



Edgecumbe floods, NZ, March 2017

# Social vulnerability indicators for natural hazards and pandemics

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# Introduction

- Social vulnerability to natural hazards:  
characteristics of people and their situation that influence their capacity to anticipate, cope with, and recover from the impacts of hazards
- In 2019 we developed a set of social vulnerability indicators for flooding (using 2013 Census data)
- The indicators have since been updated with 2018 Census data

# Methods for developing the indicators

## Scoping stage

**Understand the issue**  
(how flooding affects health and wellbeing, who is more vulnerable, and why)

**Review previous research** and indicator sets

**Understand end-users** and their needs

## Selection stage

**Create a conceptual framework**

**Identify potential indicators**  
to reflect the conceptual framework

**Evaluate indicators**

## Design stage

**Design the indicators**  
(e.g. technical aspects)

**Feedback** from end users

**Produce and publish** the indicators

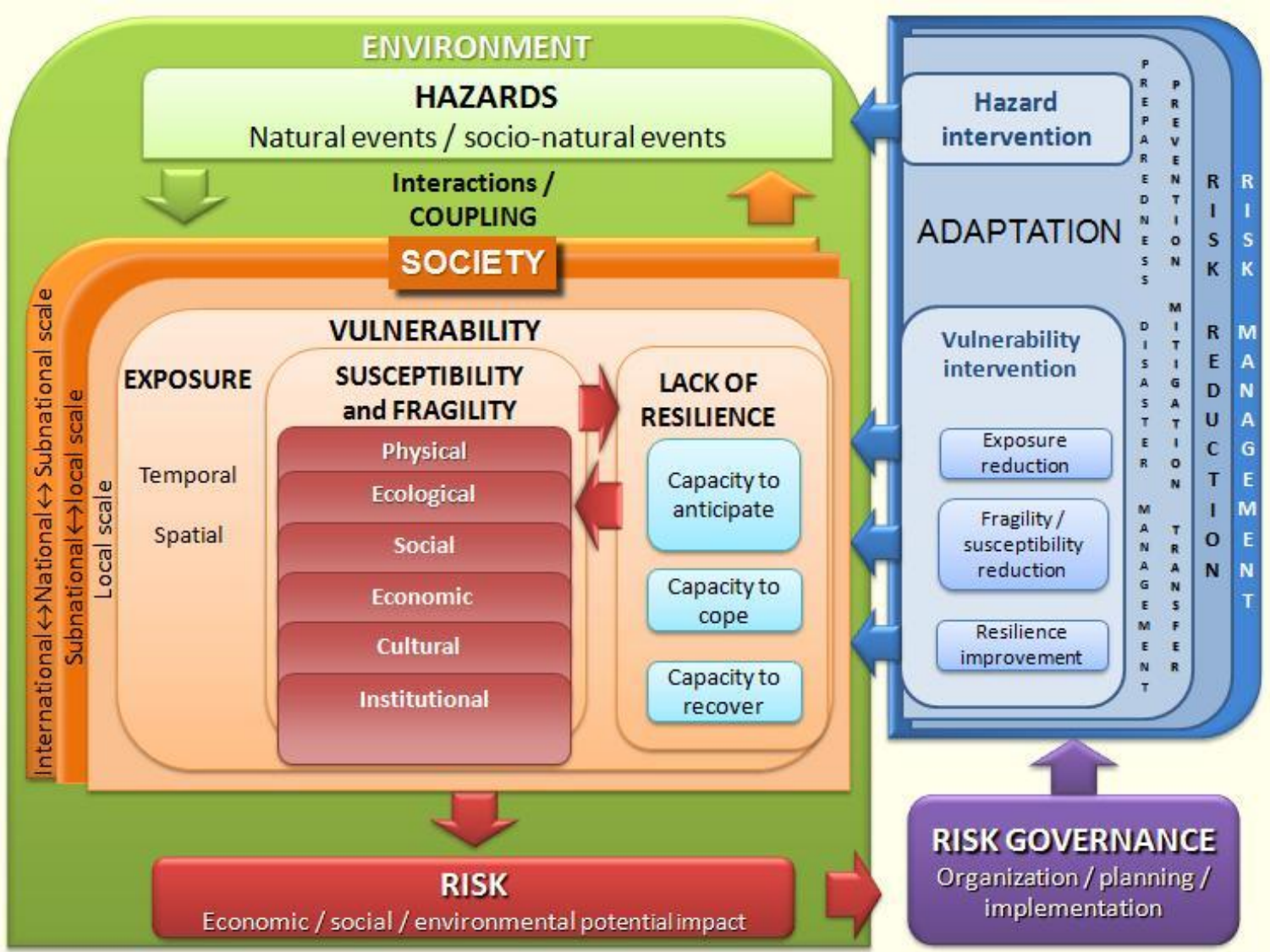
End user input, Mātauranga Māori



**Indicators used by end-users**

A heatmap table with multiple columns and rows. The columns represent different indicators, and the rows represent various categories or regions. The cells in the table are colored in shades of orange and brown, indicating the presence or intensity of an indicator within a specific category.

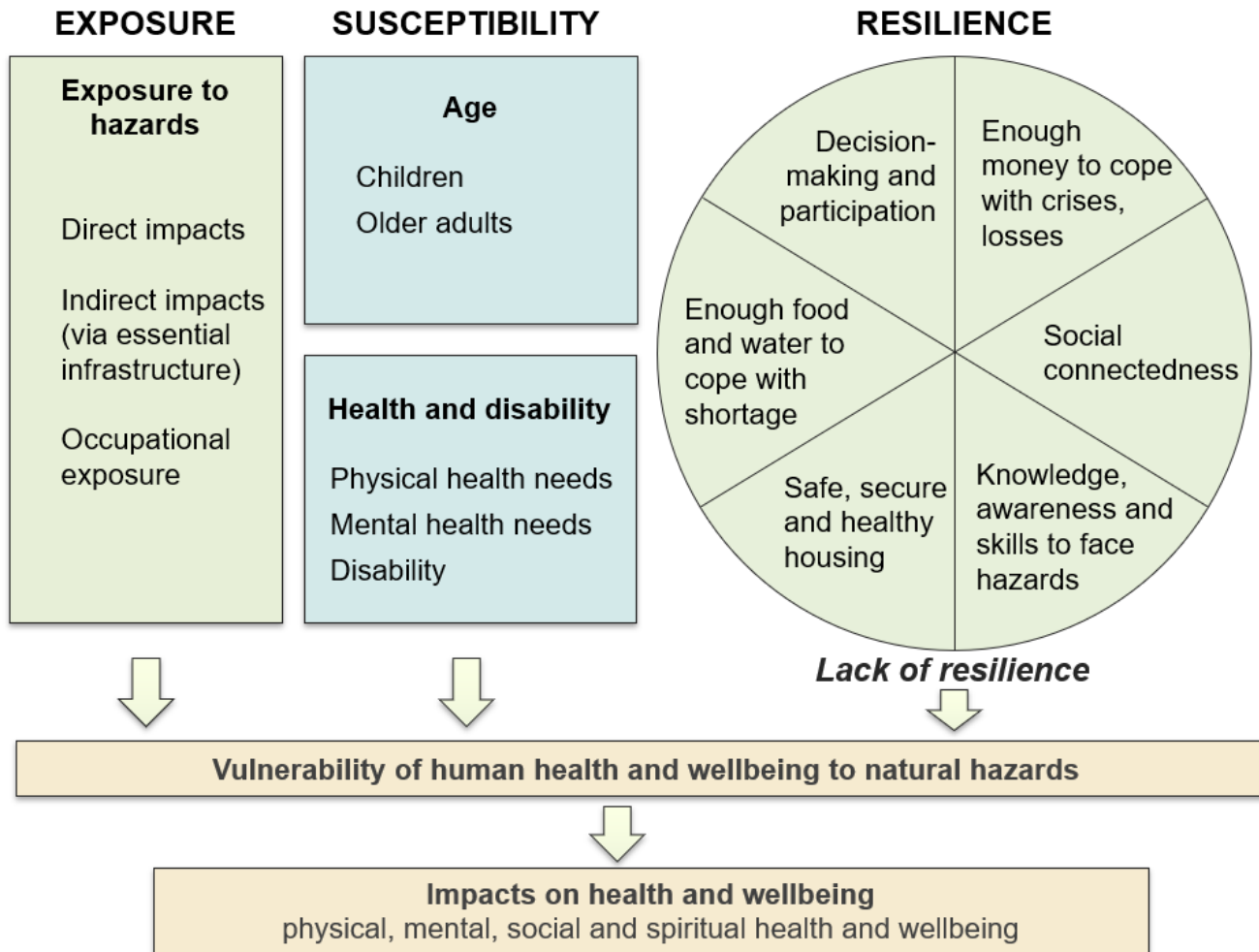
# MOVE framework



Methods for the Improvement of Vulnerability Assessments in Europe

Source: Birkmann J, Cardona OD, Carreno ML, Barbat AH, Pelling M et al. 2013. Framing vulnerability, risk and societal responses: the MOVE framework. *Natural Hazards* 67: 193-211.

# Conceptual framework for social vulnerability



Conceptual framework adapted from the MOVE framework (Birkmann et al 2013), the circle of resilience (Wisner et al 2012), and 'Te whare tapa whā' (Durie 1985).

References:  
 Wisner B, Gaillard J, and Kelman I. 2012. "Framing disaster: Theories and stories seeking to understand hazards, vulnerability and risk," in *Handbook of Hazards and Disaster Risk Reduction*, B. Wisner, J. Gaillard, and I. Kelman Eds. London: Routledge.

Durie. M. 1985, "A Māori perspective of health," *Social Science & Medicine*, vol. 20, no. 5, pp. 483-486.

# Social vulnerability indicators for 2018

Dimension	Indicators (with Census-type data for NZ)
Exposure	Usually resident population Number of households Urban/rural classification Ethnic group (total response): European, Māori, Pacific peoples, Asian, MELAA
Exposure (occupational)	Health care and social assistance workers Primary industry workers
Children	Children aged 0-4 years Children aged 0-14 years School-aged children (5-14 years)
Older adults	People aged 65+ years People aged 75+ years People aged 85+ years People aged 70+ years
Health and disability	Pregnant women (proxy)

Dimension	Indicators (with Census-type data for NZ)
Having enough money to cope with crises/losses	Socioeconomic deprivation (NZDep2018) Unemployed people People who are not in the labour force Households with no access to a car
Social connectedness	Households living in rental housing Recent immigrants (less than 1 year; 0-1 years)
Knowledge, skills and awareness to face hazards	People who do not speak English Households with no access to a mobile phone Households with no access to the internet
Safe, secure and healthy housing	Crowded households People living in crowded households Damp dwellings (always; always or sometimes) Mouldy dwellings (always; always or sometimes)
Enough food and water to survive	Households living in rental housing Socioeconomic deprivation (NZDep2018) Dwellings with no access to safe drinking water Dwellings with no access to fridge Dwellings with no electricity
Decision-making and leadership	Voter turnout in 2019 Local Authority Elections

# Point locations relating to social vulnerability

- Schools and ECEs
- Rest homes and retirement villages
- Hospitals
- Primary health care centres
- Pharmacies
- Residential and respite care facilities for people with disabilities
- Emergency services facilities
- Civil Defence Centres
- Visitor accommodation
- Temporary housing (such as boarding houses)
- Social housing
- Houses and buildings on Māori land
- Emergency water supplies
- Food stores and food banks
- Child-care and protection facilities
- Justice facilities and youth justice facilities

# StoryMap for the 2018 Social Vulnerability Indicators for NZ

Online data visualization tool of 2018 SVIs available for New Zealand

## Social vulnerability indicators for natural hazards and pandemics

Information for public health action



**ehinz** Environmental Health Indicators New Zealand

Overview

Population

Children

Older adults

Health & disability

Money

Social connectedness

Awareness

Housing

Food & water

Decision-making



### Social connectedness - overview

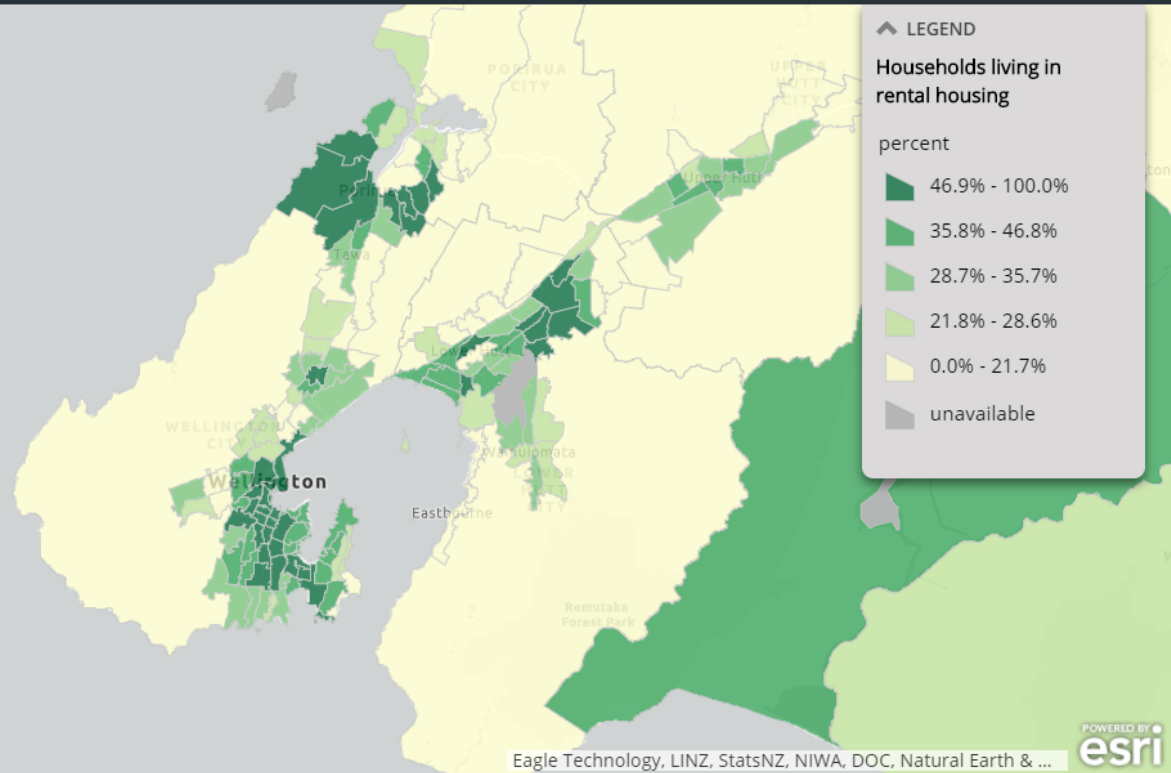
### Living in rental housing

People living in rental housing may move from place to place more regularly than people who own a house. For this reason, people who live in rental housing may not know other people in their neighbourhood.

When a local area has a high percentage of rental houses, if many of these people move each year, it may be difficult to build social connectedness in the area.

Indicator: Households living in rental housing (among all households), 2018

### Recent immigrants





# Heatmap – a visual summary of indicators

Heatmaps provide a visual summary of social vulnerability for areas

Available as downloadable Excel file, for all regional councils and territorial authorities

An example for Porirua City Council area, by SA2 (2018 data)

Geographic area				Population context					Social vulnerability indicators 2018 (percentages)																													
				Population (counts)		Population - ethnic groups (total response)			Children			Older adults			Pregnant women (proxy)	Having enough money to cope with crises and losses			Social connectedness			Awareness, knowledge and skills to cope with hazards			Safe, secure and healthy housing			Enough food and water to cope with shortage										
Territorial authority (TA)	SA2 code	SA2 name	Urban/rural	Usually resident population	Number of households	European	Māori	Pacific peoples	Asian	MELAA	0-4 years	0-14 years	5-14 years	65+ years	75+ years	85+ years	0 years	NZDep2018 deciles	Unemployed	Not in labour force	Households with no car	Living in rented dwelling	Immigrant arrived in past year	Immigrant arrived in past 0-1 years	Don't speak English	Households with no cellphone	Households with no Internet	Crowded households	People living in crowded households	Dwelling damp (always/sometimes)	Dwelling damp (always)	Dwelling mouldy (always/sometimes)	Dwelling mouldy (always)	NZDep2018 deciles	Living in rented dwelling	Dwellings with no access to safe running water	Dwellings with no access to a fridge	Dwellings with no access to electricity
Porirua City	238800	Pukerua Bay	Large urban area	1962	705	91.9	14.1	3.7	2.3	1.2	6.4	21.7	15.1	11.9	3.1	0.6	1.4	2	3.1	22.5	2.2	13.7	0.6	1.4	0.2	2.7	5.3	1.4	2.8	19.8	1.8	16.1	3.1	2	15.7	1.8	1.3	0.4
Porirua City	238900	Paekakariki Hill	Rural	375	135	93.6	10.4	1.6	4.0	0.8	4.0	20.0	16.0	16.0	5.6	0.8	1.0	1	3.0	25.0	0.0	15.6	0.0	0.0	0.8	10.0	5.0	1.0	2.9	17.9	0.0	10.3	0.0	1	13.6	5.0	0.0	0.0
Porirua City	239000	Plimmerton	Large urban area	2142	840	90.2	13.4	3.1	3.2	0.7	5.0	18.6	13.4	17.6	5.9	1.4	1.3	2	2.4	27.5	5.2	23.5	1.0	1.5	0.1	3.3	7.4	2.5	3.7	17.9	1.5	12.4	3.0	2	23.5	0.4	3.0	0.4
Porirua City	239100	Titahi Bay North	Large urban area	2688	981	69.9	35.8	16.9	7.9	0.6	7.3	22.9	15.6	11.0	4.2	0.9	1.5	8	6.8	27.1	11.0	43.3	0.7	1.2	1.0	6.5	15.4	7.4	13.7	30.0	6.0	23.5	6.6	8	43.3	3.1	4.8	1.7
Porirua City	239200	Titahi Bay South	Large urban area	3744	1266	65.8	36.3	21.6	8.0	1.8	8.3	24.6	16.2	12.3	5.1	1.9	1.7	9	6.7	30.4	12.9	48.9	0.6	1.4	1.3	7.9	19.1	8.2	14.7	28.5	4.1	24.6	5.9	9	48.9	2.4	4.2	1.3
Porirua City	239300	Elsdon-Takapuwhia	Large urban area	2418	696	47.8	52.3	28.7	10.0	0.7	8.6	24.9	16.4	9.9	3.6	0.9	1.6	9	7.4	32.2	13.0	49.8	0.7	1.9	3.4	9.5	17.9	13.6	24.4	43.1	8.7	34.2	10.4	9	49.8	3.5	4.0	3.0
Porirua City	239400	Pautaharui	Rural	966	312	95.3	7.1	2.2	0.9	0.6	4.3	20.2	15.8	10.6	3.4	0.6	0.6	1	2.7	19.5	0.0	14.4	0.9	1.6	0.3	6.0	5.0	3.3	5.7	8.2	1.0	8.2	1.0	1	14.4	2.0	1.0	0.0
Porirua City	239500	Onepoto	Large urban area	1917	624	70.1	32.2	18.0	4.5	1.4	7.8	24.4	16.6	11.6	3.9	0.9	1.6	5	4.3	25.9	4.7	26.0	0.2	0.5	1.1	5.7	9.9	5.0	8.9	30.6	4.3	22.9	6.4	5	26.0	1.6	1.6	1.0
Porirua City	239600	Camborne	Large urban area	2013	726	89.4	9.5	2.8	6.7	1.2	6.4	21.6	15.1	12.4	4.0	0.7	1.8	1	2.9	23.0	3.0	16.9	1.0	2.1	0.8	1.7	4.2	1.4	1.6	14.5	1.7	10.3	2.1	1	16.9	1.3	0.8	0.8
Porirua City	239800	Paremata	Large urban area	2463	972	89.6	11.9	5.8	4.1	0.9	4.9	16.7	11.8	19.2	6.8	1.2	1.2	2	3.2	27.2	3.9	22.8	1.6	2.6	0.2	3.9	7.8	2.1	4.1	15.7	2.6	11.0	3.6	2	22.8	1.3	1.9	1.6
Porirua City	239900	Porirua Central	Large urban area	261	33	57.5	28.7	13.8	11.5	2.3	2.3	4.6	3.4	8.0	3.4	1.1	1.0	1.2	48.8	25.0	63.6	3.5	5.8	1.1	12.5	25.0	1.0	1.0	50.0	12.5	14.3	0.0	10	63.6	0.0	0.0	0.0	
Porirua City	240000	Papakowhai	Large urban area	2268	759	83.6	13.6	6.9	8.7	0.5	5.6	18.1	12.7	17.2	7.3	2.4	0.8	1	3.1	26.8	1.6	14.6	0.7	2.0	1.1	3.3	4.5	2.7	4.5	14.1	1.2	12.0	2.1	1	14.6	1.2	1.2	0.8
Porirua City	240100	Actea	Large urban area	3138	1062	70.6	8.2	7.2	22.0	1.3	8.0	24.4	16.3	14.4	7.4	2.6	1.7	1	2.5	28.1	4.1	17.8	1.2	2.4	2.2	4.4	4.7	1.9	2.8	1.8	0.3	2.6	0.6	1	17.8	0.9	0.6	0.6
Porirua City	240200	Postgate	Large urban area	2754	927	77.6	14.9	13.6	8.5	0.5	8.4	22.1	13.9	9.9	3.2	0.3	1.3	2	3.9	21.7	1.7	23.0	0.8	2.1	0.9	2.3	4.3	4.4	8.4	19.0	1.7	15.4	3.1	2	23.0	0.7	1.7	1.3
Porirua City	240300	Ascot Park	Large urban area	2862	804	45.1	29.4	42.6	12.1	1.5	8.7	25.2	16.5	9.4	2.5	0.2	2.1	9	6.2	30.8	6.0	39.9	0.5	1.2	2.9	4.8	13.2	14.1	22.8	36.6	8.2	31.1	9.4	9	39.9	1.2	2.4	2.4
Porirua City	240400	Whitby	Large urban area	3042	1059	86.7	10.6	6.2	6.8	0.9	6.7	21.4	14.7	15.7	7.0	1.9	1.2	1	2.6	26.6	2.9	19.5	0.8	1.7	1.2	4.0	4.8	1.9	3.2	15.7	1.2	13.0	2.9	1	19.5	0.6	0.6	0.0
Porirua City	240500	Porirua East	Large urban area	2235	681	38.9	31.1	44.6	12.2	1.3	9.0	24.0	15.0	8.6	2.3	0.3	1.7	10	7.4	31.6	16.0	59.9	1.1	2.3	4.3	8.6	20.7	14.3	24.0	38.5	11.2	31.6	11.8	10	59.9	4.1	5.6	5.1
Porirua City	240600	Endeavour	Large urban area	4617	1482	85.7	7.4	3.0	9.7	1.4	7.3	22.6	15.3	12.1	4.2	1.0	1.4	1	2.9	23.9	1.2	12.3	1.8	3.2	0.9	2.3	2.1	1.4	1.9	5.4	0.4	5.1	1.0	1	12.3	0.4	1.2	0.2
Porirua City	240700	Cannons Creek North	Large urban area	3474	915	28.1	28.8	58.0	10.4	3.3	10.4	29.8	19.3	7.2	2.4	0.5	2.0	10	10.3	35.6	23.2	75.4	1.1	3.1	6.4	12.9	27.3	23.5	38.3	52.4	13.1	44.5	16.3	10	75.4	7.3	8.5	7.3
Porirua City	240800	Waitangina	Large urban area	4398	1044	22.0	28.8	66.0	8.3	1.4	9.8	30.1	20.9	7.8	2.5	0.3	1.7	10	9.7	37.5	14.6	72.8	1.2	2.1	6.9	10.8	24.9	25.5	39.6	53.4	13.7	46.4	18.4	10	72.8	5.1	5.4	4.7
Porirua City	240900	Ranui Heights	Large urban area	1326	465	62.4	24.2	26.2	9.7	1.4	7.7	18.3	10.9	13.3	4.5	0.9	2.0	5	4.7	27.7	6.2	30.1	0.5	0.7	2.1	5.5	13.8	4.4	8.3	25.4	3.5	19.1	4.3	5	30.1	2.7	4.1	2.7
Porirua City	241000	Cannons Creek East	Large urban area	3879	933	19.9	23.8	68.1	7.1	2.2	9.4	26.5	18.9	8.6	2.9	0.3	1.8	10	9.9	37.5	17.0	64.6	0.3	1.0	5.2	11.9	26.5	25.0	39.5	52.5	13.2	44.6	16.5	10	64.6	5.9	6.3	5.1
Porirua City	241100	Cannons Creek South	Large urban area	1620	414	26.7	28.7	59.6	8.1	2.6	8.3	27.8	19.4	7.0	2.2	0.2	2.4	10	9.7	30.3	10.6	64.0	0.4	0.9	5.9	8.8	22.8	21.1	33.3	51.9	13.2	45.8	15.9	10	64.0	5.3	7.1	5.3

# Potential uses for the social vulnerability indicators

- Useful for flooding, and likely to be useful for other sudden-onset disasters (eg earthquakes, tsunamis, heatwaves, wildfires)
- Also could be relevant for infectious disease pandemics
  - For influenza, similar vulnerabilities identified (eg poverty, single parents, household crowding, children, older adults, people with high health needs etc)
  - For COVID-19, older adults 70+ years, impacts of lockdown and border closures (social isolation, financial impacts)
- Indicators could be useful for CDEM and health sector planning and preparedness, response and recovery activities, potentially COVID-related activities
- Inform risk reduction activities, eg
  - decreasing vulnerability through land use planning (district plan rules)
  - supporting infrastructure upgrades and hazard mitigation works

# Conclusions

- Social vulnerability indicators are a useful tool for understanding who is most vulnerable to the impacts of hazards, and where they live
- Indicators are relevant to natural hazards and pandemics
- Indicators can be used for emergency planning and response, by the health sector, CDEM sector and local councils, and risk reduction
- Indicator set and data visualisations are available from the EHI website

## Social vulnerability indicators

[www.ehinz.ac.nz](http://www.ehinz.ac.nz)

EHI website → Population vulnerability

[www.ehinz.ac.nz/indicators/population-vulnerability/social-vulnerability-to-natural-hazards/](http://www.ehinz.ac.nz/indicators/population-vulnerability/social-vulnerability-to-natural-hazards/)

For more information, please contact me:

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