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RESEARCH ARTICLE



The geography of deprivation in New Zealand by electorate

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ABSTRACT

In the run-up to the 2017 General Election, the economy, housing, health, education, inequality and justice were important policy issues. General Elections are a time when voters exercise their democratic right to vote for their preferred party and parliamentary candidate to represent themselves, their whānau and community. In many cases, political parties' policies seek to improve the wellbeing of people who are living in more deprived communities, but people in deprived communities are typically less likely to vote. The recently released New Zealand Index of Multiple Deprivation (IMD) enables users to explore deprivation in electorates across the country. This paper compares the distribution of deprivation and voter turnout across a selection of General Electoral Districts (GEDs) and demonstrates that while overall patterns of deprivation may be similar between GEDs, the drivers of these patterns can differ immensely.

ARTICLE HISTORY

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KEYWORDS

Deprivation; IMD; data zones; electoral boundary; voter turnout

Introduction

Deprivation related issues played an important role in the 2017 New Zealand (NZ) general election campaign. For instance, the economy and housing were the two most frequently discussed issues in the NZ Herald reporting in the lead up to the election (Mills et al. 2018). Additionally, an unpredictable pre-election period suggested that there might be changes in turnout among (typically) deprived, lower turnout groups, such as young people and Māori. Advanced voting in the weeks that followed Jacinda Ardern becoming the leader of the Labour Party led to rumours in the media of a potential 'youth quake'—a surge in the number of younger adults enrolling to vote for the first time, or returning to the polling booth (Edwards 2017; Lynch 2017). The Labour Caucus appointed Kelvin Davis, the Māori Member of Parliament for Te Tai Tokerau, as Adern's deputy. The general increase in Labour party popularity, alongside the decreasing popularity of the Māori party after their National party coalition, indicated that there could be close races in the Māori seats, which could potentially stimulate turnout. Given the importance that societal factors played in the closely fought election campaign and turbulence of the pre-election period, this paper aims to explore variations in voter turnout patterns and their associations with area-level deprivation within different electorates. The Electoral

Act (1993) ensures the privacy of an individual's voting information, however information concerning voter turnout is freely available for download and reported for General Electoral Districts (GEDs) across the country.

Voter turnout in NZ

Voter turnout in NZ has been steadily decreasing from world record high levels since the middle of the twentieth century (Vowles 2014). There are several consistent demographic predictors of higher voter turnout across the international literature, many of which have been well established over many decades. These are: older age, a higher level of education, having a higher income, and being from the majority ethnicity in the country (see for example: Almond and Verba 1963; Blais et al. 2004; Matthews and Prothro 1966; Miller and Shanks 1996; Stoker and Jennings 1995; Verba and Nie 1972). Researchers have replicated these effects in NZ across Electoral Commission data, and data from large, national probability studies: the NZ Election Study (NZES) and the NZ Attitudes and Values Study (NZAVS; (Townrow 2015; Vowles 2015; Vowles et al. 2017)). Indeed, younger people in NZ are less likely to vote than their older counterparts. However, in analyses of the 2014 election, it seemed as though other generational differences were beginning to appear, with those in the 30–39 age group having lower than expected turnout rates (Vowles et al. 2017). There was talk of a ‘missing million’ in voter turnout in the 2014 election despite the concerns ‘millennials’ had over housing, employment, and inequality (Nissen 2017; Vowles et al. 2017)

Income, assets, education and other factors associated with deprivation have been shown to predict voter turnout in NZ. A key result from Townrow's (2015) analysis of NZAVS data was that those who earned lower incomes were less likely to vote in the 2011 general election. Further, people's perceptions of relative deprivation, that is, the extent to which they personally feel they are disadvantaged compared to others, partially explained the relationship between income and turnout. In short, feeling deprived related to a lower likelihood of voting. Additionally, when analysing data from the 2014 NZES, Vowles and colleagues (2017) found an interaction between age and wealth. They showed that having a lower number of assets at a younger age (25) related to a far lower likelihood of voting (when compared to those with more assets), yet the number of assets for those aged 65 did not matter. Overall, those who owned a house were more likely to vote than renters, as did those with a university education when compared to those with lower level qualifications. In sum, a range of indicators of deprivation, from basic demographics through to psychological perceptions, have been shown to relate to turnout.

Ethnic minorities and indigenous peoples vote at lower rates than majority ethnic groups, even though they may be politically active through other means. Māori have actively participated in politics through vehicles such as hikoī and protest (Bargh 2013; Waitoa et al. 2015; Greaves et al. 2018) but those with Māori ethnicity (Townrow 2015) and ancestry (Townrow 2015; Vowles et al. 2017) have had lower overall voter turnout rate. This lower turnout has been attributed to the continued effects of colonisation, distrust in colonial political institutions, and differences in education and income—all variables which predict lower turnout (Banducci et al. 2004; Greaves et al. 2018). Thus, the lower voter turnout of Māori may be, at least in part, related to deprivation. The

economy and housing were key issues of the 2017 campaign, which alongside leadership changes, had the potential to increase voter turnout for Māori and others.

The NZ Index of Multiple Deprivation

Since the mid-1990s, the NZ Index of Deprivation (NZDep) (Salmond et al. 1998; Salmond and Crampton 2012; Atkinson et al. 2014) has been widely used in research, policy and advocacy to measure area-level social circumstances. NZDep uses nine indicators representing eight dimensions of deprivation, derived from the national Census (see Table 1). NZDep is typically divided into deciles or quintiles to identify those small areas, which are among the least deprived or most deprived 10% or 20% of areas, respectively. On the one hand this is intuitive and clear, allowing users to identify areas most in need of services. On the other hand, there is potential for users to assume that the circumstances leading to the deprivation status of two areas are the same if their decile or quintile is the same, particularly when thematic maps portray areas of the same status with the same colour. However, the role that specific domains of deprivation play in determining the overall level of deprivation may vary from area to area.

Whereas NZDep is derived solely from census data, the NZ Index of Multiple Deprivation (IMD) draws on routine administrative data sources maintained by government agencies, non-governmental organisations, and the census to measure area-level deprivation (Table 1). The IMD allows users to investigate disadvantage in overall terms as well as separately for seven domains of deprivation: Employment, Income, Crime, Housing, Health, Education and Access to services, using 28 indicators. Another important difference between NZDep and the IMD is the geographical scale of analysis. NZDep uses Census Meshblocks (MBs), which have a population of approximately 100 people, as its geographic base, and these small numbers results in the suppression of some data for privacy reasons. By contrast, the IMD uses Data Zones (Zhao and Exeter 2016), whose population range is 500–1000 per zone and 712 on average ($n = 5958$ data zones). The data zones reflect ‘neighbourhoods’ and were specifically designed for social and health research using criteria including compactness, population equality, and respecting higher geographical boundaries, physical and social environments and internal homogeneity where possible. In urban settings data zones are just a few streets long and a few streets wide. Data zones are assigned ranks of deprivation for both the IMD and its 7 domains from the least to most deprived (from 1 to 5958). For the purposes of analysis, ranks may be grouped into quintiles and deciles, consistent with research using NZDep.

The aim of this paper is to explore geographic variations in area-deprivation within and between GEDs, and then to investigate patterns of voter turnout and their associations with deprivation.

Methods

General electoral district (GED)

In 2014, the Electoral Commission defined the GEDs used for the 2014 and 2017 General Elections. The 2013 Census of Population and Dwellings and the subsequent Māori Electoral Option define the total number of GEDs (64) and their allocation between the North

Table 1. A comparison of the indicators and domains of deprivation measured by NZDep2013 and the IMD.

Domain of deprivation	NZ Dep indicators	IMD indicators
Employment	People aged 18–64 unemployed	No. of working age people receiving the Unemployment Benefit No. of working age people receiving the Sickness Benefit
Income	People aged 18–64 receiving a means tested benefit People living in equivalised* households with income below an income threshold	Weekly Working for Families payments (\$ per 1000 population) Weekly payments (\$ per 1000 population) in the form of income related benefits
Crime		Victimisation rates for: • Homicide and Related Offences • Assault • Sexual Assault • Abduction and Kidnapping • Robbery, Extortion and Related Offences • Unlawful Entry with Intent/Burglary, Break and Entree • Theft and Related Offences
Housing	People living in equivalised* households below a bedroom occupancy threshold	No. of persons in households which are rented No. of persons in households which are overcrowded
Health	People not living in own home	Standardised Mortality Ratio Hospitalisations related to selected infectious diseases Hospitalisations related to selected respiratory diseases Emergency admissions to hospital
Education	People aged 18–64 without any qualifications	People registered as having selected cancers School leavers <17 years old School leavers without NCEA L2 School leavers not enrolling into tertiary studies Working age people without qualifications Youth not in Education Employment or Training
Access	People with no access to a car People aged <65 with no access to the Internet at home	Distance to 3 nearest: • GPs or Accident and Medical • Supermarkets • Service stations • Primary or intermediate Schools • Early childhood education centres
Support	People aged <65 living in a single parent family	

*Methods used to control for household composition (Atkinson et al. 2014, p. 8).

(48) and South (16) Islands, in addition to the number of Māori electorates (7). By law, electorates must have electoral populations within 5% of the quota for the North Island or South Island. Thus, typical GEDs in the North Island have $59,731 \pm 2,986$ people, while the South Island GED population was $59,679 \pm 2,983$. Their similar population sizes make GEDs ideal for analysis.

Area deprivation

We used the IMD and its 7 domains to measure data-zone level deprivation. A full description of how the data zones and IMD were developed is available elsewhere

(Zhao and Exeter 2016; Exeter et al. 2017). In brief, the IMD combines 28 indicators into 7 domains of deprivation using data from routine Education, Social Development, Police, Health, and Inland Revenue databases, the 2013 Census, and organisations such as the Royal NZ College of General Practitioners and Koordinates.com. Indicators were selected based on their national coverage and their ability to directly measure specific components of deprivation; to be available as x,y coordinates or for small areas (Meshblock); and to be easily updatable over time. Area deprivation is measured at the data zone level, and each data zone is assigned a rank in order of ascending levels of deprivation for each of the 7 domains (Employment, Income, Crime, Housing, Health, Education and Access). Data for the 7 domains are then combined to create the overall IMD. In this paper, we have assigned the ranks of deprivation into quintiles, with Quintile 1 (Q1) representing the least deprived 20% of areas across NZ and Q5 the most deprived 20% of areas.

Deprivation and the GEDs

The population-weighted centroid (xy coordinate) of each data zone was assigned to its General Electorate boundary using the spatial join function in ArcGIS version 10.3. This process ensured that each data zone was assigned to only one general electorate. In the few cases where a data zone overlapped two or more electorates, we allocated the data zone to the electorate with the highest degree of population overlap. Given the large geographic areas that electoral boundaries comprise, and because data zone populations vary between 500 and 1000, there is some degree of variation in the number of data zones within each GED. On average, there were 93 data zones per GED, with a combined average data zone population of 66,268. The Auckland Central and Dunedin South electorates have the fewest data zones ($n = 80$), and have comparable total populations of 60,849 and 60,561 respectively. At the other extreme, the East Coast electorate comprises 137 data zones, with a total data zone population of 94,923 in 2013.

Voter turnout statistics

We were able to obtain GED level statistics for the 2017 General Election voter turnout (New Zealand Electoral Commission 2017). In this paper, we can therefore talk about broad patterns of voting participation by GED, by age group and ethnicity—defined in the electoral Commission’s dataset as being of either Māori or non-Māori descent. Ethnicity data were obtained from each individual’s response to the question on Māori descent on voter registration forms (the Electoral Commission collects ethnicity data on Māori vs. non-Māori descent for the purposes of the Māori Electoral Roll option). We also obtained counts of enrolled electors by Meshblock from the Electoral Commission, and by aggregating these data to data zones were able to determine local patterns of voter turnout within and between GEDs. Specifically, we used Spearman Rank Correlations to calculate the association between rank of IMD deprivation and voter turnout.

Results

Figure 1 shows the distribution of IMD deprivation by General Electorate. For convenience, the GEDs are sorted in ascending order by the proportion of the most deprived

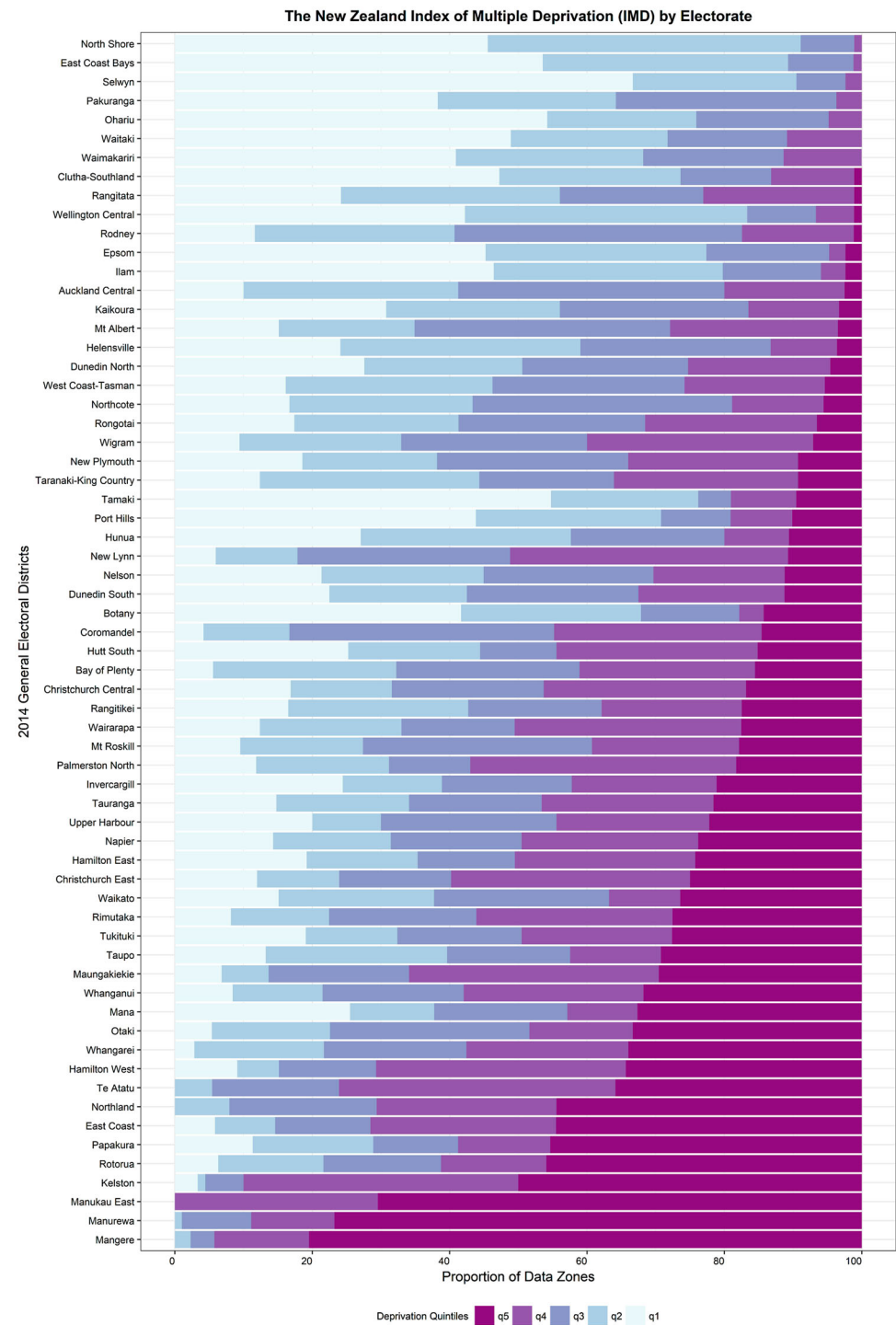


Figure 1. The distribution of the IMD deprivation quintiles by 2014 General Electoral District, ordered by increasing proportions of most deprived (Q5) data zones.

(Q5) data zones. The 7 GEDs at the top of [Figure 1](#) (North Shore, East Coast Bays, Selwyn, Pakuranga, Ohariu, Waitaki and Waimakiriri) have no data zones that are among the 20% (Q5) most deprived in NZ, and very few Q4 data zones. The 4 GEDs at the bottom of [Figure 1](#) (Kelston, Manukau East, Manurewa and Mangere) are those electorates with 50% or more of their data zones among the most deprived (Q5) in the country. Within the Mangere electorate, 80% of data zones are Q5, while over three quarters of Manurewa's data zones are Q5. When we consider Q4 (moderate deprivation) and Q5 (severe deprivation) combined, **all of the data zones** in Manukau East are experiencing moderate to severe deprivation. In Kelston, Manurewa and Mangere at least 88% of the electorate consists of Q4 or Q5 data zones.

Overall, there are 25 electorates (39.1%) in which the proportion of data zones in the most deprived quintile (Q5) is greater than 20%, and the same number (25; 39.1%) of electorates have more than 20% of their data zones among the least deprived (Q1). We selected 3 electorates (Invercargill, Mana, and Upper Harbour) to explore patterns of overall deprivation ([Figure 2](#)). In the Invercargill electorate ([Figure 2A](#)), rural Q1 and Q2 data zones surround the city, but Grasmere has four Q4 data zones. By contrast, Q5 areas cluster in the south of the city along the estuary and to the east and they are interspersed with Q4 neighbourhoods. In Mana ([Figure 2B](#)), most Q5 neighbourhoods are in the south of the electorate in Porirua City, while Q1 neighbourhoods are all located in the northern half of the electorate. Q1 areas that are contiguous with Q5 neighbourhoods in Mana are more isolated from each other than first appears, because there is a large area of forest between these neighbourhoods. In the Upper Harbour electorate ([Figure 2C](#)), which was established in 2014, the less deprived areas to the North are joined by a corridor of Q2 and Q3 areas, while most of the Q5 areas in the west of the electorate are adjacent to Q4 neighbourhoods, presenting an electorate of two-realities. Readers are invited to explore the geography of deprivation for all electorates (and other administrative areas) at http://www.imd.ac.nz/NZIMD_Single_animation_w_logos/atlas.html.

So far, we have been comparing patterns of overall deprivation across these three electorates. One strength of the IMD is its flexibility and the potential for users to explore more closely the drivers of deprivation within communities. Each stacked bar chart in [Figure 3](#) shows the proportion of data zones in the General Electorate that belong to each deprivation quintile for the IMD and its seven domains in 2013. The Mangere and Manukau East electorates are adjacent to each other and their deprivation profiles are broadly similar, but the Mangere GED has less unemployment and crime victimisation. The deprivation profiles of the Bay of Plenty and Christchurch Central GEDs are also broadly similar, but with far less overall deprivation than Mangere or Manukau East. Christchurch Central is urban and has more crime victimisation and housing deprivation than the Bay of Plenty, possibly because crime victimisation is typically higher in cities and so much housing was lost in the 2010/2011 earthquakes. The Bay of Plenty is more rural and has more access deprivation, especially if we combine Q4 (moderate) and Q5 (severe) data zones. The biggest difference between the Selwyn and North Shore GEDs is the very high access deprivation in Selwyn, which is predominantly rural. In each of these selected GEDs, the distribution of overall IMD deprivation in a given electorate was similar to the Employment and Income Domains, which is not surprising as these two domains comprise the greatest weights of the index (Exeter et al. 2017).

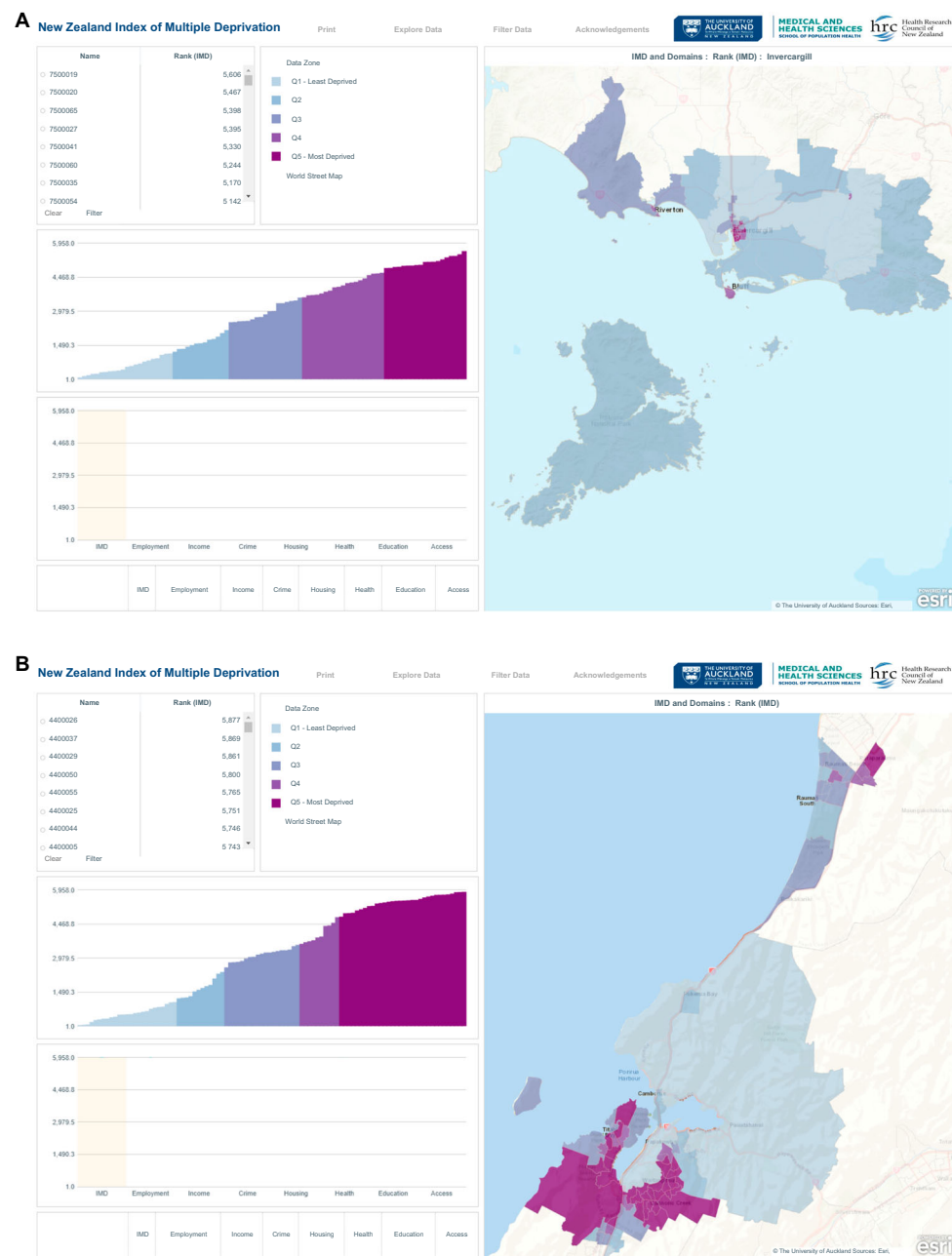


Figure 2. The geographic distribution of deprivation in **A**, Invercargill, **B**, Mana and **C**, Upper Harbour General electorates.

The distribution of employment deprivation is shown in the second column of the bar plots in [Figure 3](#). The Employment Domain measures the proportion of working age people who were receiving the Unemployment or Sickness Benefits in 2013. In the Mangere GED, 46% (40/87) of data zones were among the 20% most employment

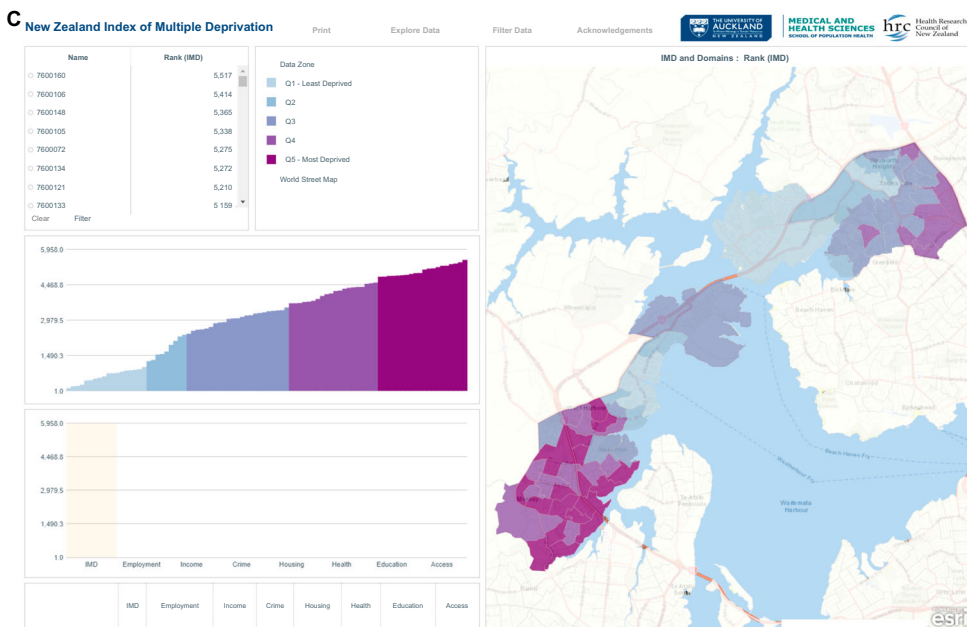


Figure 2. Continued.

deprived (Q5) in NZ, whereas in neighbouring Manukau East, 70.5% (62/88) of data zones were Q5 in the Employment Domain. The median employment deprivation rank in Mangere was 4685, which is 1708 ranks (28.7%) more than the NZ median of 2979, while the median employment rank in Manukau East was even higher at 5134, 42.0% higher than the NZ median. At the other end of the scale, employment deprivation in Selwyn was low, with 80% (67/84) of data zones in the least deprived employment quintile (Q1) and a median employment deprivation rank of 396, some 43% lower than the national median. These massive disparities in employment deprivation are reflected in voter turnout rates of 62.4% and 64.5% for Manukau East and Mangere respectively, compared to a turnout rate of 85.1% for Selwyn.

Column 3 of the stacked bars in [Figure 3](#) represent the Income Domain, which measures the amount of money per person paid by the government in the form of Working for Families payments and income-tested benefits, as a proxy for insufficient income. In the Mangere GED, 74.7% (65/87) of data zones were Q5 income deprived, even though only 46% (40/87) of data zones were Q5 employment deprived, suggesting that there are many ‘working poor’ in the Mangere electorate. The Bay of Plenty electorate had lower levels of severe income deprivation, with only 17.8% (16/90) of data zones among the 20% most income deprived in NZ. However, when we consider Q4 and Q5 combined, 41.1% of data zones were moderately or severely deprived, and the median income deprivation rank (3400) in the Bay of Plenty was 14.1% higher than the national median of 2979.

The Crime Domain (Column 4, [Figure 3](#)) uses data from the NZ Police’s Recorded Crime Victimisations Statistics to measure victimisation rates of per 1000 people, which

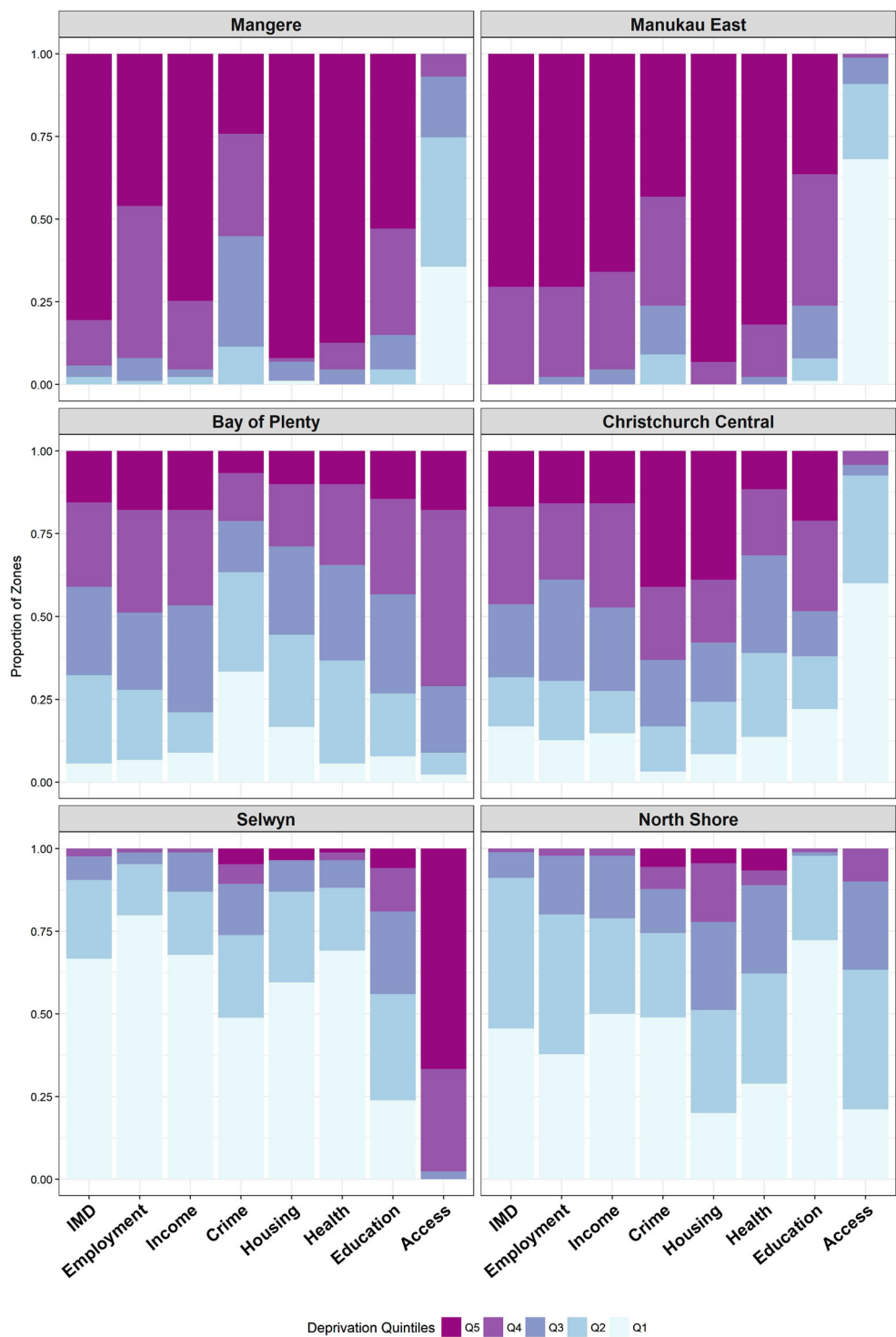


Figure 3. The distribution of the IMD and its domains of deprivation for selected General Electorates.

predominantly comprise reported thefts (55%), burglaries (24%) and assaults (18%). In the development of the IMD, the Crime Domain accounts for 5% of the overall weighting. An interesting observation in [Figure 3](#) is the variability in the distribution of the Crime Domain in comparison to the overall IMD. For example, in Mangere, only 24.1% (21/87) of data zones were Q5 for crime victimisation, considerably fewer than for overall IMD deprivation (70/87 data zones were Q5). In Manukau East, where overall IMD deprivation is similar to Mangere, 43.2% (38/88) of data zones were Q5 for the Crime Domain, almost double the proportion in the Mangere electorate.

Urban areas tend to have more crime victimisation because they have more potential offenders and targets. [Figure 3](#) shows that the Bay of Plenty and Christchurch Central electorates have similar overall IMD deprivation, but the proportion of Q5 Crime Domain data zones in Christchurch Central is over 6 times higher than in the Bay of Plenty. Despite the influence of urban areas, a relationship between crime and deprivation can be seen in the low proportions of data zones with Q5 crime victimisation in the Selwyn and North Shore electorates (4.8% and 5.6% respectively), which are the least deprived GEDs in NZ. In fact the association between the IMD's Crime Domain and overall IMD deprivation is weaker than for most domains, with a Spearman Correlation Coefficient of 0.60787 ($p < .0001$).

The Housing Domain (Column 5, [Figure 3](#)) is the only domain that relied solely on 2013 Census data, and comprises the proportion of people living in overcrowded households (60% of the weighting) and in rented dwellings (40%). New questions in the 2018 Census on damp, mould and basic equipment will provide better data on housing deprivation in the future. The Mangere and Manukau East electorates had extreme levels of housing deprivation, with 92.0% (80/87) and 93.2% (82/88) of data zones among the 20% most housing deprived (Q5) in NZ respectively. It is interesting to compare this persistent problem with the level of housing deprivation in the Christchurch Central electorate, which suffered significant population displacement following the 2010/2011 earthquakes in Christchurch. In Christchurch Central, 41.1% (37/90) of data zones were Q5 for the Housing Domain and the median housing deprivation rank was 4163, 19.9% (1183 ranks) worse than the NZ median. The Bay of Plenty electorate had similar overall IMD deprivation to Christchurch Central, but only 10% (9/90) of its data zones were Q5 for the Housing Domain and its median housing deprivation rank was 2566, 414 ranks (6.9%) better than the NZ median.

The Health Domain (Column 6, [Figure 3](#)) comprised five indicators: standard mortality ratios, acute hospitalisations for infectious and respiratory diseases, emergency department admissions, and selected cancer registrations. In the Mangere electorate, 87.4% (76/87) of data zones were among the 20% most health deprived in NZ and of the remaining 11 data zones, 7 were Q4 and 4 were Q3. A similar distribution was found for Manukau East, with 81.8% (72/88) of its data zones Q5 for health deprivation, and the remaining 16 data zones assigned to Q4 (15.9%) and Q3 (2.3%). There were no data zones with Q2 or Q1 health deprivation in either electorate. In contrast the North Shore GED has only 6.7% (6/90) of its data zones with Q5 health deprivation, and its median health deprivation rank was 1207, 19.4% (1154 ranks) better than the NZ median.

The Education Domain (Column 7 [Figure 3](#)) measures retention, achievement and transition to education or training for school leavers; the proportion of working age

people 15–64 with no formal qualifications; and the proportion of youth aged 15–24 not in education, employment or training (NEET). Over half (46/87) of data zones in the Mangere electorate were among the 20% most education deprived in NZ, while in Manukau East, 36.4% (32/88) of data zones were Q5. In the Bay of Plenty electorate, only 14.4% (13/90) of data zones were Q5 education deprived, while in Christchurch Central, the figure was slightly higher at 21.1% (20/95). In the North Shore electorate here were no Q5 data zones for the Education Domain. With 72.2% (65/90) of its data zones in Q1, the median education deprivation rank in the North Shore district was 854, 35.7% (2126 ranks) lower than the NZ median.

The Access Domain (Column 8, [Figure 3](#)) measures the distance from the population-weighted centre of each data zone to the nearest three GPs, supermarkets, service stations, schools and early childhood education centres. Given that people in rural settings typically travel further to reach these basic amenities, the Access Domain approximates well to an urban/rural indicator. Two-thirds (56/84) of data zones in the Selwyn electorate were among NZ's 20% most access deprived, and it had no Q1 data zones. The Bay of Plenty electorate also has a significant rural hinterland and while only 17.8% (16/90) of its data zones were Q5 for access deprivation, 53.3% (48/90) were Q4. There were no other electorates in [Figure 3](#) that contained Q5 data zones for the Access Domain.

The voting electorate

There were 3,298,009 people registered to vote in the 2017 General Election, of whom 2,605,854 (79.0%) voted ([Table 2](#)). Those aged ≥ 70 years accounted for over 15% of eligible voters, with the next biggest age band being for 18–24 year olds with 9.72% of eligible voters ([Table 2](#)). All other age bands covered 5 year age intervals (e.g. 25–29), each representing around 8–9% of the population. The age band representing the smallest proportion of enrolled voters overall was the 65–69 year olds (7.14%). The distribution of voters by age band generally increased with age, with the lowest turnout for those aged 25–29 (67.56%) and the highest turnout for 65–69 year olds (88.2%). With only 26,552 of its 42,383 enrolled voters participating in the General Election the Manukau East GED had the lowest voter turnout overall, at 62.7%. By contrast, in the Selwyn GED 43,844 of the 50,775 enrolled voters (86.35%) participated.

A closer investigation in the voter turnout by age and GED ([Table 3](#)) reveals some interesting patterns. For example, Wellington Central had the highest voting turnout for young

Table 2. The distribution of voters and non-voters in the 2017 General Election, by age.

Age	Total enrolled	% in age band	Voters	%	Non-voters	%
All	3,046,216	100.0	2,433,511	79.9	612,705	20.1
18–24	295,941	9.7	208,815	70.6	87,126	29.4
25–29	241,825	7.9	165,981	68.6	75,844	31.4
30–34	244,058	8.0	175,458	71.9	68,600	28.1
35–39	245,445	8.1	184,386	75.1	61,059	24.9
40–44	255,262	8.4	200,560	78.6	54,702	21.4
45–49	285,294	9.4	230,387	80.8	54,907	19.3
50–54	281,071	9.2	232,222	82.6	48,849	17.4
55–59	278,234	9.1	235,617	84.7	42,617	15.3
60–64	242,277	8.0	209,993	86.7	32,284	13.3
65–69	217,514	7.1	192,497	88.5	25,017	11.5
70+	459,295	15.1	397,595	86.6	61,700	13.4

Table 3. Summary statistics of voter turnout by age and electorate, with the corresponding electorate in parentheses.

Age group	Voters: Min % (Electorate)	Voters: Max % (Electorate)	Average electorate turnout (%)
18–24	58.5 (Manukau East)	90.1 (Wellington Central)	68.5
25–29	54.2 (Manukau East)	85.8 (Wellington Central)	67.3
30–34	56.5 (Manukau East)	81.7 (Ohariu)	71.0
35–39	57.7 (Manukau East)	83.9 (Selwyn)	74.4
40–44	60.3 (Manukau East)	87.0 (Selwyn)	77.6
45–49	62.2 (Manukau East)	87.3 (Selwyn)	79.7
50–54	64.1 (Manukau East)	89.9 (Selwyn)	81.5
55–59	71.0 (Manukau East)	90.3 (Selwyn)	83.6
60–64	74.4 (Manurewa)	90.6 (Selwyn)	85.6
65–69	74.8 (Manukau East)	92.6 (Otaki)	87.3
70+	69.9 (Manukau East)	91.3 (Selwyn)	85.1

people aged 18–24 and 25–29 (90.1% and 85.8%) respectively. The Selwyn GED had the highest voter turnout for ages 35–39 to 60–64 and for ≥70 years, ranging between 83.9 and 91.3%. Those aged 35–39 voted the most in Ohariu (81.7%), while Otaki had the highest voter turnout for 65–69 year olds (91.3%). Manukau East dominated statistics for the lowest voter turnout in all age groups except those aged 60–64, for whom the lowest turnout was in the Manurewa GED. Within Manukau East, however, participation generally demonstrated an undulating increase with age, ranging from 58.5% (18–24) to 74.8% (65–69) before declining to 69.9% among those aged ≥70 years.

The average turnout by age band and ethnic group (Table 4) shows that average voter turnout across all GEDs was slightly lower among Māori voters compared to non-Māori voters in all age groups. The gap between Māori and non-Māori turnout was greatest among 18–24 year olds, with a 5.1% difference. However, this gap steadily narrowed with age to 1.6% among those aged ≥70 years. Although the average turnout for each age group was lower for Māori, Table 4 also shows the highest proportion of Māori voters turnout was in fact higher than we found for non-Māori in the 30–34 (Rongotai electorate), 35–39 (Ilam), 40–44 (Selwyn), 45–49 (Mt Albert), 50–54 (Selwyn), 60–64 (Selwyn), and 70+ (Selwyn) year age groups, however the drivers behind these patterns are not well understood.

We were only able to calculate the percentage of the enrolled electors who voted by data zone. At that geographic scale, voter turnout ranged between 37.3% (located within

Table 4. Ethnic differences in voter turnout by age. Percentages represent the highest and lowest reported voter turnout for GEDs, by age. The means were calculated at the GED level.

Age band	Māori voters			Non-Māori voters		
	Min %	Max %	Mean %	Min %	Max %	Mean %
18–24	54.2	87.9	65.1	58.5	90.3	70.2
25–29	49.2	84.7	65.4	54.7	85.9	68.7
30–34	53.6	83.2	68.2	56.6	81.8	72.5
35–39	57.4	90.3	72.7	57.7	83.9	75.7
40–44	52.3	87.6	75.6	60.1	86.9	78.8
45–49	58.7	88.9	77.7	62.5	87.4	80.9
50–54	64.2	91.6	79.3	63.7	89.8	82.7
55–59	71.7	88.6	81.8	70.4	90.4	84.6
60–64	72.2	92.2	83.8	74.7	90.6	86.5
65–69	75.5	96.4	86.5	74.6	92.6	89.1
70+	71.49	93.81	84.1	69.4	91.3	85.7

the East Coast Electorate) to 97.0% in the West Coast Electorate, with a mean of 78.6% and median of 80.0%. There was a moderate, statistically significant correlation between rank of voter turnout and deprivation ($R^2 = 0.66$, $P < 0.001$), which is demonstrated more clearly by comparing the geographical distribution of percentage voter turnout and deprivation rank for the Upper Harbour, Mana and Invercargill electorates in [Figure 4](#).

Discussion

To our knowledge, this is the first paper that provides an in-depth analysis of area deprivation circumstances by General Electoral District. Using the 2013 NZ Index of Multiple Deprivation (IMD) this descriptive analysis found considerable variability in deprivation profiles by GED and very high levels of deprivation in some electorates. For example, two-thirds of the Selwyn electorate's neighbourhoods were among the least deprived 20% of areas nationally, while 80% of data zones in the Mangere electorate were among the most deprived areas. Moreover, the remaining 20% of data zones in this electorate were in the second-most deprived quintile of deprivation (Q4). A strength of the IMD is the ability to explore the different drivers of deprivation in communities. [Figure 2](#) highlighted that while different electorates may have similar patterns of deprivation overall, each electorate had its own unique drivers of deprivation. In electorates such as Mangere and Manukau East, more than 90% of data zones are among the 20% most housing deprived in NZ, and more than 80% of data zones are among the 20% most health deprived in NZ. Neighbourhood-level data on voter turnout were unavailable at the time of writing, but turnout at the electoral level showed evidence of ecological associations between increasing levels of deprivation and reduced voter turnout, and maps of 3 GEDs showed strong spatial correlations.

The purpose of this paper was to highlight geographical variations in deprivation by electorate and their association with voter turnout. Such information is particularly timely for the recently elected (and re-elected) Members of Parliament (MPs), providing insight into the drivers of deprivation in their electorates. More importantly, the IMD and its seven domains provide MPs, researchers and planners with a comprehensive summary of the areas in each electorate that are experiencing different forms of disadvantage. Our longer-term vision is for the IMD and its domains to inform research, policy, advocacy, and resource allocation. In the UK for example, between 2008/9 and 2010/11 more than GBP 1.5 billion of the Working Neighbourhoods Fund (WNF) was allocated to local governments according to level of deprivation from the 2007 IMD (Department for Communities and Local Government [2008](#)). Another example from the UK used the Income Domain to identify the most deprived 10% (England) and 15% (Scotland, Wales) of areas to benefit from interventions as part of the Government's fuel poverty strategy (OFGEM e-serve [2013](#)).

While this paper has explored the small-area geography of deprivation within electorates, a limitation of the present study is that the voter turnout data were not available at the data zone level. Rather, in this study we were required to aggregate data from census Meshblocks to data zones, in which approximately 95% of the total eligible voter population was included (Personal Communication: Anthony Pengelly, Electoral Commission 28 June 2018). The 'missing' 5% of the eligible population were excluded due to

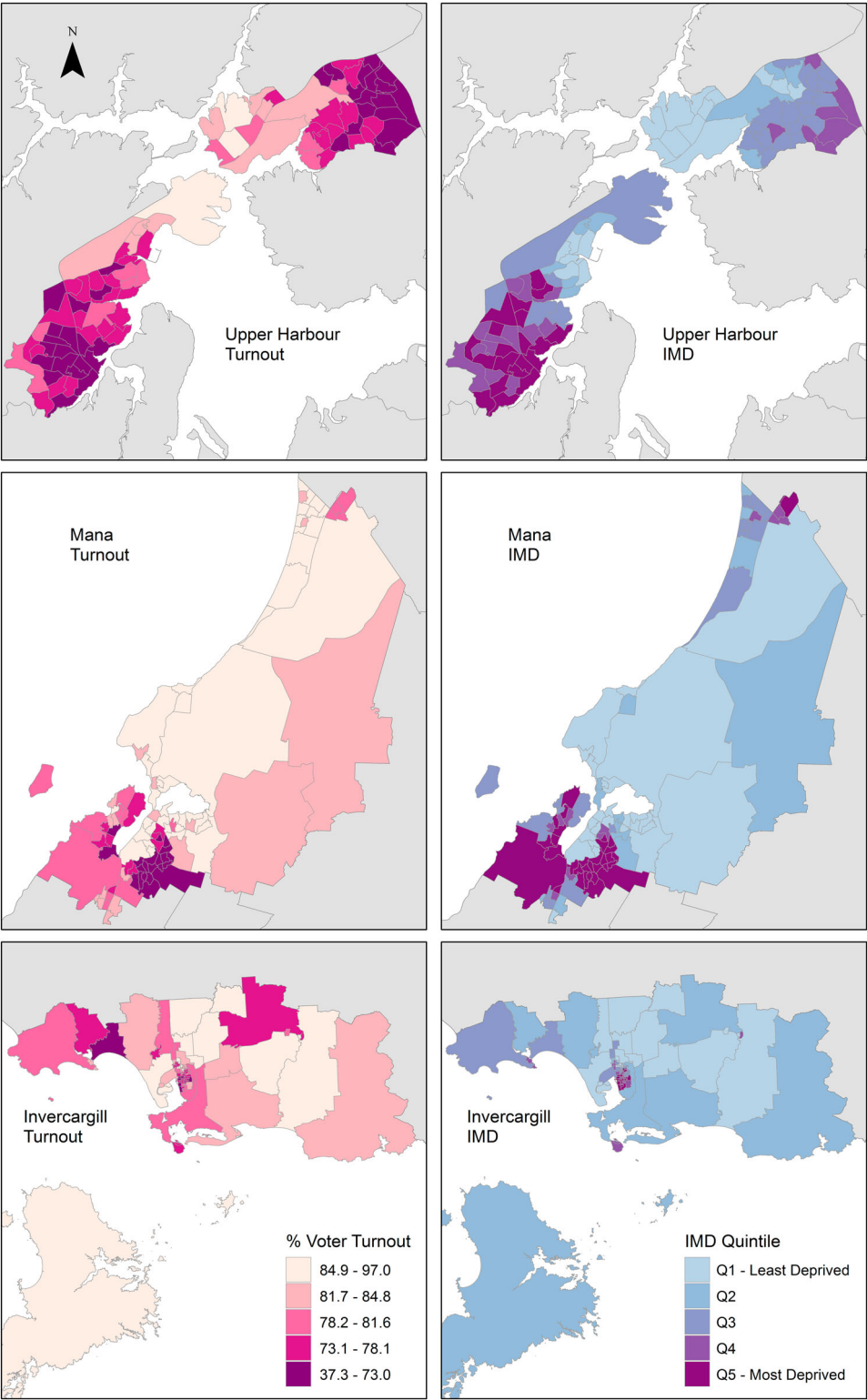


Figure 4. Voter turnout (%) and IMD rank in the Upper Harbour, Mana and Invercargill Electorates.

confidentiality constraints enforced by the Electoral Commission. In addition, there were some instances where data zones did not nest completely within the Electorate boundaries since they were not considered in the design of the data zones. Furthermore, because the IMD is based on areas, we cannot draw conclusions regarding an individual's likelihood of voting and the extent to which this differs by electorate. Having voter turn-out and other election results available at the data zone level would provide a unique opportunity to explore the socio-demographic characteristics of the electorate and enable researchers to better understand whether there are geographic determinants of non-participation in elections. Such analyses at the data zone level would not identify specific individuals, but area-level factors that affect turnout. This would be an interesting demographic study, while being informative to various political parties canvassing for votes in future elections.

Participating in the electoral process is a democratic right. We found a strong association between increasing levels of deprivation and decreasing levels of voter turnout. These results have the potential to inform the Electoral Commission's strategies to encourage our citizens living in deprived communities to have their voices heard and their votes counted in the 2020 General Election.

Disclosure statement

No potential conflict of interest was reported by the authors.

Statistics New Zealand disclaimer

The results in this study 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 study are those of the author(s), not Statistics NZ or The University of Auckland.

Access to the anonymized data used in this study was provided by Statistics NZ under the security and confidentiality provisions of the Statistics Act 1975. Only people authorized by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organization, and the results in this study have been confidentialized to protect these groups from identification and to keep their data safe.

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.

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