

Thursday 28<sup>th</sup> June 2018

# Development and implementation of the New Zealand Index of Multiple Deprivation (IMD)

A presentation at

**Using big data to tackle inequalities in society**

**The University of Auckland**

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[www.fmhs.auckland.ac.nz/imd](http://www.fmhs.auckland.ac.nz/imd)



**MEDICAL AND  
HEALTH SCIENCES**





## **Statistics New Zealand Disclaimer Statement**

Access to the data presented was managed by Statistics New Zealand under strict micro-data access protocols and in accordance with the security and confidentiality provisions of the Statistic Act 1975. Our findings are not Official Statistics. The opinions, findings, recommendations, and conclusions expressed are those of the researchers, not Statistics NZ, or the University of Auckland.

## **Acknowledgements**

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A special thanks to Antony Vlug, Rachael Yong, Bianca Haux and Nick Young for their work in producing some of the utilities developed and presented today.

Census boundaries used in this analysis are Crown Copyright

# Outline

- Background
  - What is deprivation, how is it measured
- Developing the Index of Multiple Deprivation
  - Data Zones
  - Indicators, Domains, and the IMD
- How different is the IMD to NZDep?
- Some research examples to-date
- Where to get the files!

# What is deprivation?

- “Deprivation is a state of observable and demonstrable disadvantage relative to the local community or the wider society or nation to which an individual, family or group belongs” (Townsend 1987)
- Deprivation should be applied to conditions and quality of life that are of a lower standard than is *ordinary* in a particular society
- Living in poverty should refer to a lack of income and resources to obtain the normative standard of living.

# NZDep 2013

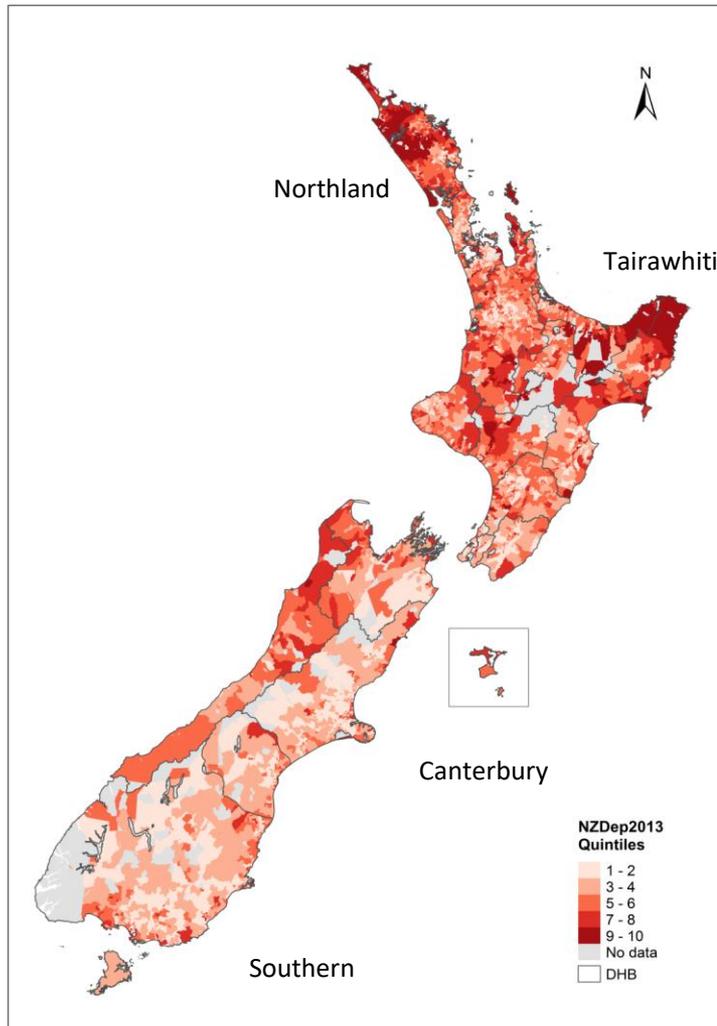
- Deprivation in NZ has been measured using NZDep since 1991
- NZDep was initially designed for research, planning, and advocacy
  - Can be linked to health and social data retrospectively using the Meshblock of e.g. a patient's address
  - Ranking of the deprivation scores is strongly associated with health or social outcomes
  - Also available for Census Area Units/Health Domicile
- **BUT**
  - Limited to census data – limited set of variables
  - Can't 'unpack' NZDep and examine its component variables
  - Meshblocks are often too small for robust epidemiological studies
    - Data are typically suppressed to preserve confidentiality
  - Census Areas too large and may mask 'pockets' of deprivation
  - A perception that areas in the same deprivation group are equally deprived

# Variables included in NZDep2013

Dimension of Deprivation	Weights on the 1 <sup>st</sup> PCA	Description
Communication	0.372	People aged <65 with no access to the Internet at home
Income	0.364	People aged 18-64 receiving a means tested benefit
Income	0.356	People living in equivalised households with income below an income threshold
Employment	0.338	People aged 18–64 unemployed
Qualifications	0.332	People aged 18–64 without any qualifications
Owned Home	0.322	People not living in own home
Support	0.317	People aged <65 living in a single parent family
Living space	0.303	People living in equivalised households below a bedroom occupancy threshold
Transport	0.286	People with no access to a car

Source: Atkinson J, Salmond C, Crampton P (2014) NZDep2013 Index of Deprivation: Research Report. Department of Public Health, University of Otago, Wellington. Available at: <http://www.otago.ac.nz/wellington/departments/publichealth/research/hirp/otago020194.html>. Accessed 10 April 2016

# NZDep 2013



NZDep2013 classifies small census areas into deprivation deciles or quintiles

9 census-based indicators of deprivation combined to create a composite index

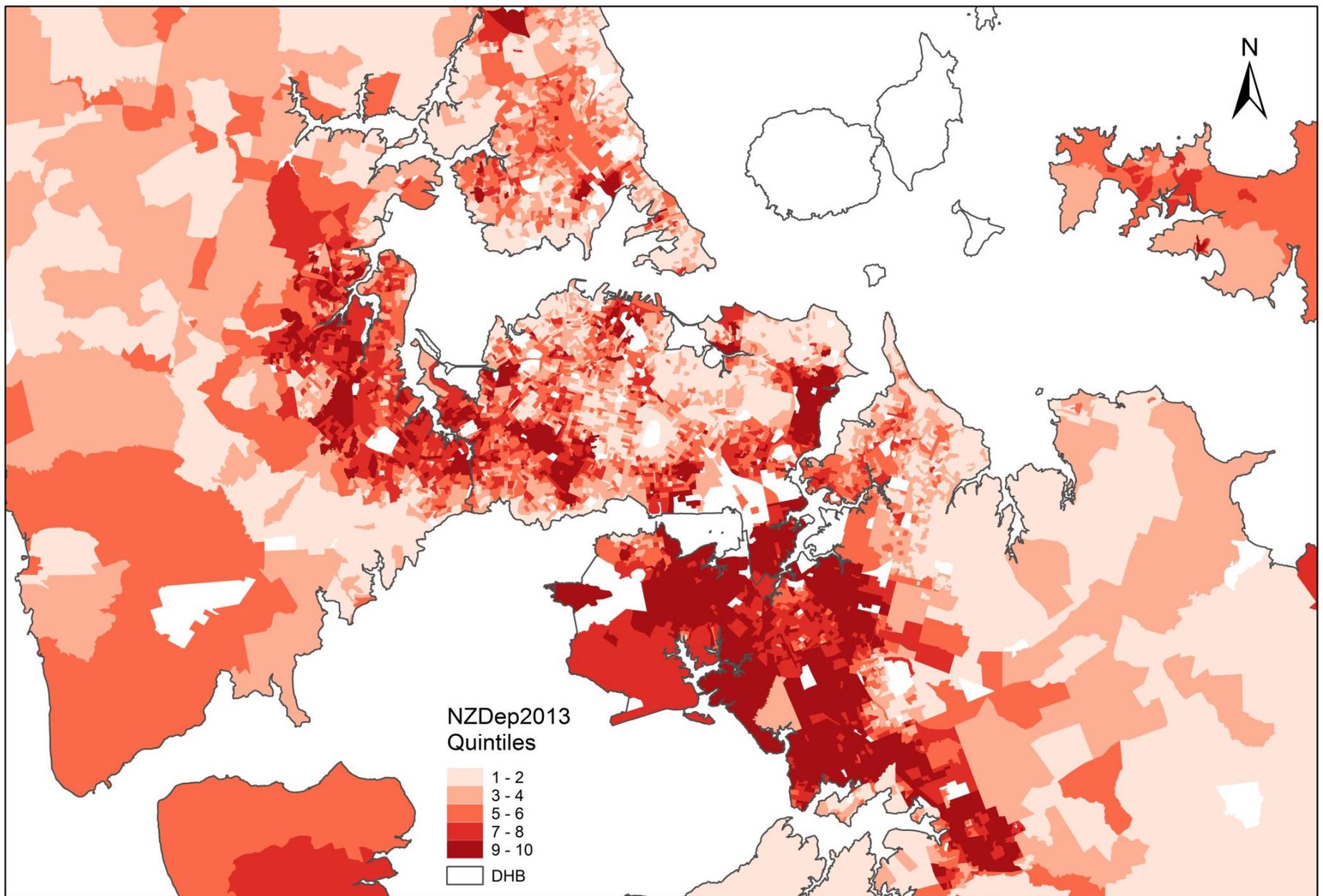
Darker red = more deprived meshblocks

Large rural areas are more visible

Apparently more deprived in Northland and Tairāwhiti DHBs

Apparently less deprived in Southern and Nelson-Marlborough DHBs

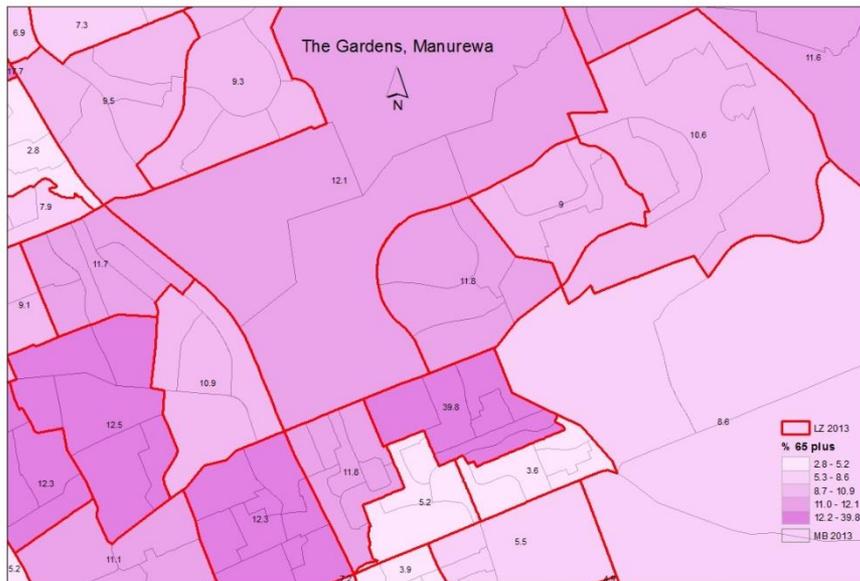
Source: Map produced by author using NZDep2013: Atkinson J, Salmond C, Crampton P (2014) NZDep2013 Index of Deprivation: Research Report. Department of Public Health, University of Otago, Wellington. Available at: <http://www.otago.ac.nz/wellington/departments/publichealth/research/hirp/otago020194.html> Accessed 10 April 2016. 2013 Meshblocks © Statistics New Zealand, available at: [http://www.stats.govt.nz/browse\\_for\\_stats/Maps\\_and\\_geography/Geographic-areas/digital-boundary-files.aspx](http://www.stats.govt.nz/browse_for_stats/Maps_and_geography/Geographic-areas/digital-boundary-files.aspx)



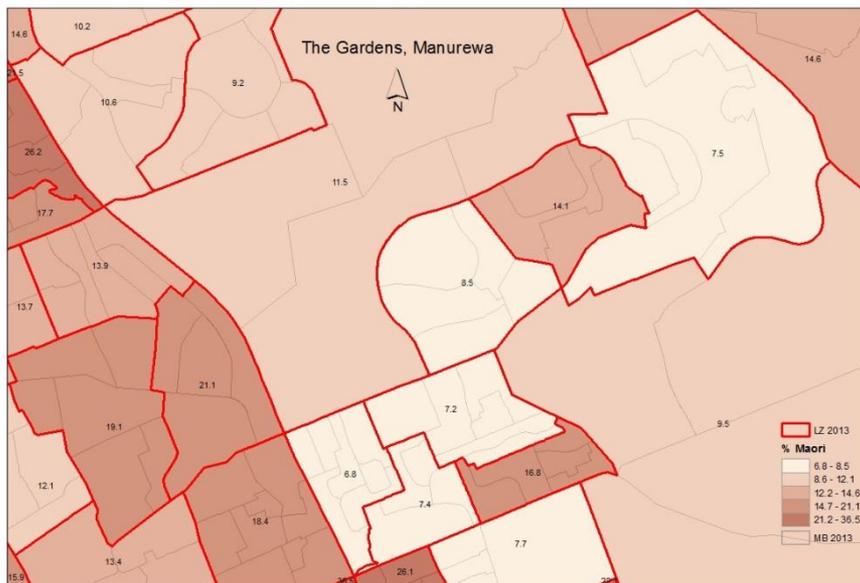
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# The NZ Index of Multiple Deprivation (IMD)

<b>EMPLOYMENT</b>	Measure the degree to which working age people are excluded from employment
<b>INCOME</b>	Captures the extent of income deprivation in a data zone by measuring state-funded financial assistance to those with insufficient income
<b>CRIME</b>	Counts victims for 7 major offences per 1,000. Counts were collected after 30 days of investigation: Homicide/Assault/Sexual Assault/Abduction/Robbery/Burglary/Theft
<b>HOUSING</b>	Proportion of people living in overcrowded housing and the proportion living in rented accommodation
<b>HEALTH</b>	Identifies areas with a high level of ill health or mortality
<b>EDUCATION</b>	Captures youth achievement, retention, tertiary pathways and disengagement. Also working age people with no formal qualification
<b>ACCESS</b>	Measures the travel distance to access basic services. Supermarkets, GPs, service stations, ECE, primary & intermediate schools



16 data zones (0.3%) in NZ with null for % 65+ compared with 7.2% of CAUs and 18.6% of MBs.



4 data zones (0.07%) in NZ with null for % Māori compared with 6.8% of CAUs and 12.9% of MBs.

The IMD measures deprivation at the neighbourhood level using 5,958 custom designed data zones that were specifically developed for social and health research, particularly to reduce the level of data suppression.

- Data zones that have a mean population of 712 people.
- In urban settings, data zones can be just a few streets long and a few streets wide.

In the maps and diagrams that follow, data zones are ranked from the least to most deprived (from 1 to 5,958) and grouped into five quintiles.

- Q1 (light shading) represents the least deprived 20% of data zones in the whole of NZ
- Q5 (dark shading) represents the most deprived 20%

# Data providers



**MINISTRY OF SOCIAL DEVELOPMENT**  
TE MANATŪ WHAKAHIATO ORA



The Royal New Zealand  
College of General Practitioners  
Te Whare Tohu Rata o Aotearoa

# Measuring area deprivation in New Zealand

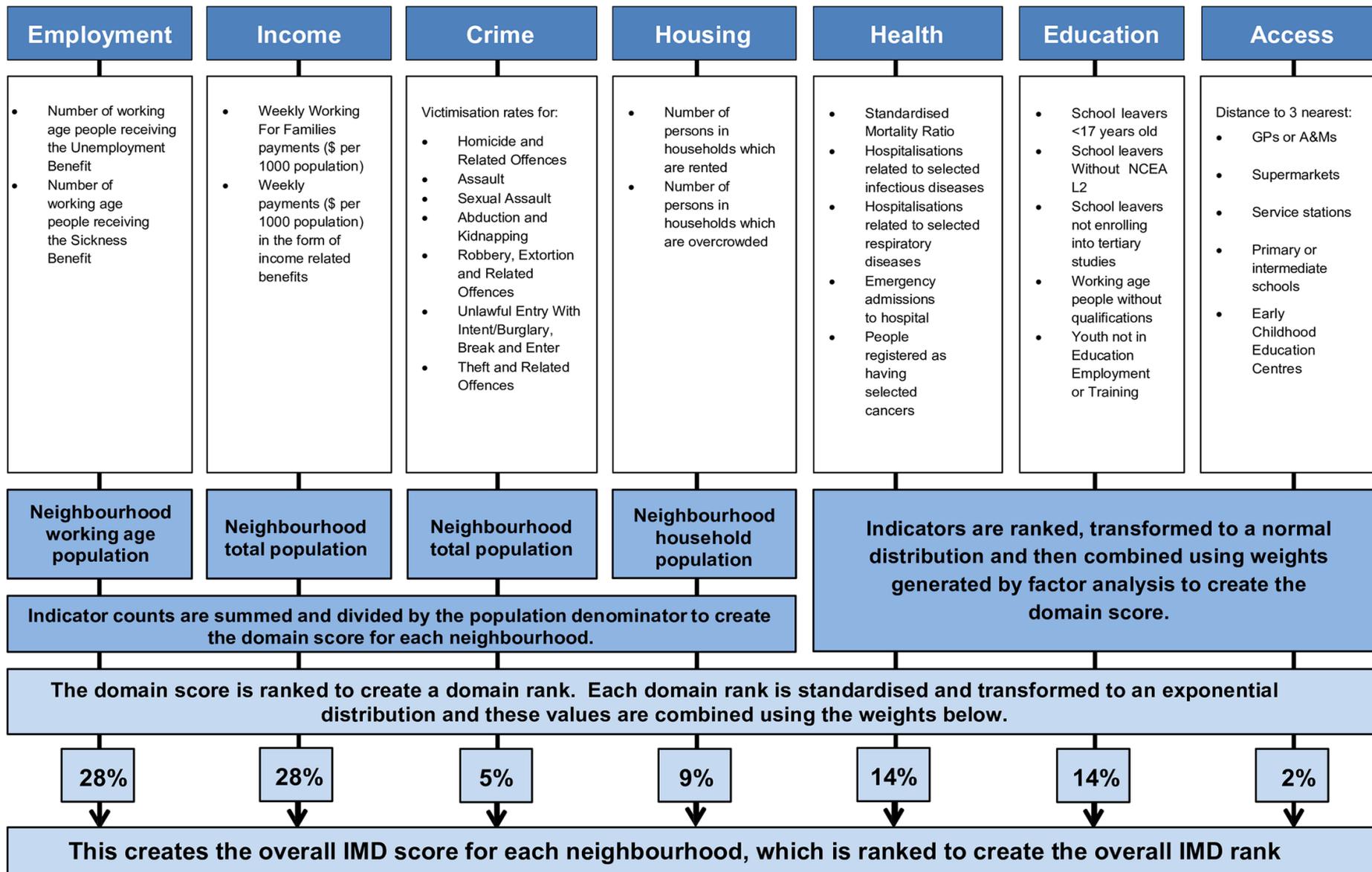
Indicators were selected if they were:

- Domain-specific and appropriate for the purpose
  - as direct as possible measures for that particular form of deprivation
- Measuring major features of that aspect of deprivation
  - not conditions experienced by a very few people or areas
- Up-to-date and could be updated regularly
- Were statistically robust
- Available for the whole of New Zealand at a small area level in a consistent form

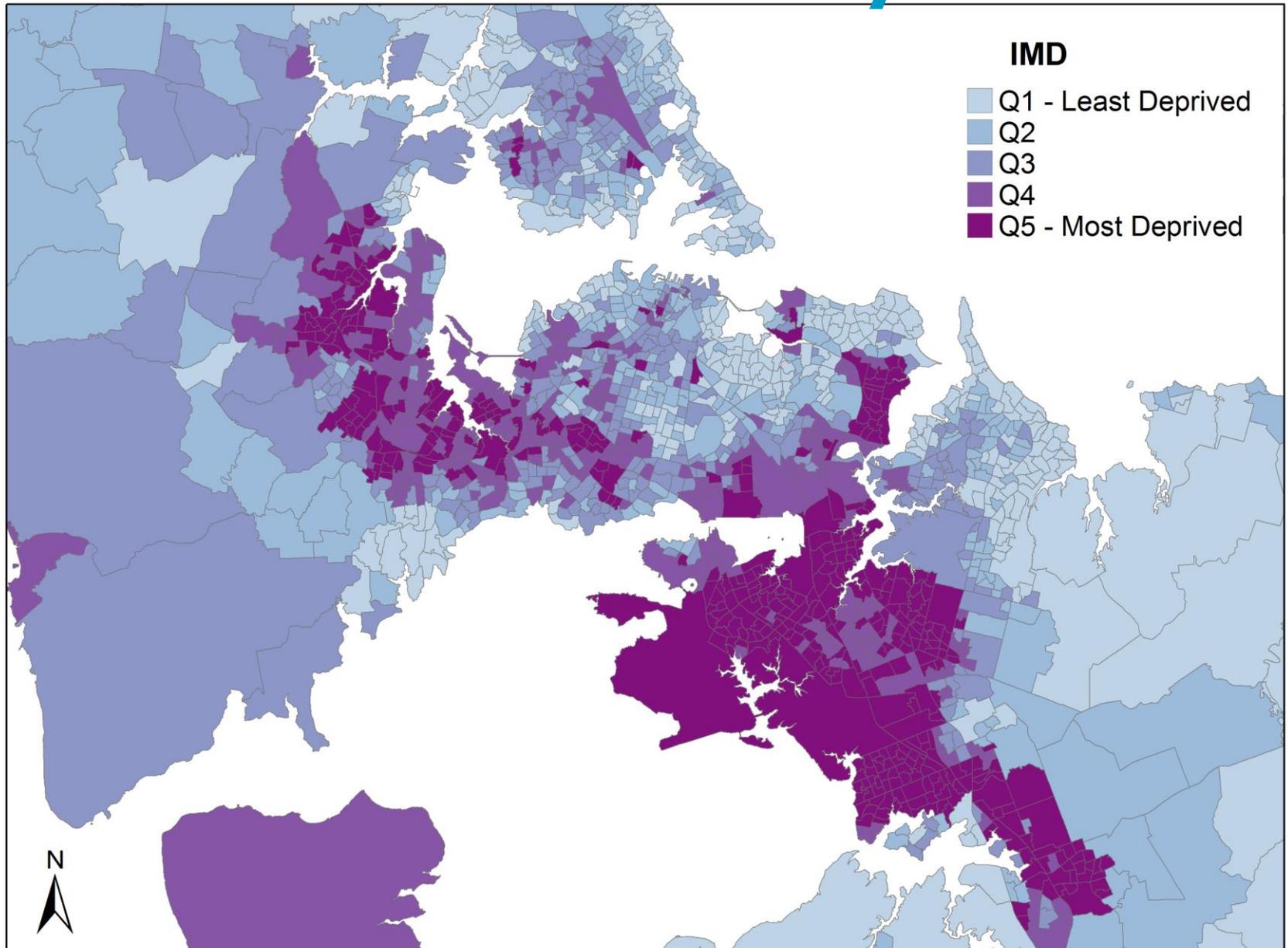
Dozens of potential indicators were investigated but only 28 met the criteria.

The IMD allows one to look at disadvantage in overall terms, as well as in terms of seven domains of deprivation.

## The New Zealand Index of Multiple Deprivation 2013



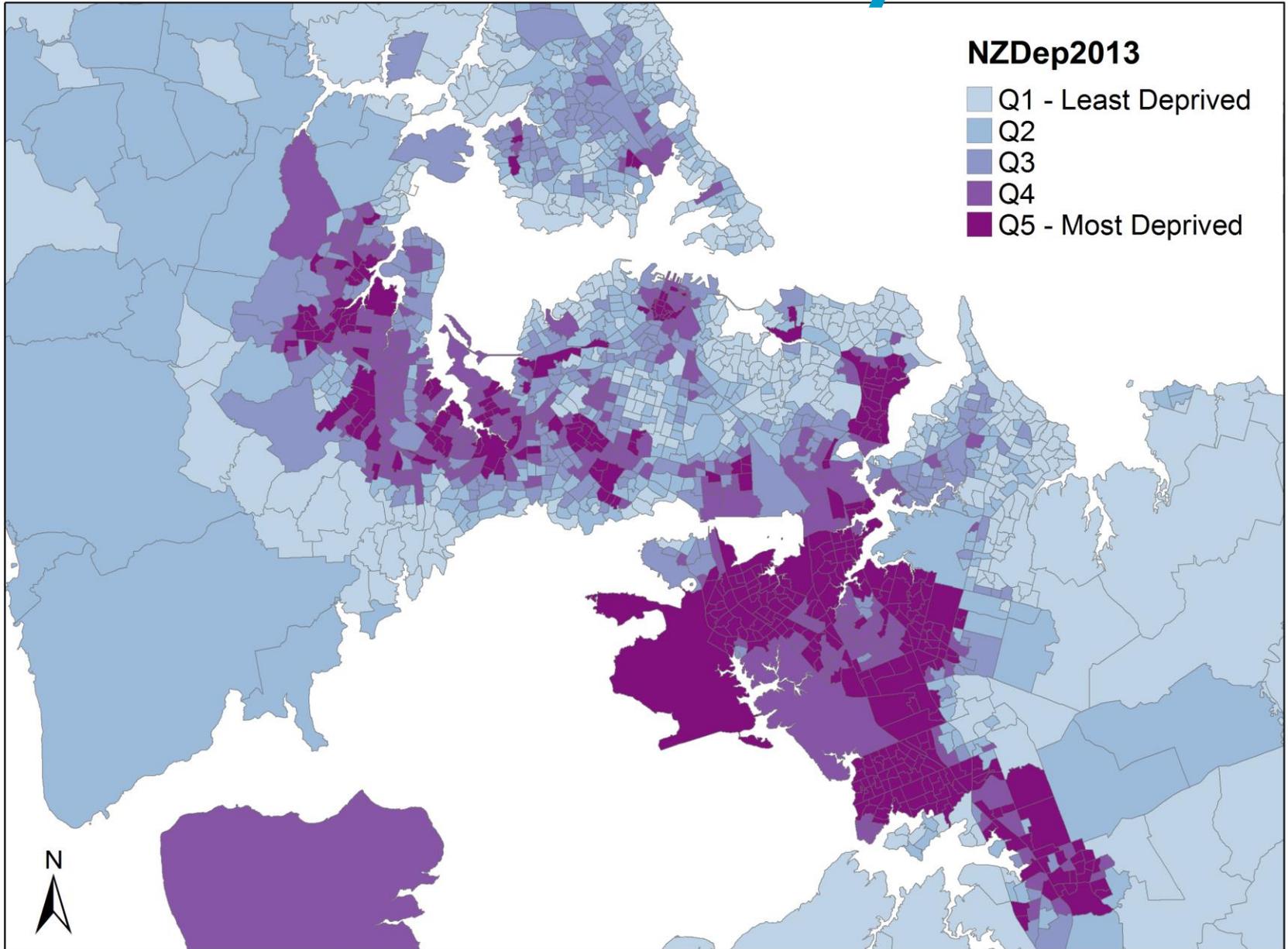
# Auckland City



# Auckland City

## NZDep2013

- Q1 - Least Deprived
- Q2
- Q3
- Q4
- Q5 - Most Deprived



# IMD compared to NZDep13

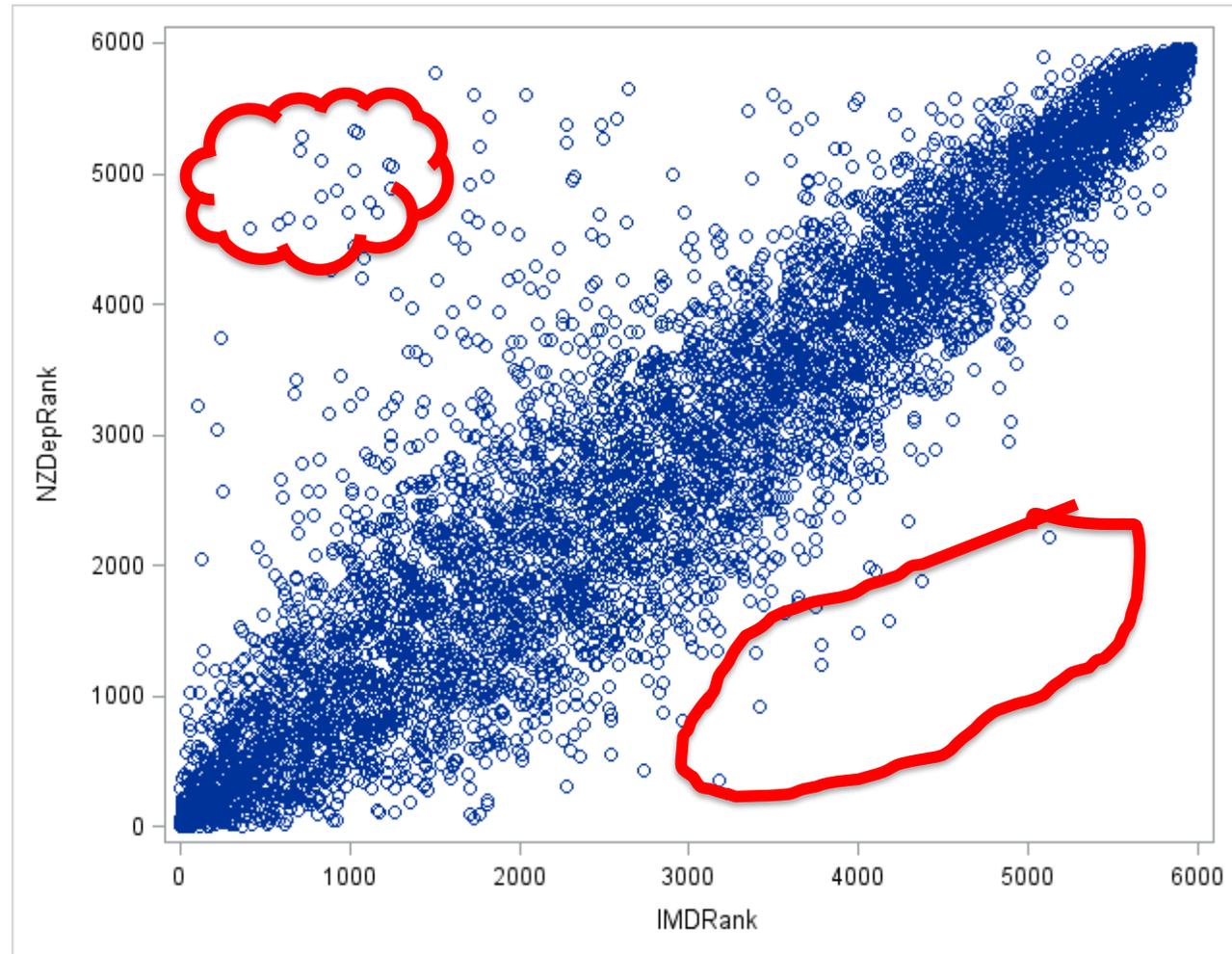
We calculated the population weighted average NZDep13 rank for each data zone

We excluded 86 (1.4%) data zones with MBs without an NZDep13 score

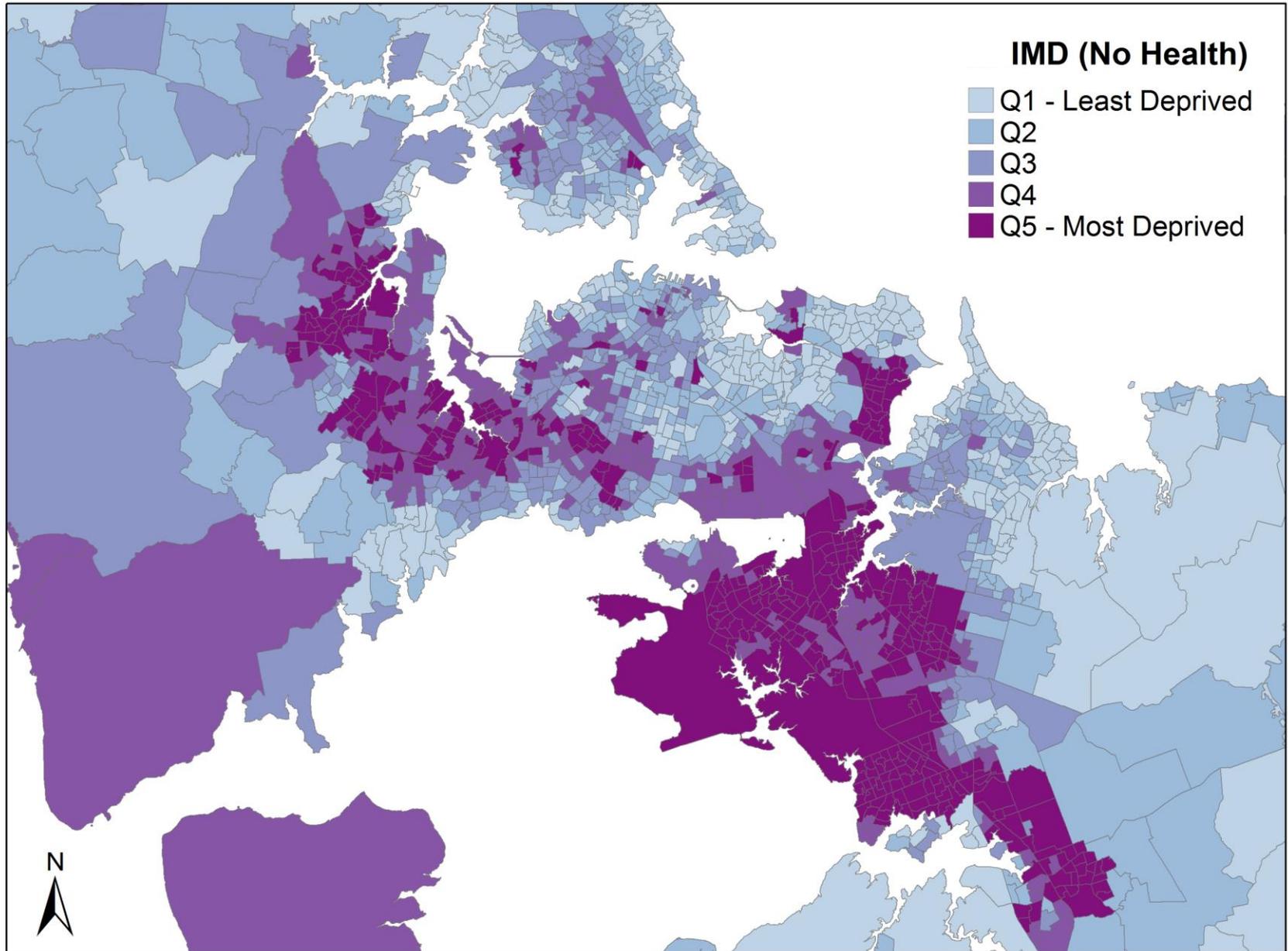
Spearman Correlation Coefficient:

0.92

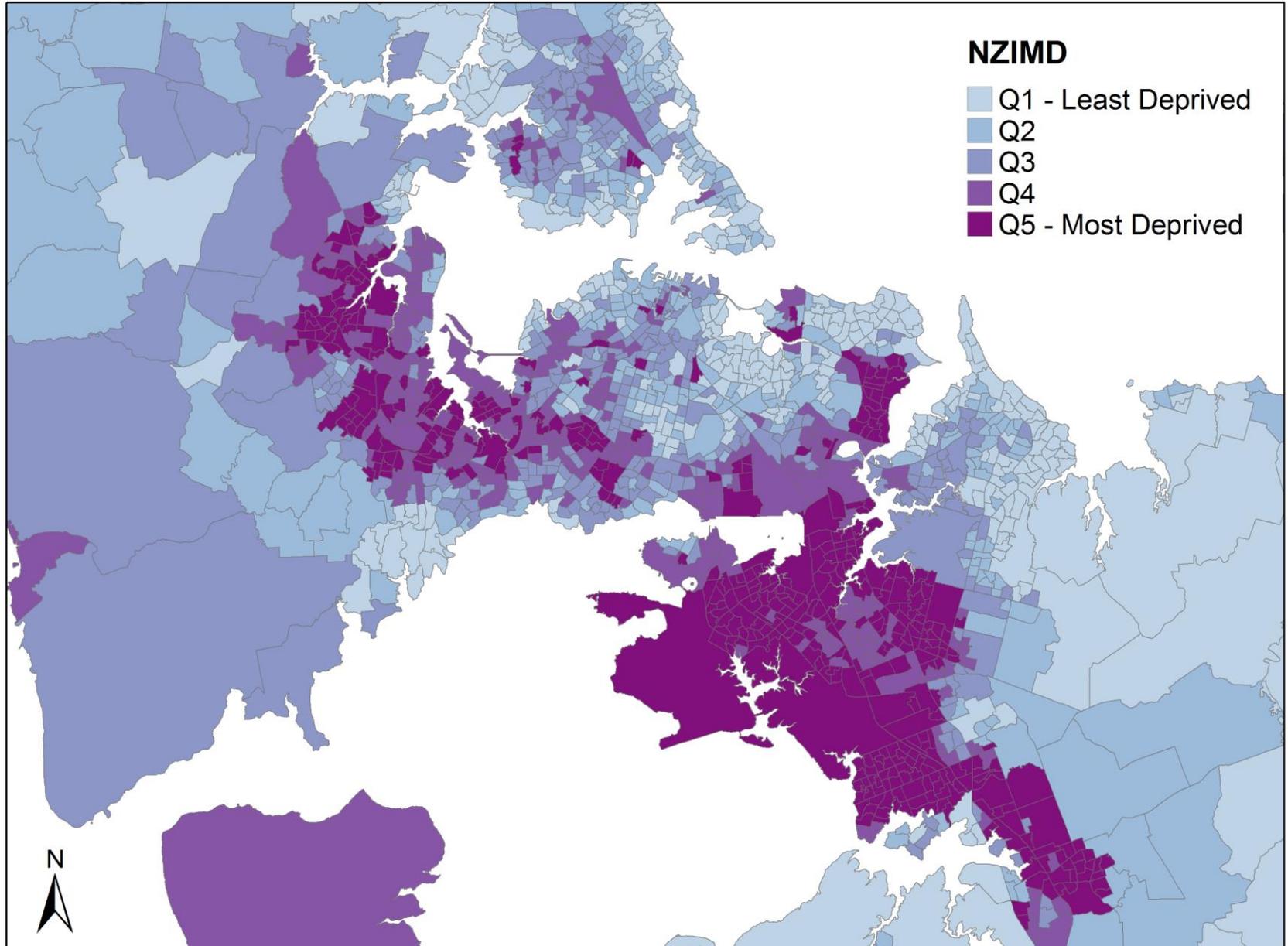
( $p < .0001$ )



# We created IMD-1 Domain to minimise data circularity



# Auckland City



# Exploring the drivers of deprivation

## New Zealand Index of Multiple Deprivation

Explore Data

Filter Data

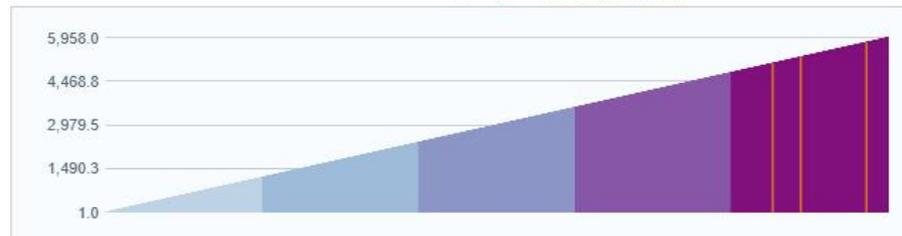
Acknowledgements



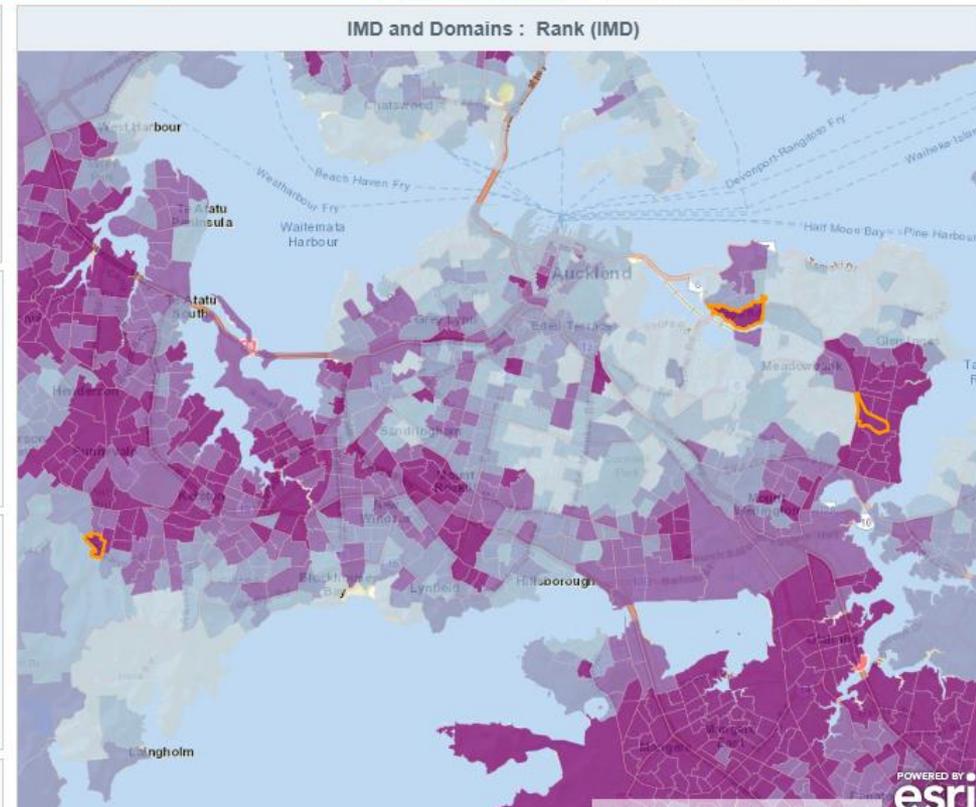
Name	Rank (IMD)
7600156	5,293
100034	5,292
7600114	5,291
7600592	5,290

Data Zone  
 Q1 - Least Deprived  
 Q2  
 Q3  
 Q4  
 Q5 - Most Deprived

Clear  Filter



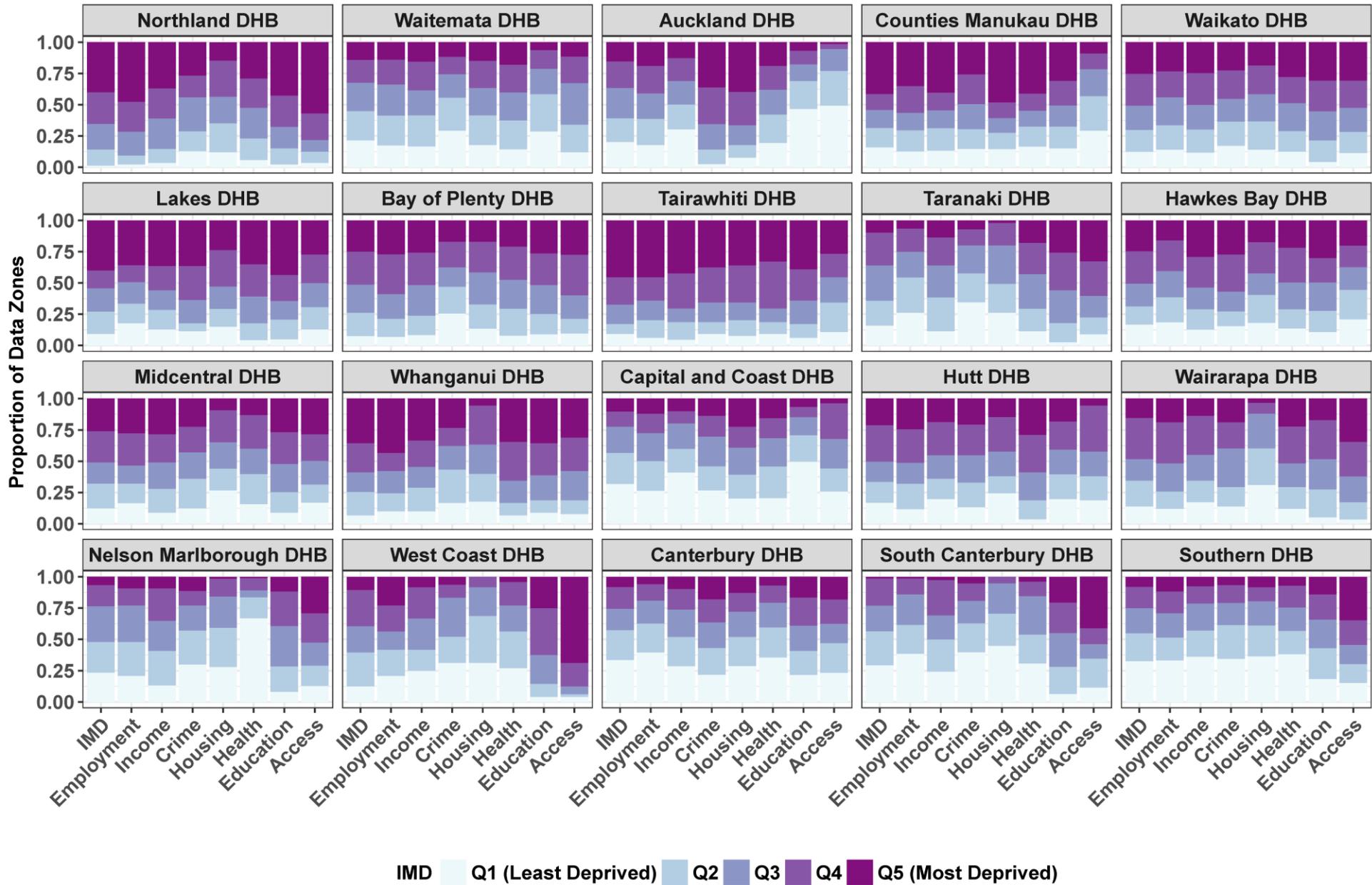
- IMD
- Employment
- Income
- Crime
- Housing
- Health
- Education
- Access



# Deprivation in the Auckland DHB



# The New Zealand Index of Multiple Deprivation (IMD)



IMD Q1 (Least Deprived) Q2 Q3 Q4 Q5 (Most Deprived)

# How the IMD may help improve outcomes and reduce inequalities

- A more comprehensive, nuanced and flexible index will help users understand neighbourhoods better. Each neighbourhood is unique and faces a different set of challenges and may have different drivers of deprivation
- Users might:
  - Identify and focus on the most deprived neighbourhoods
  - Identify neighbourhoods with similar characteristics and design interventions to suit
  - Remove one of the domains to address potential circularity  
e.g. an analyst at the DHB may choose to remove the Health Domain

# Get the IMD and Data Zones!

- We have a [website](#) that includes links to:
  - MB2013 to Data Zone concordance files
  - Data Zone to IMD concordance files
  - Data Zone and IMD shapefiles
- [Interactive online maps](#)
- [Papers](#), [reports](#), DHB profiles, API for geocoding in surveys
- [www.fmhs.auckland.ac.nz/imd](http://www.fmhs.auckland.ac.nz/imd)

# Exploring the drivers of deprivation

## New Zealand Index of Multiple Deprivation

Explore Data

Filter Data

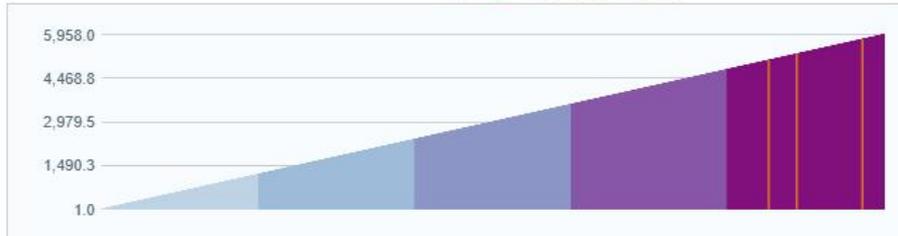
Acknowledgements



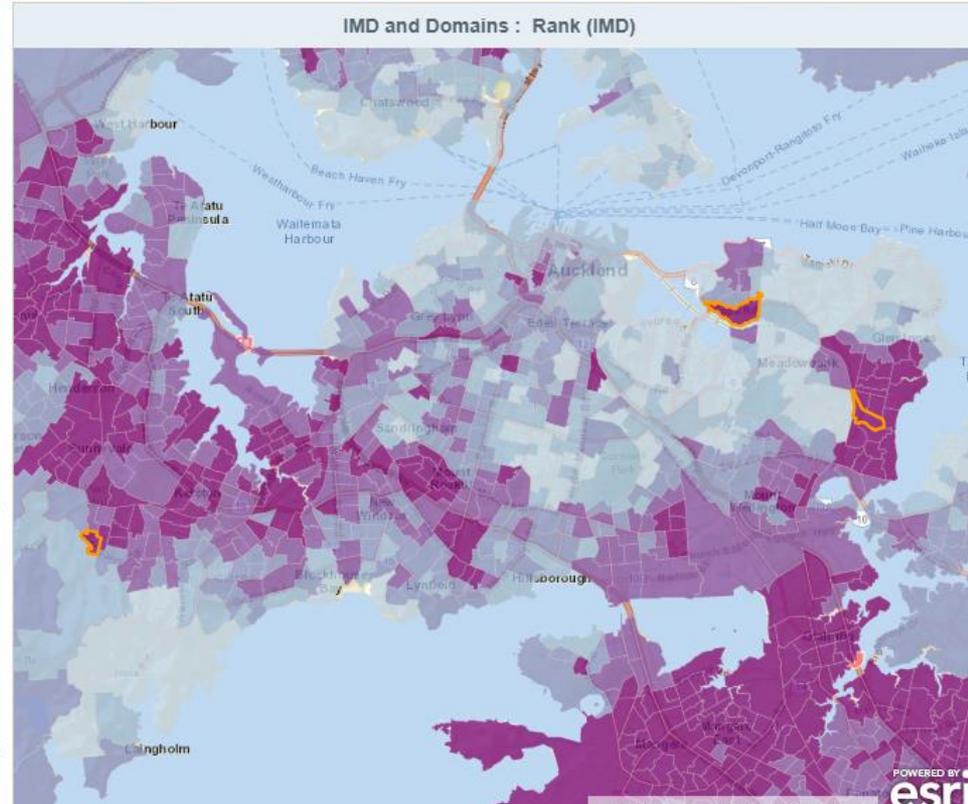
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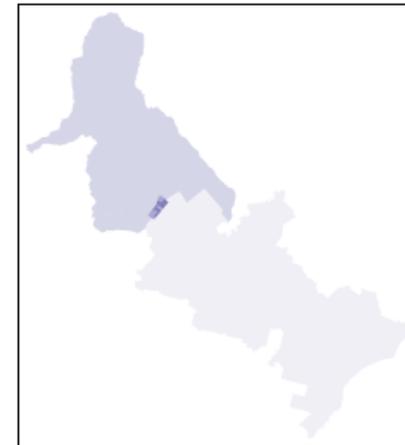
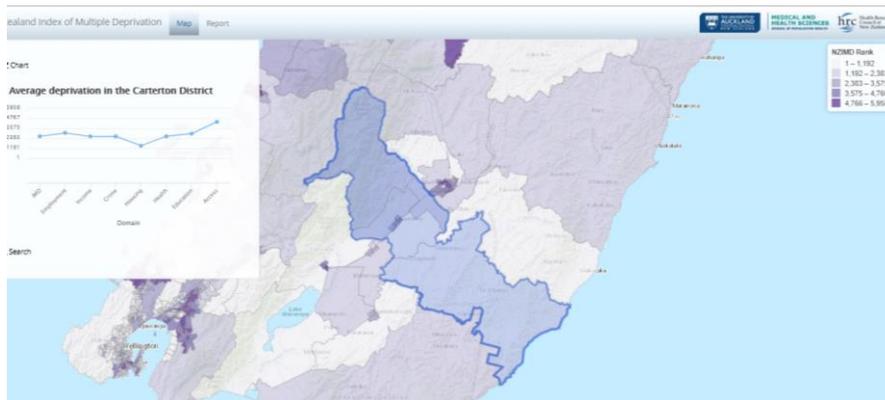


IMD
  Employment
  Income
  Crime
  Housing
  Health
  Education
  Access



# Deprivation reports for geographic regions

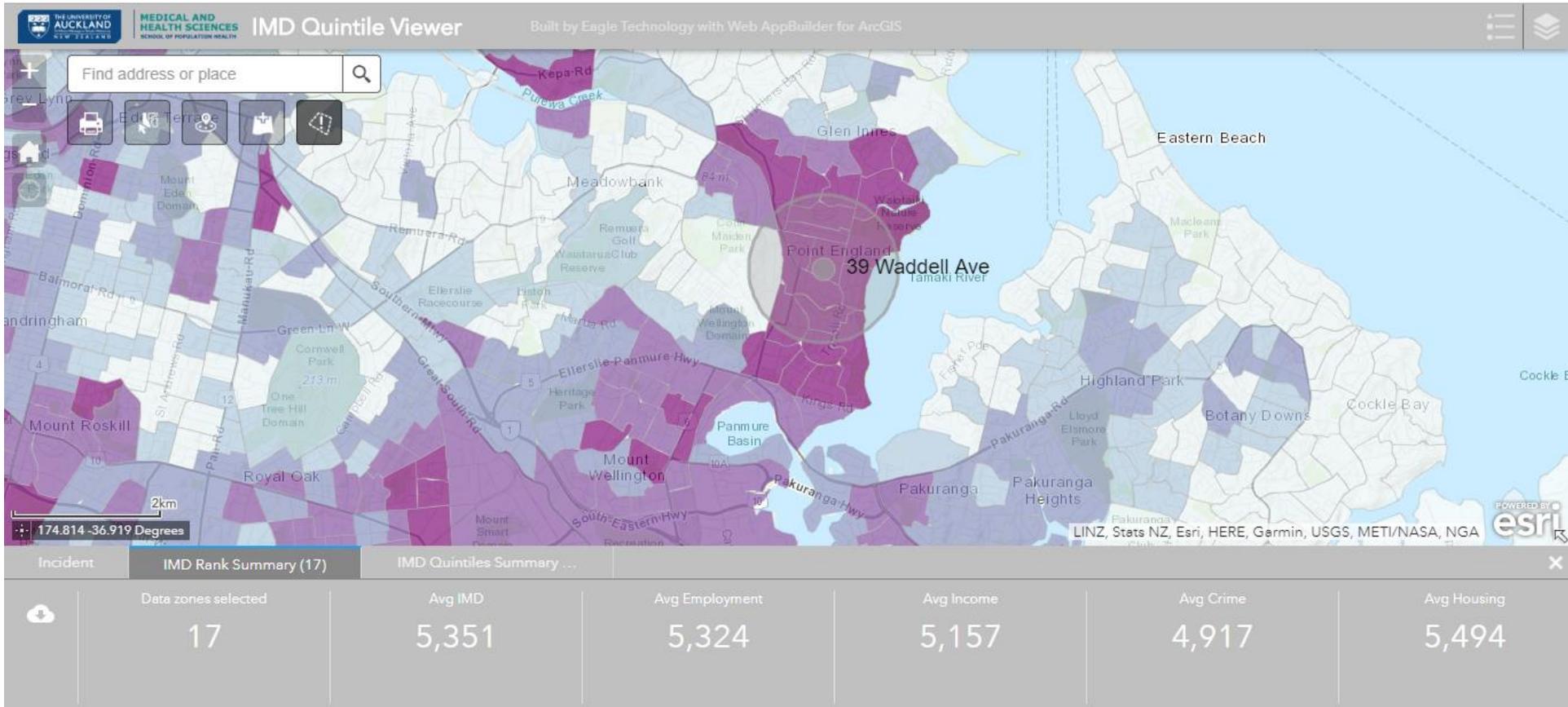
## A deprivation and demographic profile of the Carterton district



Carterton district, showing overall IMD deprivation with the most deprived areas shaded darkest

Rachael Yong, Michael Browne, Dr Jinfeng Zhao, Dr Arier Chi Lun Lee, Dr Nichola Shackleton, Dr Sue Crengle, Dr Daniel Exeter

# Community advocacy



# Geocoding survey data



Enter your address and convert to data zone ID for IMD deprivation information

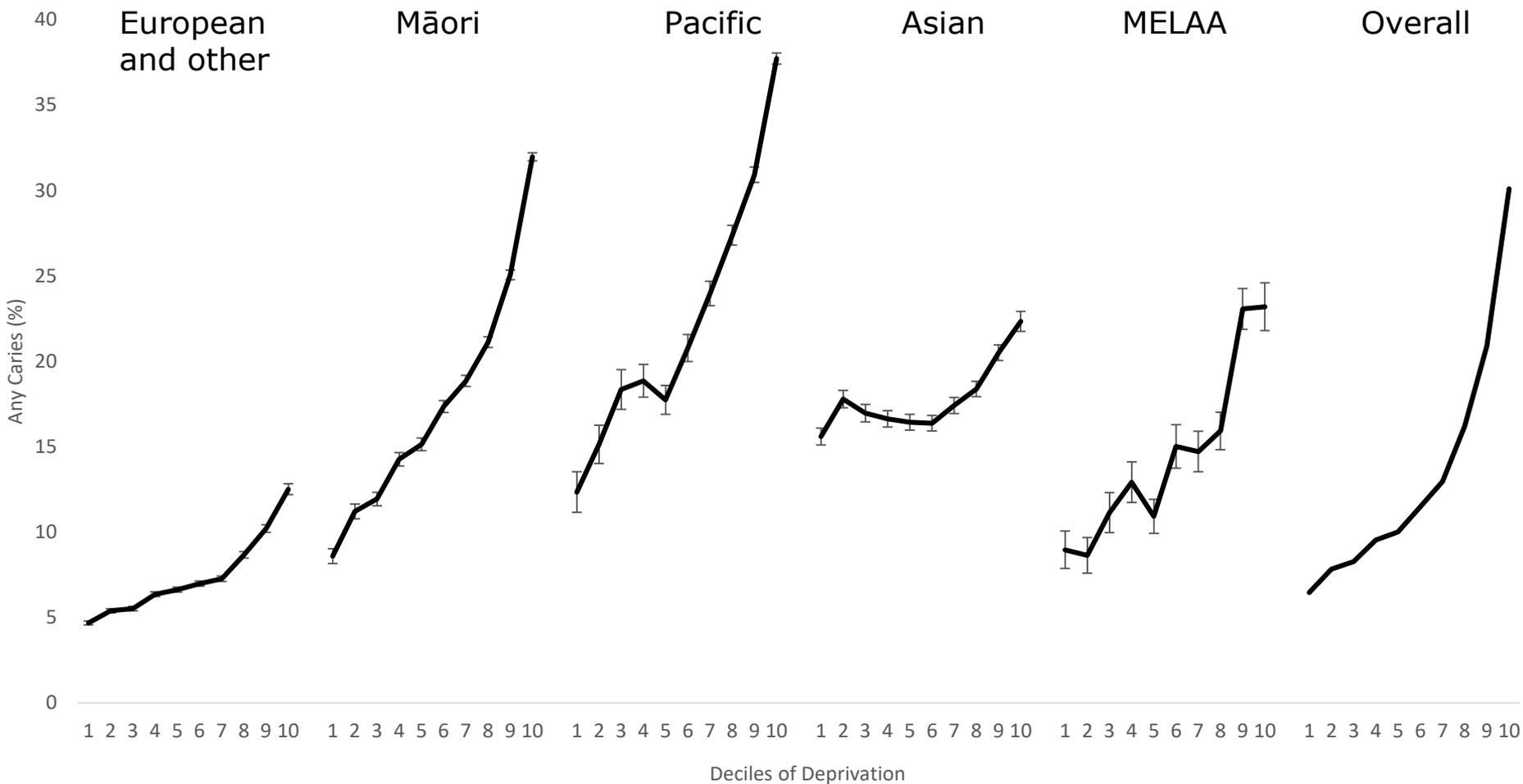
Convert to DatazoneID

Want to know more? [Visit IMD Website](#)

Created by the [Centre for eResearch, University of Auckland](#).

- Stores the Data Zone, not the address 
- Directly embeds the IMD and domain values into the survey (.csv) file for each participant

# The association between the IMD and any caries by ethnicity

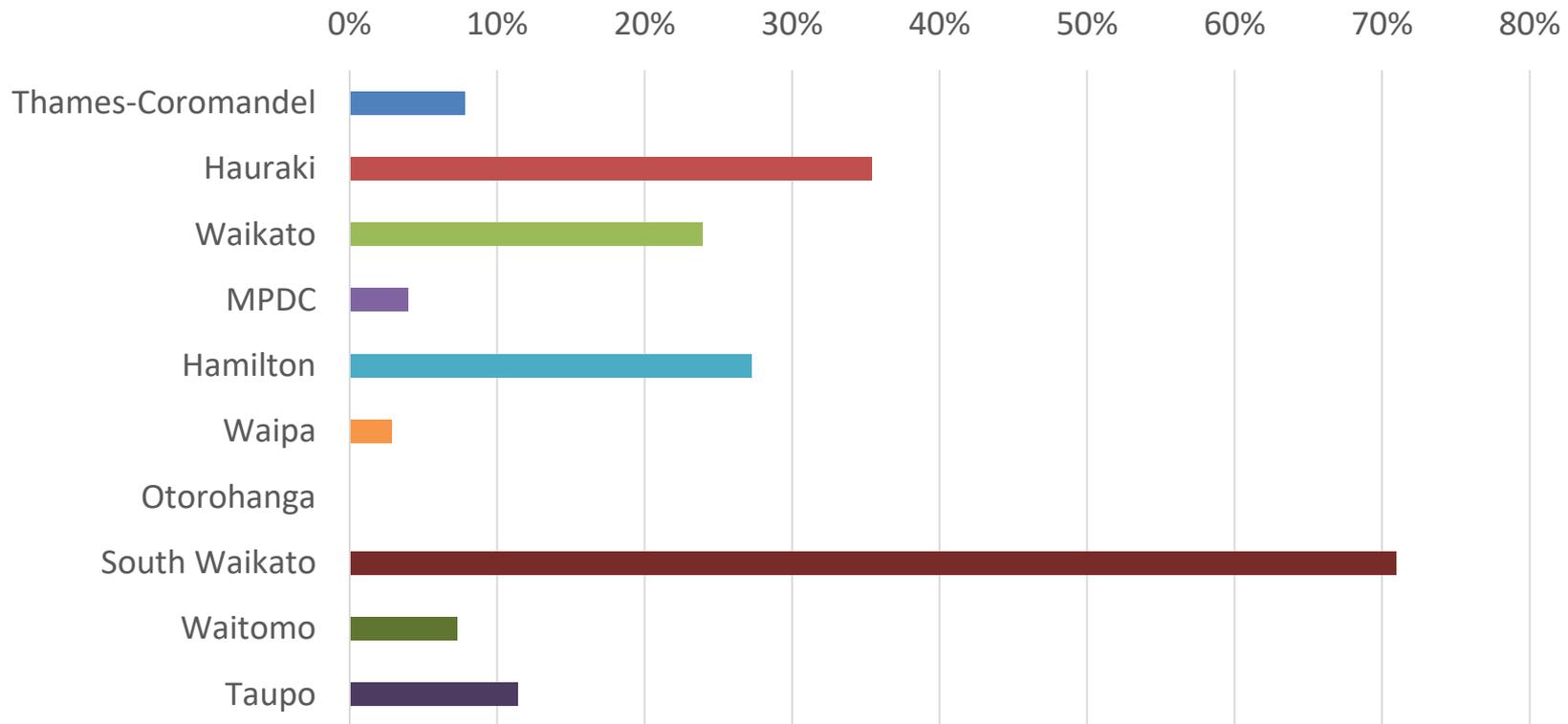


# Employment domain



THE  
WAIKATO  
PLAN

Percentage of total district population that live in areas that are Q5 for employment – 2013



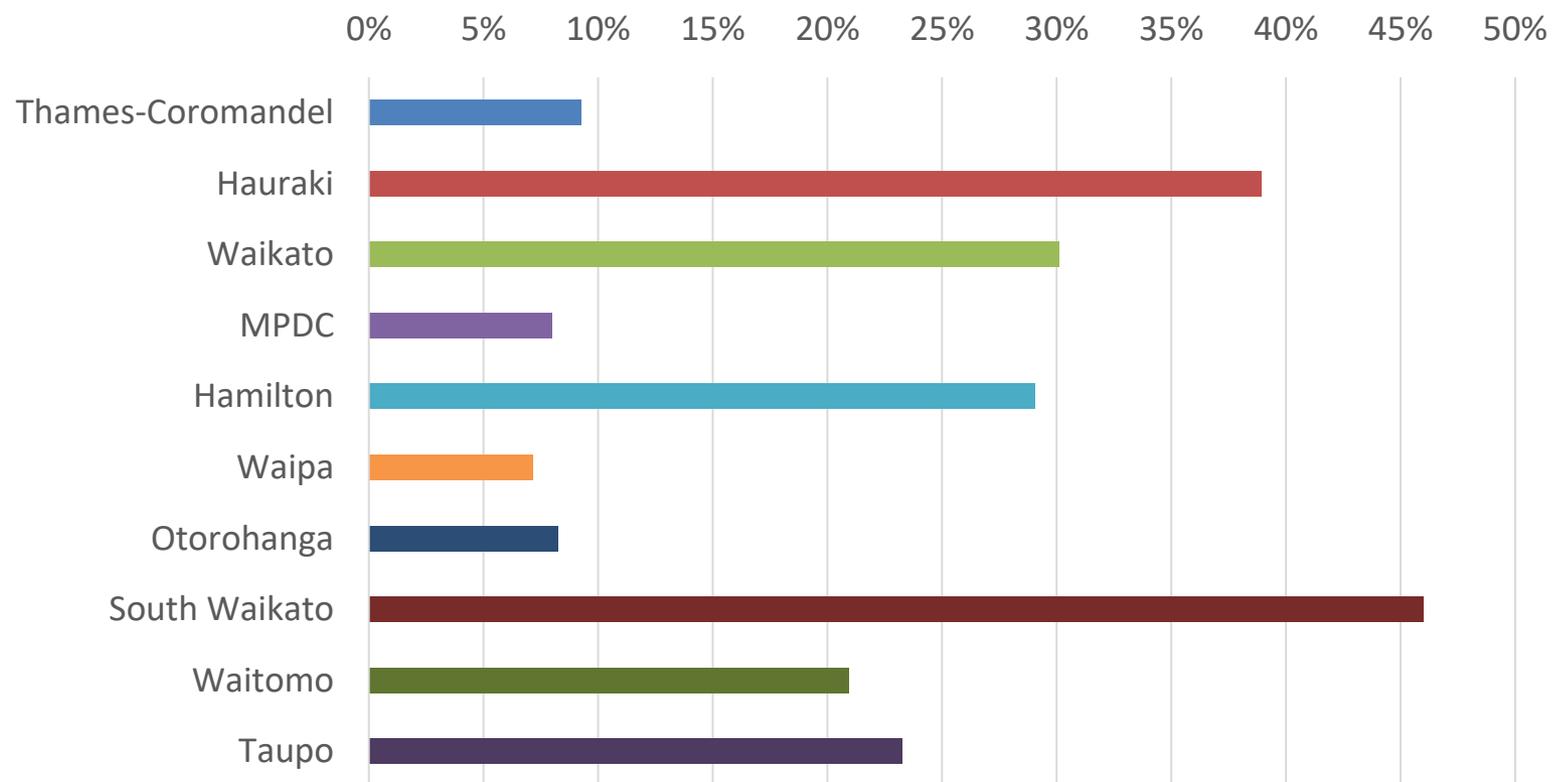
Waikato : he reo kotahi  
Waikato : one voice

# Income domain



THE  
WAIKATO  
PLAN

Percentage of total district population that live in areas that are Q5 for income – 2013



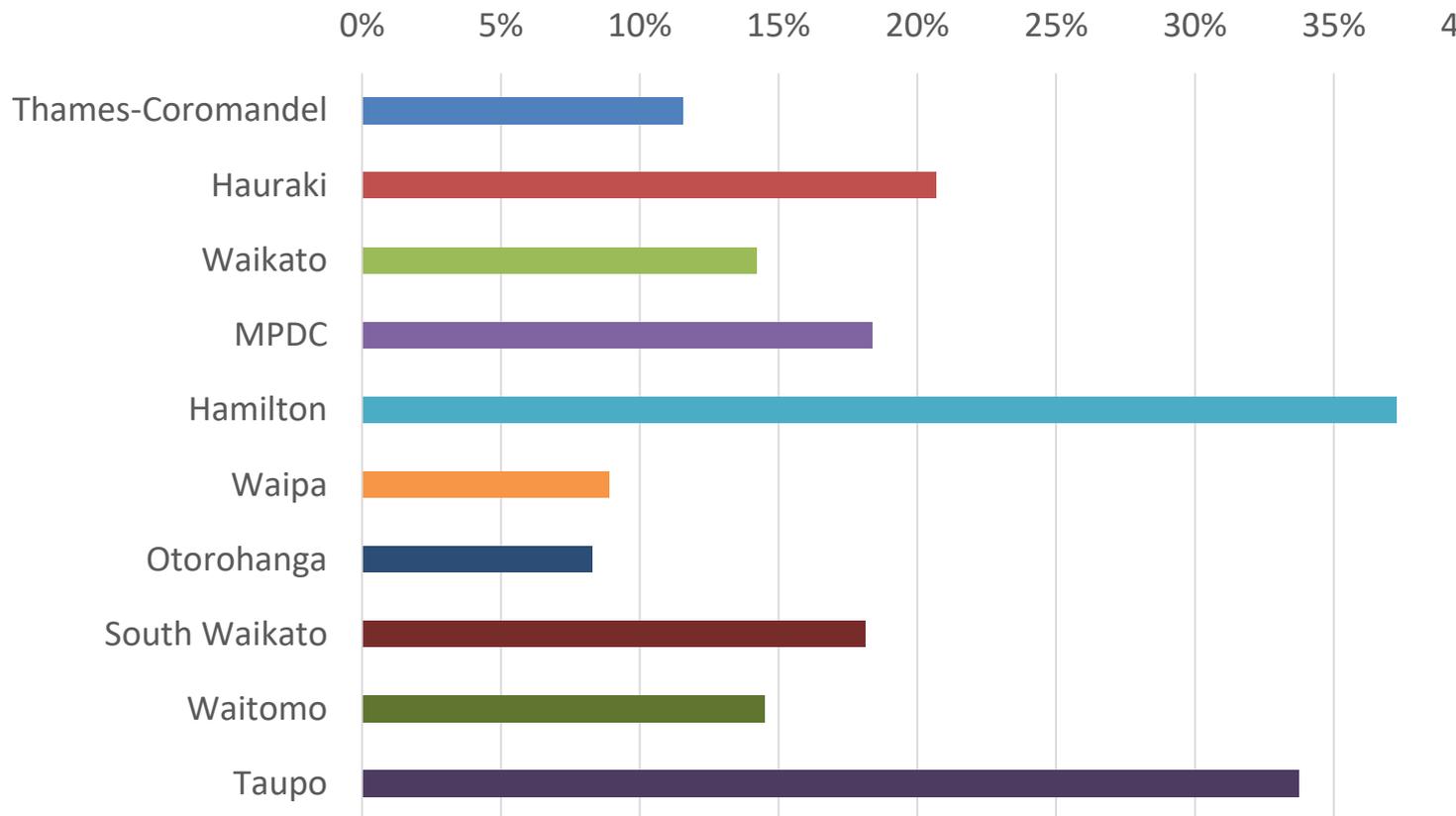
Waikato : he reo kotahi  
Waikato : one voice

# Crime domain



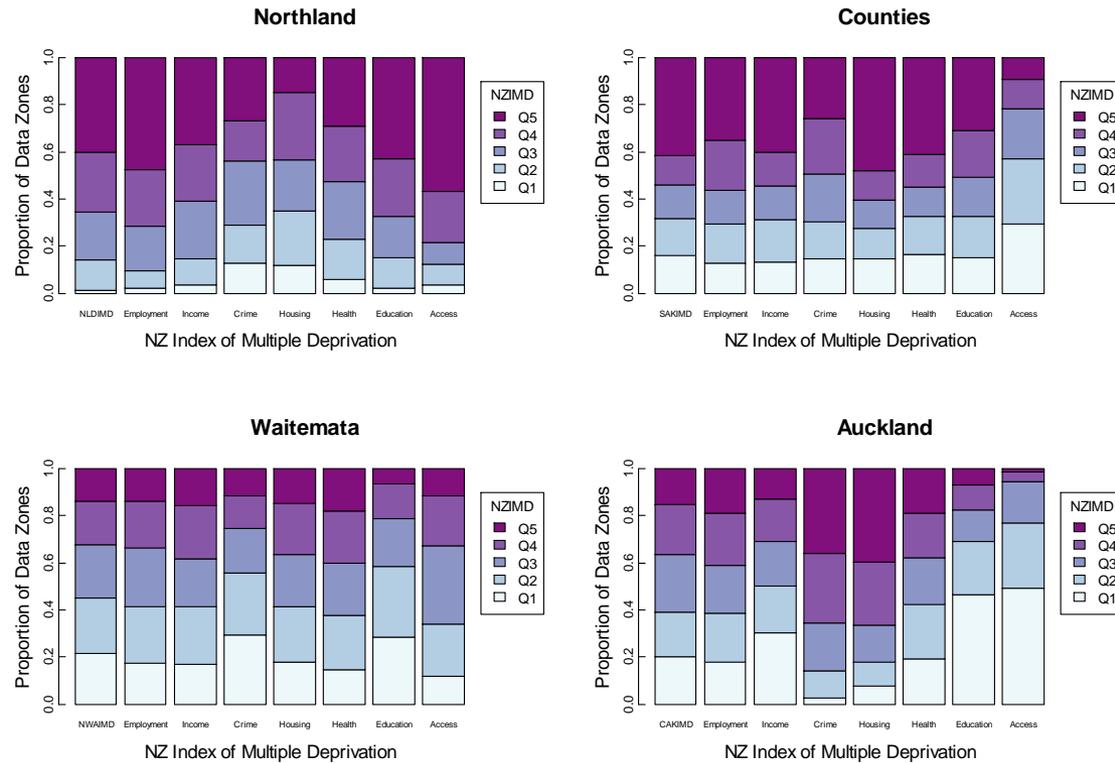
THE  
**WAIKATO  
PLAN**

Percentage of total district population that live in areas that are Q5 for crime – 2013



Waikato : he reo kotahi  
Waikato : one voice

Manuscript Number:	
Article Type:	Research Article
Full Title:	The New Zealand Indices of Multiple Deprivation: a new suite of indicators for social and health research in Aotearoa, New Zealand.
Short Title:	Developing the NZIMD
Corresponding Author:	Daniel John Exeter University of Auckland Faculty of Medical and Health Sciences Auckland, NEW ZEALAND
Keywords:	deprivation; socio-economic position; New Zealand; Index of multiple deprivation; inequalities; resource allocation; routine data
Abstract:	<p>Abstract: This paper presents the first theoretical and methodological shift in the measurement of area deprivation in New Zealand since the 1990s and describes the development of the New Zealand Index of Multiple Deprivation (NZIMD).</p> <p>We briefly describe the development of Data Zones, an intermediary geographical scale, before outlining the development of the New Zealand Index of Multiple Disadvantage (NZIMD), which uses routine datasets and methods comparable to current international deprivation indices. We identify 28 indicators of deprivation from national health, social development, taxation, education, victimisation databases, geospatial data providers and the 2013 Census, which represent seven Domains of deprivation: Employment; Income; Crime; Housing; Health; Education; and Geographical Access. The NZIMD is the combination of these seven Domains. The Domains may be used individually or in combination to explore the geography of deprivation and its association with a given health or social outcome.</p> <p>Geographic variations in the distribution of the NZIMD and its Domains, are found among the District Health Boards in NZ, suggesting that factors underpinning overall deprivation are inconsistent across the country. With the exception of the Access Domain, the NZIMD and its Domains are statistically and moderately-to-strongly associated with both smoking rates and household poverty measures.</p> <p>The NZIMD provides a more nuanced view of area deprivation circumstances in New Zealand. Our vision is for the NZIMD and the Data Zones to be widely used to inform research, policy and resource allocation projects, providing better measurement of area deprivation in New Zealand, improved outcomes for Māori, our indigenous population, and a more consistent approach to reporting and monitoring the social climate of New Zealand.</p>



**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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[www.fmhs.auckland.ac.nz/imd](http://www.fmhs.auckland.ac.nz/imd) for all outputs

- Excel or ESRI Shape files,
- Reports, papers etc.

<https://imdmap.auckland.ac.nz/> for automated report generation and ad-hoc geocoding

# Conclusions

- Data zones are a robust geographical scale to analyse health and social data
- The IMD identifies deprived areas and their deprivation profiles, and is flexible e.g. IMD (No Health)
- Overall, the IMD is broadly consistent with NZDep2013

## **HOWEVER**

The IMD has the flexibility to show the effects different domains of deprivation have on health outcomes

- In some cases, allocation of resources according to one domain of deprivation may be appropriate
  - Using the Employment Domain to allocate work-related schemes