

The New Zealand Indices of Multiple Deprivation (IMD): A new suite of indicators for social and health research in New Zealand

Brief report

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Statistics New Zealand Disclaimer

The results in this paper are not official statistics, they have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics New Zealand. The opinions, findings, recommendations, and conclusions expressed in this paper are those of the author(s) not Statistics NZ or the University of Auckland. Access to the anonymised data used in this study was provided by Statistics NZ in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation and the results in this paper have been confidentialised to protect these groups from identification. Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz. The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes. Any person who has had access to the unit-record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

Introduction

There is an abundance of evidence in the literature highlighting the association between area-based measures of deprivation and a number of social and health outcomes. Mapping areas of relative deprivation is a powerful way to demonstrate geographical inequalities. While grouping areas into quintiles of deprivation provides a map that is easy to interpret, there is potential for users to incorrectly assume that the drivers of deprivation are the same for areas in the same quintile. Deprivation is multifaceted so it is necessary to use data relating to multiple aspects of disadvantage in order to gain the most complete picture of deprivation possible.

The 2013 New Zealand IMD uses methodology developed by indices in the UK, in particular the Scottish Government's Scottish Index of Multiple Deprivation (SIMD) 2012. The IMD measures relative disadvantage in 5958 neighbourhood-level data zones across NZ in 7 domains of deprivation (employment, income, crime, housing, health, education and access to services). Figure 1 outlines the indicators included in each domain and how they are combined.

The purpose of the IMD is to inform resource allocation, policy development, community advocacy, clinicians and researchers so that the causes and consequences of deprivation can be addressed more effectively. It can be used to analyse health and social phenomena, identify service delivery gaps, allocate resources, and target disadvantage. It allows effective analysis for targeting of policies and funding, where the aim is to tackle or take account of area concentrations of deprivation.

In addition to this Technical Report, the University of Auckland has published online interactive maps to aid in the dissemination of the IMD. Visitors to the [IMD website](#) can download the IMD as a spreadsheet and access maps to look at the deprivation profile of a particular neighbourhood, or a particular dimension of deprivation such as education or housing.

The most widely used deprivation measure in NZ at the present time is the New Zealand Deprivation Index (NZDep) (Salmond & Crampton, 2012), which is derived from census variables that are only produced every 5 years. Another limitation of this measure is the inability for researchers to deconstruct and isolate different indicators to understand the association between a given health or social outcome and different categories of deprivation. The New Zealand Indices of Multiple Deprivation (IMD) were developed in response to both an increasingly uncertain future of national census surveys and the increasing availability of routine electronic health and social data, which allows us to measure deprivation more directly and more frequently.

What is the New Zealand Indices of Multiple Deprivation?

The 2013 New Zealand Index of Multiple Deprivation (IMD) is a set of tools for identifying concentrations of deprivation in New Zealand. Funded by the Health Research Council of New Zealand, the IMD uses data routinely collected by many

government agencies to populate 28 indicators of deprivation. The indicators are grouped into 7 domains of deprivation, which can be used separately or combined to explore associations between health or social outcomes for small geographical areas known as data zones. The IMD and the data zones will soon be freely available as simple downloadable spreadsheets. The IMD provides a relative ranking for each data zone for each domain of deprivation from 1 (least deprived) to 5958 (most deprived). For mapping purposes, ranks are grouped into quintiles (Q5 represents the 20% most deprived data zones in NZ).

Data zones

In response to the need for a standard neighbourhood level geography, a customised geographical base called data zones was developed. The NZ land mass was divided up into 5,958 data zones with populations between 500 and 1000 (mean 712). Data zones lie between Meshblocks and Census area units, and are small enough to facilitate statistically robust analyses while still conveying a sense of neighbourhood. In suburban areas they are just a few streets long and a few streets wide. The use of data zones is also advantageous because they are independent of administrative units used by different government agencies, such as school zones or police districts, which are often subject to change over time.

Indicators and Domains of Deprivation

The IMD consists of seven domains of deprivation. This is underpinned by the idea that multiple deprivation “is a combination of more specific forms of deprivation which can be more or less directly measurable” (Townsend, 1987). The following section will describe the seven domains and their corresponding indicators. Key stakeholders such as topic-experts and data managers at multiple government agencies were engaged to identify and refine potential indicators.

Employment

The purpose of the Employment Domain is to measure the degree to which working age people are excluded from employment. It consists of two indicators that use data from the MSD: The working age population receiving a Sickness Benefit and the working age population receiving Unemployment Benefit. This indicator only counts people who are registered with Work and Income New Zealand and are actively seeking employment.

Income

The Income Domain aims to capture the extent of income deprivation in a neighbourhood by measuring the financial assistance provided by the State to those whose income was deemed insufficient. One indicator measures financial assistance in the form of selected income-tested benefits from the Ministry of Social Development (MSD) and Working for families (WFF) Tax Credits provided to beneficiaries. The other measures payments from Inland Revenue (i.e. WFF tax Credits, Child Tax Credits and Paid Parental Leave for working people).

Crime

The Crime Domain was constructed using data from the NZ Police's new Recorded Crime Victimization Statistics (RCVS) dataset, which counts victims for seven major offence types. Counts of victimisation were collected after 30 days of investigation as recommended by Statistics New Zealand (2016), by which time most offences have been confirmed. Victimisations were allocated to data zones using the Meshblock of the scene of the offence. A victimisation rate (per 1,000) was calculated and then ranked in order of increasing victimisation rates.

Housing

This domain comprises of two indicators derived from the 2013 census data: the proportion of population living in overcrowded households and the proportion of people living in rented accommodation. The indicators were weighted 60:40 respectively because, in the literature, overcrowding consistently had a stronger correlation with poor social outcomes than renting.

Health

The purpose of the Health Domain is to identify areas with a higher than expected level of ill-health or mortality using routinely collected data from the Ministry of Health. Five indicators were selected and given different weightings using exploratory factor analysis (the maximum likelihood method): Emergency Department admissions to hospital (0.42); Acute Hospitalisations related to respiratory disease with a social gradient (0.28); Acute Hospitalisations related to infectious disease with a social gradient (0.19); Standardised Mortality Ratios (0.08) and Registrations for cancers with a social gradient (0.04).

Education

The Education Domain consists of five indicators. Three indicators use Ministry of Education data obtained from the Integrated Data Infrastructure (IDI) and measure the proportion of school leavers who; left before they were 17 years old; left without an NCEA level 2 equivalent; did not enrol in any level of tertiary studies within 3 years of leaving school. The other two indicators use data from the 2013 census and measure the proportion of youth (15-24 years) Not in Education, Employment or Training (NEET) and the proportion of the working age population without a formal qualification. Exploratory factor analysis using the maximum likelihood method was then applied to the five ranked indicators, generating the weights shown in Figure 1.

Access

The Access domain measures the cost and inconvenience of travelling to access basic services. The geographic co-ordinates of supermarkets, primary health care providers, service stations, early-childhood centres and primary and intermediate schools were obtained. The distance to the nearest three localities of a given service was then measured. This distance was converted to a score following a negative exponential distribution, to prevent outliers having a disproportionate effect on the overall score. The scores of the three nearest services were summed

and ranked. Exploratory factor analysis using the maximum likelihood method was then applied to the five ranked indicators, generating the following weights: supermarkets (0.20), primary health care providers (0.26), service stations (0.23), early-childhood centres (0.15) and primary and intermediate schools (0.15).

Strengths and Limitations

The IMD not only measures overall deprivation more comprehensively than existing census-based deprivation indices, it also allows users to explore the 'deprivation profile' of an area in terms of the seven domains of deprivation. Another key strength is that the seven domains can be used individually or together. For example, a health researcher might choose to exclude the Health Domain to avoid circularity if she/he was assessing a health outcome. In addition, the use of routine administrative datasets mitigates issues of bias associated with self-reported data obtained from the census. Furthermore the IMD can be updated regularly to remain relevant to societal changes since administrative information is routinely collected.

Not everyone living in a deprived area is deprived

The IMD is not designed to be used as a measure of an individual's wellbeing. It is an area-based measure designed to identify small area concentrations of multiple deprivation. Not everyone living in a deprived area is deprived, and not all deprived people live in deprived areas. In addition, the IMD is not designed to convey how much more deprived one data zone is than another, nor to suggest whether or not an area is affluent.

The IMD can be used to compare all of the data zones in NZ to identify the overall least/most deprived, or to compare large geographical areas (e.g. the *rohe* of your *iwi* or your DHB) by looking at the proportion of the most deprived data zones contained in those areas, using an appropriate threshold such as the most deprived 10% or 20%. It can also be used to identify areas that may be deprived in specific domains (e.g. employment) even if they are not considered 'deprived' in the overall index. For example, the stacked bar plots in Figure 2 show that, while the Tairāwhiti and Counties-Manukau DHBs have similar levels of severe (Q5) overall deprivation, the proportion of data zones with severe employment, crime, education and access deprivation is greater in Tairāwhiti than in the Counties-Manukau DHB, while the proportion of data zones with severe housing and health deprivation is greater in the Counties-Manukau DHB.

Validation of the IMD

To validate the IMD and its domains, we assessed domains and indicator scores as they were produced, and explored outliers and unusual patterns. We also tested the association between the IMD and the average NZDep for each data zone (0.9242, $p < .0001$), smoking rates from the 2013 census (0.8133, $p < .0001$), and households earning less than 60% of the median income (0.7979, $p < .0001$) using the Revised Jensen Scale (Jensen, 1988). In all cases, the association was strong and consistent.

The New Zealand Index of Multiple Deprivation 2013

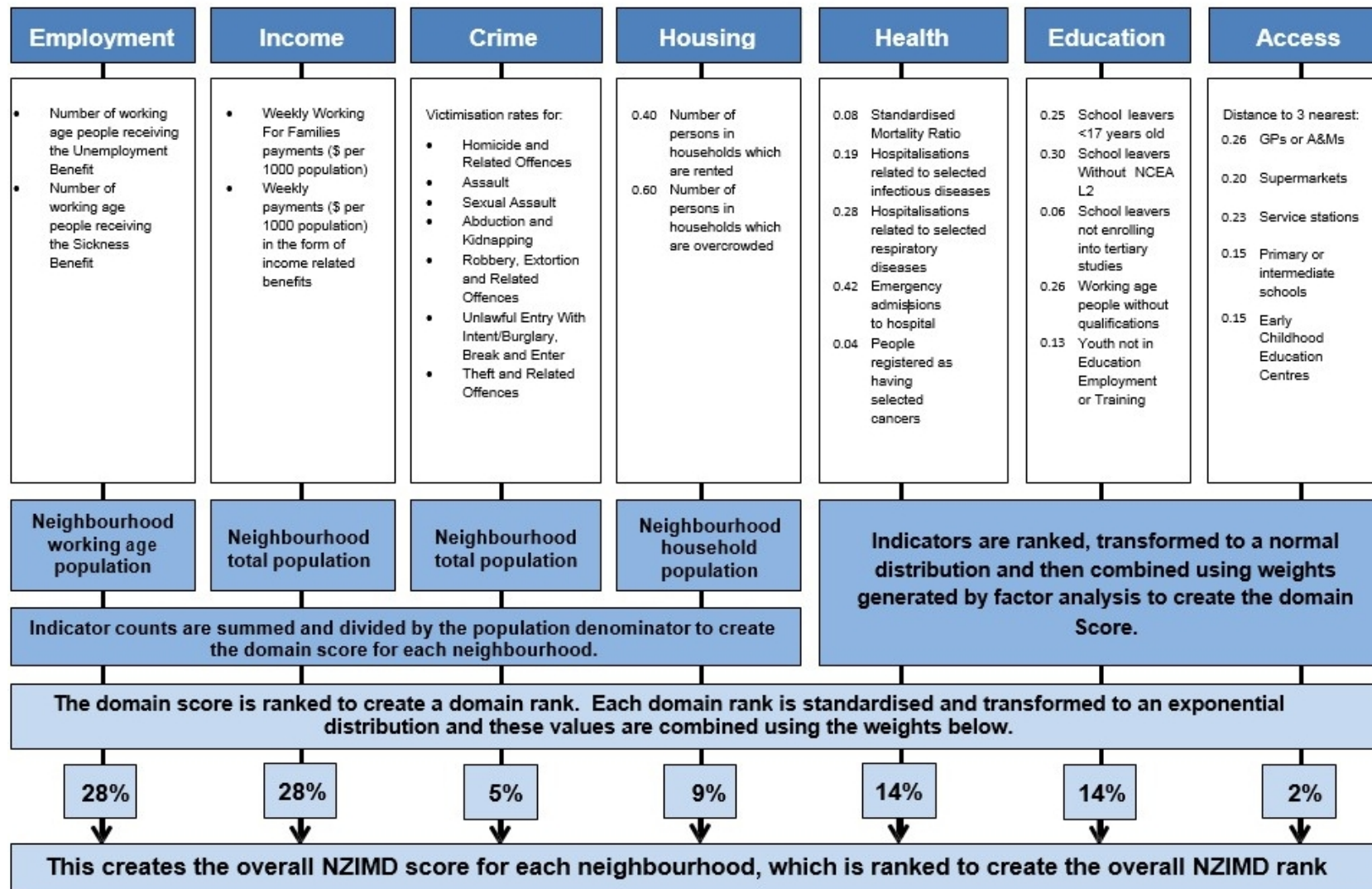
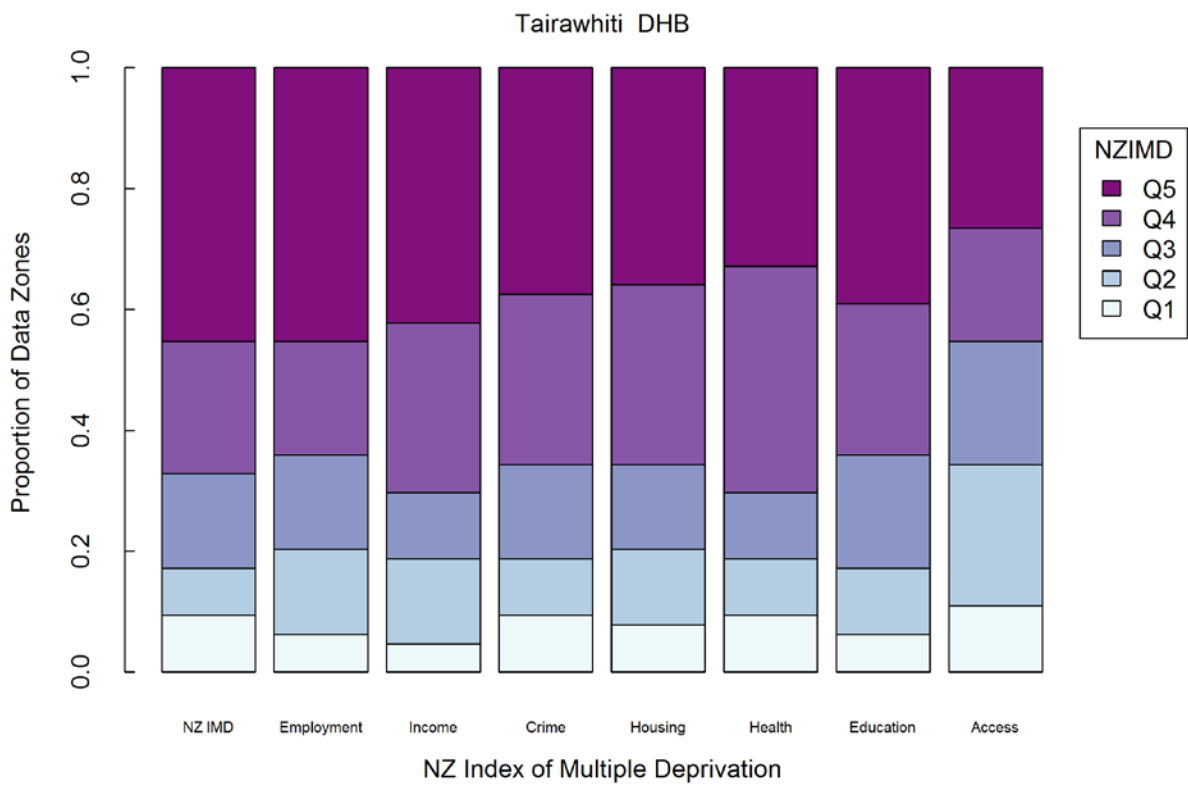
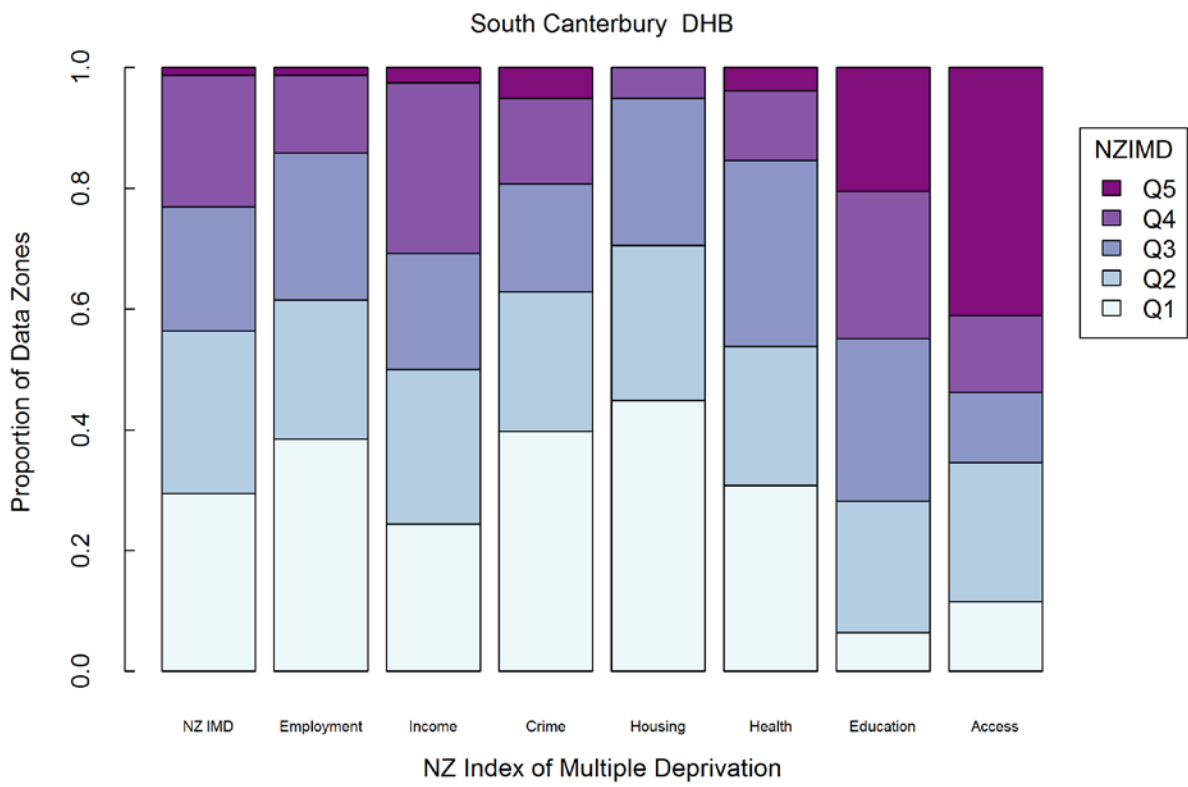


Figure 1. Developing the NZ Indices of Multiple Deprivation: An overview of indicators, domains and weights. Adapted from Figure 4.2 SIMD 2012 Methodology, in Scottish Index of Multiple Deprivation 2012. Edinburgh: Scottish Government (Crown copyright 2012).



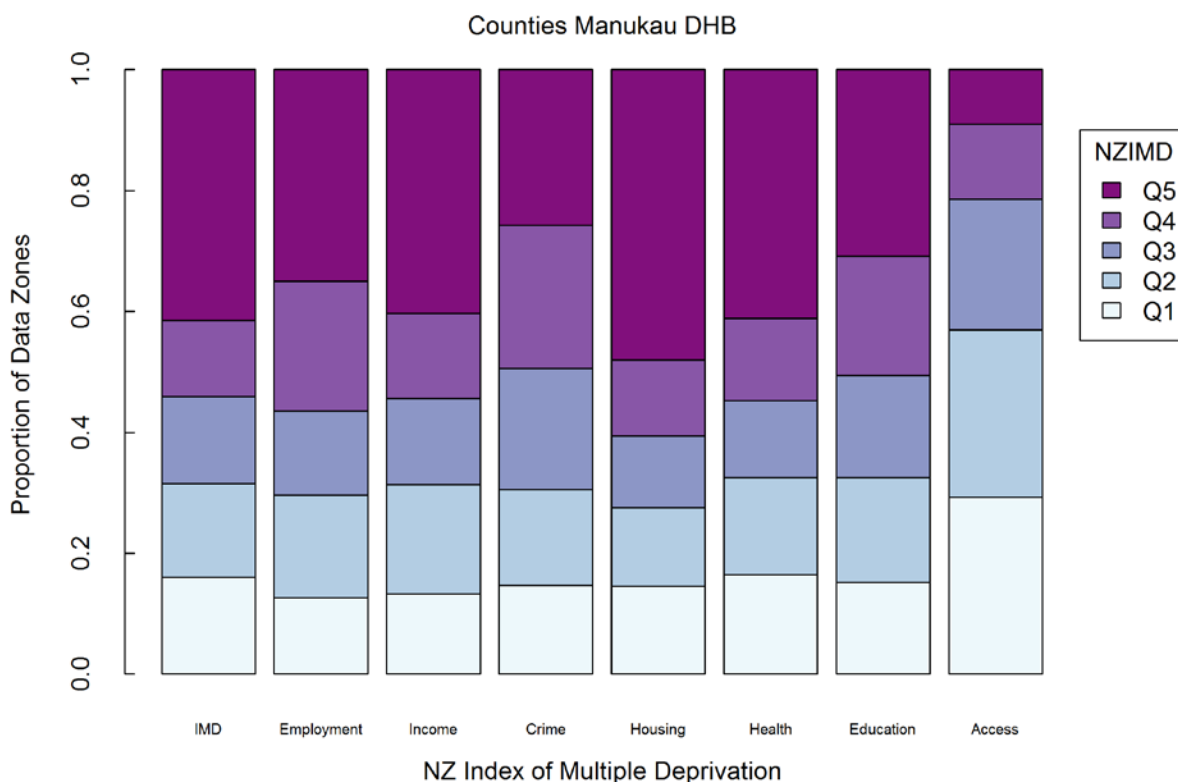


Figure 2. The deprivation profiles of three DHBs

Geographical Variations in Multiple Deprivation in New Zealand

There are geographic variations in the distribution of the IMD as can be seen in the maps of the North and South Island (Figure 3). Only 7.6% (108/1421) of data zones in the South Island are among NZ's 20% most deprived (Q5), whereas in the North Island, 23.9% (1083/4536) of data zones are Q5 deprived. There are also variations in the distribution of the IMD's domains, suggesting that the underlying causes of deprivation are inconsistent throughout New Zealand. For example, the South Canterbury DHB (Figure 2) has very little severe (Q5) employment, income, crime housing or health deprivation. Only the Education and Access Domains have more than 20% of data zones amongst NZ's most deprived (Q5). In contrast, the Tairāwhiti DHB has many data zones with severe (Q5) deprivation in all seven domains, with employment and income deprivation having the most.

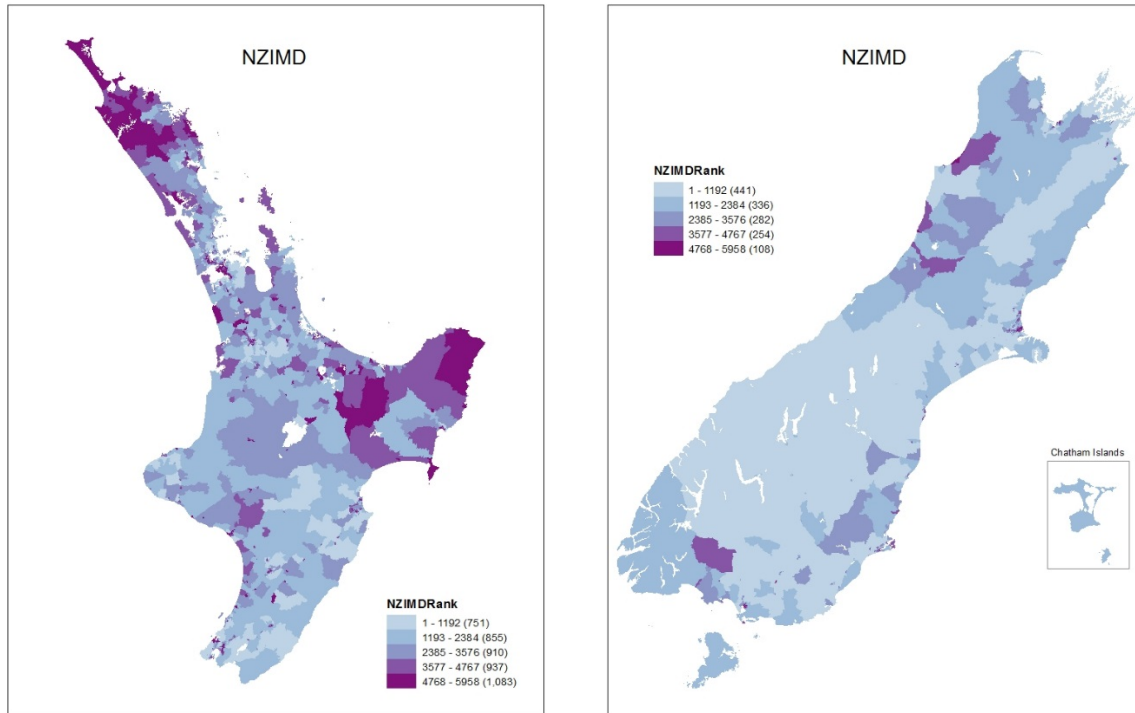


Figure 3. The distribution of overall deprivation in New Zealand (NZIMD)

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