealand was the first nation in the world to introduce a universal healthcare system and lay the foundations for a welfare state following the enactment of the Social Security Act in 1938.²⁴ According to the Prime Minister at this time, Joseph

Savage, the act was:

'for the first time to provide, as generously as possible, for all persons who have been deprived of the power to obtain a reasonable livelihood through age, illness, unemployment, widowhood, or other misfortune' (quoted in Boston, 1999, p.3)²⁵

Despite the high ambitions of the pre-war Labour administration, since the early 1980s there has been a significant shift in governmental support away from New Zealand's welfare state, as successive (often Labour) governments have adopted a more neo-liberal policy agenda, which has eroded the long accepted assumptions of a universal and freely accessible public health system.²⁶ These changes have led some commentators to claim that the reforms in New Zealand resulted in social and economic changes that were more extreme than in any other democracy, not only in terms of where it started but also where it ended up.²⁷ New Zealand was, therefore, not only the first country to introduce the principles of a universally available welfare system but among the first to substantially dismantle them. Being the fourth smallest of the OECD nations and one of only two lying south of the equator, New Zealand is often excluded from international comparisons,^{28,29} despite the fact that it could well be a good indicator for other OECD countries of the consequences of adopting a more market-focused health strategy (as, for instance, is currently being, considered under the third term of the British Labour party's current rule of office).³⁰

Recent evidence thus suggests that by the end of the 20th century, socioeconomic inequalities in health in New Zealand had reached extremely high levels by OECD standards, but inequalities towards which many other comparable OECD countries are moving.³¹ In terms of the potential effects of changing social policies on health in rich nations, New Zealand could be viewed as a sentinel nation where policies and implications are often first seen. However, there has been relatively little published on how these socioeconomic inequalities in health became established, during the 1980s and 1990s, a period of considerable social and economic restructuring. Therefore, this paper uses mortality records to monitor the trends in the level of spatial inequality in health during the period 1980–2001.

Methods

This study considers whether there has been a polarization in the mortality gap in New Zealand from the early 1980s to the 1990s and into the current century. Mortality records were extracted for the period 1980–2001 from the New Zealand Health Information Service (NZHIS) Mortality Collection. For each year, the mortality data were configured to the 21 District Health Boards (DHBs) across the country using consistent geographical units (2001 boundaries). The DHBs were formed in 2001 and are responsible for the provision of health and disability services in the region. The boards have an average population size of 194 000 and range in size from 31 000 to 489 000.³² In addition, age-specific and sex-specific population data for 38 groups (males and females 0, 1–4, 5–9, 10–14, up to 85+) were supplied from the five censuses that took place

during this period. For inter-census years, population estimates were calculated for each age–sex group through linear interpolation. The small number of unspecified and overseas deaths (0.45% of total deaths) was excluded from the analysis. Life expectancies were calculated for each DHB in New Zealand using the ‘Chiang II method’ because this approach is not susceptible to errors resulting from a count of zero deaths in a particular age–sex group.³³

The geographical polarization in life expectancy was measured by calculating the slope index of inequality (SII) of life expectancy for each 3 year time period from the slope of the regression line that runs from the hypothetically poorest individual to the hypothetically richest individual derived using a measure relative poverty (areas ranked by the 2001 New Zealand Deprivation Score: lowest three deciles) for each DHB, weighted for population size (see Low and Low, for more details).³⁴ The SII of life expectancy provides a consistent measure of regional inequalities in health across a population and allows comparisons to be made over time.^{34,35} The measure compares absolute differences in years of life, which has been argued to be a better gauge for policy work than relative measures.^{36,37}

Results

Although life expectancy in New Zealand increased from 70.4 and 76.4 for males and females in 1980–82, to 76.3 and 81.1, respectively, by 2000–02,³⁸ the levels of regional inequalities in health between the least and most deprived DHBs rose during the period for both sexes, particularly from the late 1980s to mid-1990s. By the year 2000 there was a clear relationship between relative deprivation and life expectancy by area (Figure 1); the correlation coefficients by DHB being 0.86 and 0.80 for men and women, respectively.

An examination of the SII demonstrates a steady rise for men, which was rising most steeply in the early 1990s followed by an apparent slight fall since the mid-1990s (Figure 2). The SII of life expectancy has increased from 2.29 years in 1981 to 3.78 years in 2000, peaking at 4.08 years in 1998. For women, the increase has been less marked (2.34–3.18 years between 1981 and 2000) although more recently there has been a noticeable plateau. It is interesting to note that regional inequalities in health appear to have temporarily reduced by a small amount during the period 1986–88, which was followed immediately by a sharp increase. Since the mid-1990s the levels of regional inequalities have fluctuated at very high levels. The results are not an artefact of the sorting of DHBs by levels of deprivation in 2001 because when the areas are instead sorted according to life expectancy in the period 1980–82 the same pattern of rising geographical inequalities over time is found with the highest level of inequalities for males and females occurring in the early to mid-1990s (results not shown). Similarly, if areas are sorted by contemporary life expectancies (1999–2001), the same trend in geographical inequalities is noted although the rise is less acute (results not shown). There are no discernable geographical trends in life expectancy between the North and South islands of the country during the period 1980–2001, with only small and inconsistent differences at each point in time (Figure 3).

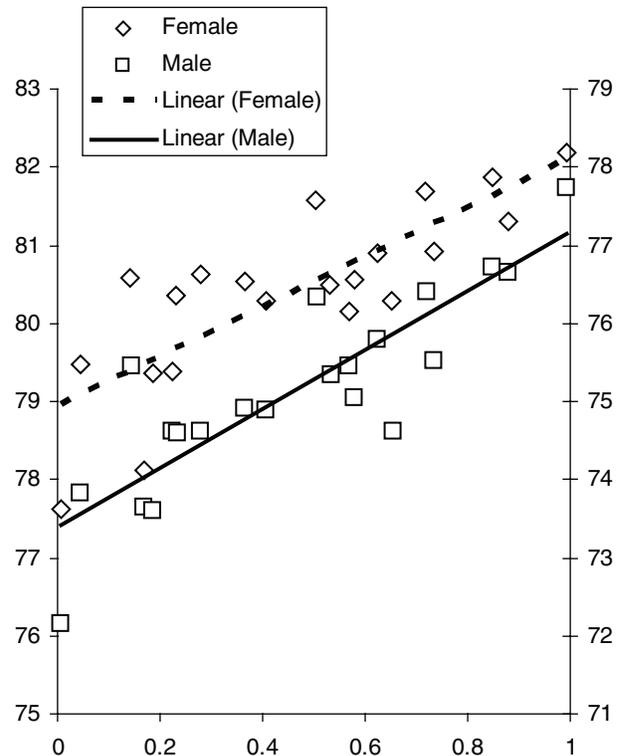


Figure 1 Relationships between life expectancy (right y-axis for men, left for women) and relative deprivation (x -axis; 0 is highest deprivation) by DHBs, 2000

Discussion

Although life expectancy in New Zealand continues to rise, the rate of increase has not been consistent across all areas of the country. There have been significant increases in life expectancy in the most advantaged areas of the country, yet, despite repeated government rhetoric about reducing socioeconomic inequalities in health, more deprived areas have not kept pace. What is clear now in New Zealand may well soon become more clearly evident elsewhere, as governments around the world begin to evaluate their policies to reduce socioeconomic inequalities in health and find that policies, labelled as progressive appear—in the round and upon measurement—to have favoured the more advantaged most.³⁹ Thus the following kind of announcement may become increasingly common as governments with ‘progressive’ policies are surprised to find that their policies on health have not reduced socioeconomic inequalities within the borders of each respective territory:

‘It’s gone better in the better off groups more rapidly’
Caroline Flint, MP, Minister for Public Health, BBC Radio 4;
7.25 am, Friday 9 September 2005.

During the period 1980–2001, the level of regional health inequalities in New Zealand worsened rapidly, particularly in the late 1980s and early 1990s. More recently, the levels of inequality appear to have stabilized but remain at internationally high rates and there is only limited evidence of a

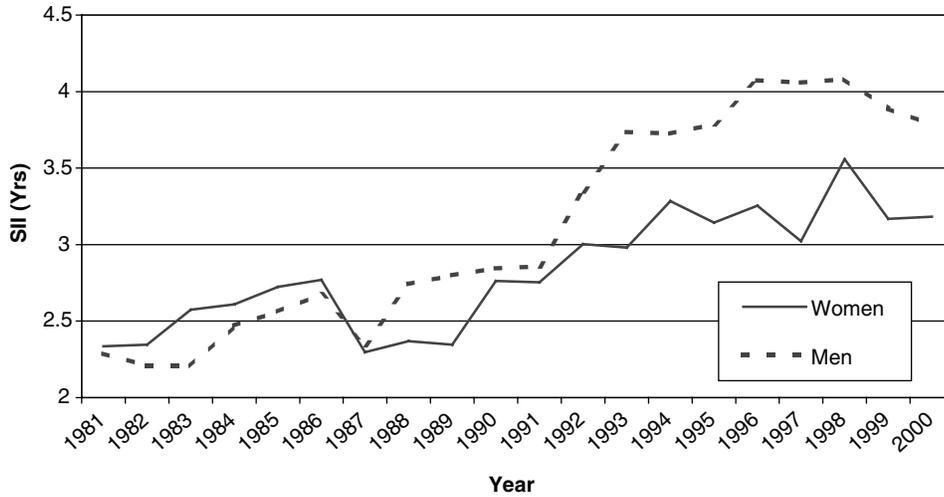


Figure 2 Slope index of inequality for males and females, 1981–2000

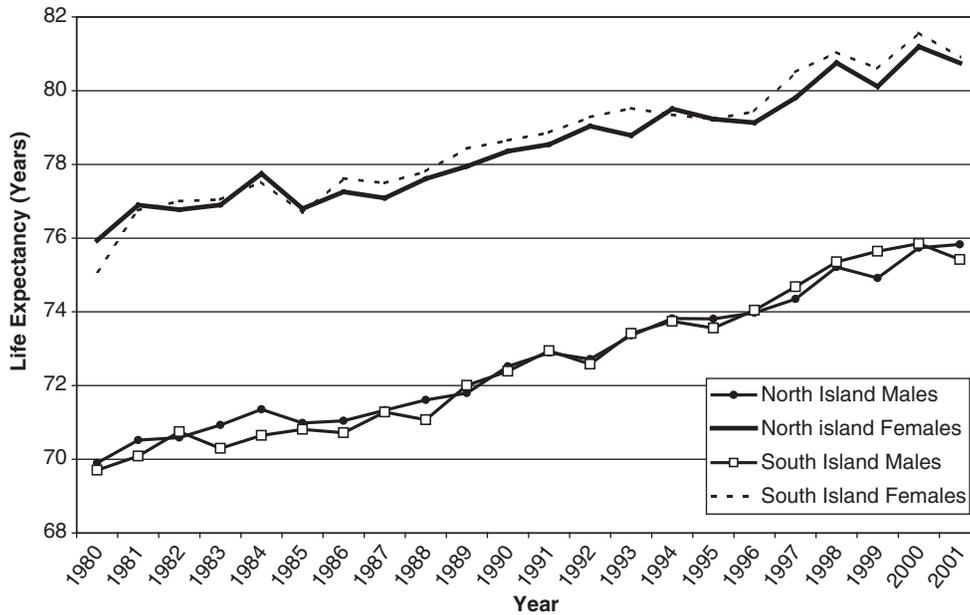


Figure 3 Life expectancy on the North and South Islands of New Zealand, 1980–2001

reduction. The sustained high levels of regional inequality during the late 1990s and the early part of the 21st century should be of great concern to policy makers as there are major differences in life expectancy between the most deprived and least deprived areas of New Zealand. To place New Zealand's social and spatial polarization in mortality into context, had all DHBs in the country experienced the mortality rates of Waitemata DHB (the area with amongst the lowest rates of mortality in the country), then it could be anticipated that between 1980 and 2001, 23% of infants would not have died as infants and 25% of children aged 5–9 would not have died as young children (of all those who did die in this period). In total, 1 in 5 people aged under 65 would not have died as young as they did, which equates to ~31 000 people over 20 years.

To some extent, the growing geographical inequalities may be explained by changing ethnic disparities in health between Maori and non-Maori New Zealanders. There are significant ethnic differentials in health in New Zealand, that have increased during the 1980s and 1990s,⁴⁰ which may have, at least partially, driven the growing geographical inequalities in mortality in New Zealand during this period. It has been argued that in a New Zealand context, socioeconomic position is to some degree determined by ethnicity and, hence, only some of the ethnic gradient in health is explained by socioeconomic factors.^{41,42} However, it is not clear as to whether the widening geographical differentials in overall mortality noted in this study can be fully explained by the observed widening ethnic gradient in mortality. Maori deaths only account for ~10% of

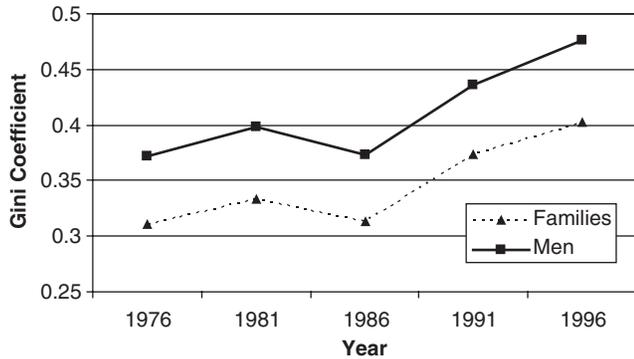


Figure 4 Gini coefficient of income inequality in New Zealand, 1976–96⁴⁶

the total deaths in New Zealand⁴³ and, hence, the ethnic differences in mortality are unlikely to fully account for the dramatic increase in the geographical differentials. Furthermore, the pattern of increasing ethnic inequality through the 1980s and 1990s does not closely correlate with the geographical trends, which saw geographical inequalities fall in the mid-1980s and then rapidly increase again in the early 1990s. This interpretation is supported by a large body of evidence from the US and UK, which suggests that ethnic inequalities in health are largely a consequence of socio-economic differentials.^{44,45} Instead, the increasing geographical and social polarization in health could reflect larger differences between the ‘haves’ and ‘have nots’ in New Zealand. In particular, the rising geographical inequalities in health between the 1980s and early 1990s are mirrored by the observed increase in income equality (measured using the Gini index), which grew dramatically during the late 1980s and persisted at very high levels through the remainder of the 1990s (Figure 4). The dramatic rise in income inequality was likely to be a response to the significant reductions in benefit payments and a switch to a flatter taxation system, which included the introduction of a goods and service tax during this period.⁴⁷ Furthermore, the drop in mortality differentials that was witnessed between 1986 and 1988 was paralleled by an earlier decrease in income inequality between 1981 and 1986. The reduction in income inequality in New Zealand during this period is probably a reflection of the highly regulated economy in the first part of the decade, where prices were frozen more rigidly than income and which is likely to have reduced the levels of inequality. Although the heavily interventionist policies of Muldoon’s National Government were ultimately deemed unsustainable, it is likely that they temporarily reduced income inequality during this period.²⁴ Between the mid-1990s and 2001, the high but stable regional inequalities in health noted in this paper have been mirrored by high but consistent income inequalities in New Zealand (O’Dea, 2005, personal communication).

Levels of geographical inequalities in health are particularly high in New Zealand. Partially, this will reflect growing social inequalities and how they are reflected across space but there are also likely to be other influences. For example, it is plausible that a proportion of the polarization in life expectancy may be attributable to selective patterns of migration between DHBs during the study period and into DHBs from abroad and

emigrants from DHBs. New Zealand has one of the highest proportions of the population born overseas (19.5% in 2001) among OECD countries⁴⁸ and this high level of immigration invariably leads to high levels of population sorting between areas. It is feasible that the different migration patterns of ill people as compared with healthy people may strengthen the widening mortality gap as research in other countries has shown that selective migration patterns extenuate geographical differences in health.^{49,50} Similarly, Great Britain, a country that also has significant geographical inequalities in health¹ also has high levels of internal migration (but a relatively low proportion of overseas born population), which is likely to be a reflection of the flexible education, housing and labour markets, and educational systems which encourage internal migration and hence geographical sorting of the population.⁴⁹

The results of this study are consistent with similar research in a number of other affluent countries, including the UK, which has noted that although regional inequalities in health appear to have stabilized, they still remain at unprecedented high levels.³⁶ Furthermore, the results agree with other New Zealand studies, including the work of Blakely *et al.*,⁸ who demonstrated an increase in relative inequalities in all-cause mortality between high and low income groups during the 1980s and 1990s. Similarly, Davis *et al.*²⁰ found increasing health differentials over the 1980s, which was supported by the results of Tobias *et al.*²² who found levels of regional inequality that remained at a stable but very high level in the late 1990s. However, this study is the first to note widening geographical differentials in health in New Zealand during this period.

These results call into question the current government’s strategy for addressing health inequalities in New Zealand. In order to reduce the social and spatial gap in health, greater political will is necessary to moderate income and wealth inequalities through a more redistributive taxation policy and a more generous benefit system. By 1997 (the most recent year for which income distribution data has been calculated), the distribution of income was so unequal that the richest 10% of the New Zealand population received 27.8% of the nation’s income whereas the poorest 10% received only 2.2% of income.⁵¹ Furthermore, New Zealand expenditure on social benefits (including health and welfare) is only 21.7% of GDP, 4.2% less than the OECD average.⁵² The results of this study also raise concerns about the population-based formula used to calculate DHB funding in New Zealand as the DHB with the highest life expectancies during the study period (Waitemata) is being provided with disproportionately extra resources owing to its increasing population despite its needs for these resources being significantly less (of course, in general the population within countries tends to move towards areas with better health⁵³). If reducing socioeconomic and regional inequalities in health is a key government concern, as the New Zealand Health Strategy suggests, then a re-examination of the funding formula may be prudent.

This paper has demonstrated increasing geographical inequalities in life expectancy between the richest and poorest areas of New Zealand during the 1980s and 1990s, a period of rapid social and economic restructuring for this country that may act as a sentinel nation for social policy changes made later elsewhere. The high levels of inequality in New Zealand remain at the start of the 21st century, despite the repeated policy

statements of a Labour government to address the socioeconomic differentials in health in New Zealand, suggesting that a commitment to more redistributive social and economic policies is needed. The experience of New Zealand should act as a warning to other countries considering adopting a more market-oriented healthcare system as the healthcare reforms in New Zealand have served to widen health inequalities within the country. Further research is needed to monitor health inequalities in New Zealand and to assist in understanding the reasons for why health continues to remain polarized. For instance, although a great deal of work has now concentrated on the health of indigenous groups in New Zealand there has been relatively little work on the larger and most recently arrived minority groups now living in the country. With over half of the immigration stream entering through the 'skilled/business migrant' schemes,⁵⁴ this group is likely to be, in general, a healthy population. As three-quarters of the recent migrants live in the three major urban areas of the country (Auckland, Wellington, and Christchurch),⁵⁵ they undoubtedly contribute towards the geographical inequalities in health. To understand socioeconomic inequalities in health requires understanding of both the advantages that some groups accrue

as well as the disadvantages that others suffer over time. The recent General Election in New Zealand (September 2005) returned a minority government but with Labour as the largest single party. In its election manifesto, the Labour administration pledged a greater strategic investment in public resources, which included an undertaking to end child poverty and extend tax reforms to low income families. It will be important for researchers to evaluate the new government's promises of greater investment in neo-material conditions via more equitable distribution of public and private resources and to monitor the impact of this public policy agenda upon the moderation in health inequalities, which might be anticipated.

Acknowledgements

We thank Craig Wright and Li-Chia Yeh from the Public Health Intelligence group at the Ministry of Health for providing the mortality and population data. We would also like to thank two anonymous referees for their invaluable comments on an earlier draft of this paper.

Conflicts of interest: None declared.

Sources of funding: None declared.

KEY MESSAGES

- Geographical inequalities in health in New Zealand have reached historically high levels.
- Although overall life expectancy has increased during the 1980s and 1990s, New Zealand has experienced increased spatial polarization in health, with a particularly sharp rise in regional inequalities during the late 1980s and early 1990s. Since the mid-1990s regional inequalities have remained at stable but high levels.
- The polarization in mortality in New Zealand was mirrored by a growth in income inequality during the 1980s and 1990s. This replicates findings for other countries that growing national income inequalities appear to lead to growing geographical inequalities in mortality.

References

- ¹ Davey Smith G, Dorling D, Mitchell R, Shaw M. Health inequalities in Britain: continuing increases up to the end of the 20th century. *J Epidemiol Community Health* 2002;**56**:434–35.
- ² Hayes L, Quine S, Taylor R, Berry G. Socio-economic mortality differentials in Sydney over a quarter of a century, 1970–94. *Aust N Z J Public Health* 2002;**26**:311–17.
- ³ Mackenbach JP, Bos V, Andersen O, Cardano M, Costa G, Harding S *et al*. Widening socioeconomic inequalities in mortality in six Western European countries. *Int J Epidemiol* 2003;**32**: 830–37.
- ⁴ Shaw M, Gordon D, Dorling D, Mitchell R, Smith GD. Increasing mortality differentials by residential area level of poverty: Britain 1981–1997. *Soc Sci Med* 2000;**51**:151–53.
- ⁵ Blakely T, Kawachi I, Atkinson J, Fawcett J. Income and mortality: the shape of the association and confounding New Zealand Census-Mortality Study, 1981–1999. *Int J Epidemiol* 2004;**33**:874–83.
- ⁶ Ministry of Health. Taking the pulse: the 1996/97 New Zealand health survey. Wellington: Ministry of Health, 1999.
- ⁷ Tobias M, Howden-Chapman P (eds). *Social Inequalities in Health, New Zealand 1999: A Summary*. Wellington: Ministry of Health, 2000.
- ⁸ Blakely T, Fawcett J, Atkinson J, Tobias M, Cheung J. *Decades of Disparity II: Socioeconomic Mortality Trends in New Zealand, 1981–1999*. Wellington: Ministry of Health, 2005.
- ⁹ Shaw C, Blakely T, Atkinson J, Crampton P. Do social and economic reforms change socioeconomic inequalities in child mortality? A case study: New Zealand 1981–1999. *J Epidemiol Community Health* 2005;**59**:638–44.
- ¹⁰ Ministry of Health. *Reducing Inequalities In Health*. Wellington: Ministry of Health, 2002.
- ¹¹ Public Health Advisory Committee. *The Health of people and Communities. A Way Forward: Public Policy and the Economic Determinants of Health*. Wellington: PHAC, 2004.
- ¹² Ministry of Health. *New Zealand Health Strategy*. Wellington, New Zealand: Ministry of Health, 2000.
- ¹³ Ministry of Social Development. *New Zealand Disability Strategy*. Wellington: Ministry of Health, 2001.
- ¹⁴ Boston J, Dalziel P, St John S (eds). *Redesigning the Welfare State in New Zealand*. Auckland: Oxford University Press, 1999.
- ¹⁵ Le Heron RB, Pawson E. *Changing Places: New Zealand in the Nineties*. Auckland, NZ: Longman Paul Ltd, 1996.
- ¹⁶ Atkinson A. *Income Inequality in OECD Countries: Data and Explanations*. CESifo Report No. 881, 2003.

- 17 O'Dea D, Howden-Chapman P. Income and income inequality and health. In: Tobias M, Howden-Chapman P (eds). *Social Inequalities in Health, New Zealand 1999: A Summary*. Wellington: Ministry of Health, 2000.
- 18 UNICEF. *Child Poverty in Rich Countries, 2005*. Florence: UNICEF Innocenti Research Centre, 2005.
- 19 Dorling D. *Human Geography of the UK*. London; Thousand Oaks, CA: SAGE, 2005.
- 20 Davis P, Graham P, Pearce N. Health expectancy in New Zealand, 1981–1991: social variations and trends in a period of rapid social and economic change. *J Epidemiol Community Health* 1999;**53**:519–27.
- 21 Pearce N, Davis P, Sporle A. Persistent social class mortality differences in New Zealand men aged 15–64: an analysis of mortality during 1995–97. *Aust N Z J Public Health* 2002;**26**:17–22.
- 22 Tobias M, Salmond C, Crampton P, Chan M, Marmot M, Reid P. Life expectancy and small area deprivation. Wellington: Ministry of Health, 2001.
- 23 Bajekal M. Healthy life expectancy by area deprivation: magnitude and trends in England, 1994–1999. *Health Stat Q* 2005;18–27.
- 24 Cheyne C, O'Brien M, Belgrave M. *Social Policy in Aotearoa/New Zealand: A Critical Introduction*. Auckland; New York: Oxford University Press, 1997.
- 25 Boston J. New Zealand's welfare state in transition. In: Boston J, Dalziel P, St John S (eds). *Redesigning the Welfare State in New Zealand*. Auckland: Oxford University Press, 1999.
- 26 Hornblow A. New Zealand's health reforms: a clash of cultures. *BMJ* 1997;**314**:1892–94.
- 27 Nagel J. Social choice in a pluralitarian democracy: the politics of market liberalization in New Zealand. *Br J Polit Sci* 1998;**28**:223–67.
- 28 Kunst AE. Commentary: Using geographical data to monitor socioeconomic inequalities in mortality: experiences from Japanese studies. *Int J Epidemiol* 2005;**34**:110–12.
- 29 Ross N, Dorling D, Dunn J, Henriksson G, Glover J, Lynch J *et al*. Metropolitan income inequality and working-age mortality: a cross-sectional analysis using comparable data from five countries. *J Urban Health* 2005;**82**:101–10.
- 30 Moss J. Hewitt Plans £3 Billion Private Sector Surgery The Scotsman 2005. Available at: <http://news.scotsman.com/latest.cfm?id=4547968> (Accessed on May 13, 2005).
- 31 Nakaya T, Dorling D. Geographical inequalities of mortality by income in two developed island countries: a cross-national comparison of Britain and Japan. *Soc Sci Med* 2005;**60**:2865–75.
- 32 Ministry of Health. *Frequently Asked Questions About District Health Boards*. Wellington: Ministry of Health, 2005.
- 33 Chiang C. *The Life Table and Its Applications*. Malabar: Kreiger, 1984.
- 34 Low A, Low A. Measuring the gap: quantifying and comparing local health inequalities. *J Public Health* 2004;**2**:388–95.
- 35 Wagstaff A, Paci P, Doorslaer E. On the measurement of inequalities in health. *Soc Sci Med* 1991;**33**:545–57.
- 36 Shaw M, Davey Smith G, Dorling D. Health inequalities and New Labour: how the promises compare with real progress. *BMJ* 2005;**330**:1016–21.
- 37 Shaw M, Davey Smith G, Dorling D. Health inequalities and New Labour: author's reply. *BMJ* 2005;**330**:1507–08.
- 38 Statistics New Zealand. *New Zealand Life Tables, 2000–2002*. Wellington, New Zealand: Statistics New Zealand, 2004.
- 39 Shaw M, Dorling D, Mitchell R, Davey Smith G. Labour's 'Black report' moment? *BMJ* 2005;**331**:575.
- 40 Blakely T, Tobias M, Robson B, Ajwani S, Bonne M, Woodward A. Widening ethnic mortality disparities in New Zealand 1981–99. *Soc Sci Med* 2005;**61**:2233–51.
- 41 Pearce N, Pomare E, Marshall S, Borman B. Mortality and social class in Maori and nonMaori New Zealand men: changes between 1975–7 and 1985–7. *N Z Med J* 1993;**106**:193–96.
- 42 Blakely T, Kiro C, Woodward A. Unlocking the numerator-denominator bias. II: Adjustments to mortality rates by ethnicity and deprivation during 1991–94. The New Zealand Census-Mortality Study. *N Z Med J* 2002;**115**:43–48.
- 43 New Zealand Health Information Service. *Mortality and Demographic Data 2000*. Wellington: Ministry of Health, 2004.
- 44 Navarro V. Race or class versus race and class: mortality differentials in the United States. *Lancet* 1990;**336**:1238–40.
- 45 Nazroo JY. The structuring of ethnic inequalities in health: economic position, racial discrimination, and racism. *Am J Public Health* 2003;**93**:277–84.
- 46 O'Dea D. *The changes in New Zealand's Income Distribution. Treasury Working Paper Series 00/13*. New Zealand Treasury, 2000.
- 47 Podder N, Chatterjee S. Sharing the national cake in post reform New Zealand: income inequality trends in terms of income sources. *J Public Econ* 2002;**86**:1–27.
- 48 Organisation for Economic Co-operation and Development. *OECD Factbook 2005: Economic, Environmental and Social Statistics*. Paris: OECD, 2004.
- 49 Brimblecombe N, Dorling D, Shaw M. Mortality and migration in Britain, first results from the British Household Panel Survey. *Soc Sci Med* 1999;**49**:981–88.
- 50 Norman P, Boyle P, Rees P. Selective migration, health and deprivation: a longitudinal analysis. *Soc Sci Med* 2005;**60**:2755–71.
- 51 World Bank. *World Development Indicators 2005*. New York: World Bank Publications, 2005.
- 52 Organisation for Economic Co-operation and Development. *Social Expenditure Database, 1980–2001*. Paris: OECD, 2004.
- 53 Davey Smith G, Shaw M, Dorling D. Shrinking areas and mortality. *Lancet* 1998;**352**:1439–40.
- 54 Department of Labour. *Migration Trends 2003/04*. Wellington: Department of Labour, 2004.
- 55 Department of Labour. *Migrants in New Zealand: An Analysis of 2001 Census Data*. Wellington: Department of Labour, 2003.