Extreme temperature

This factsheet presents indicators of extreme temperature (hot days and cold days). It comments on the current overlap in where temperature extremes occur and the geographical distribution of populations that are more vulnerable to heat.

Key facts

Northern and eastern New Zealand are currently more affected by hot days, especially the Bay of Plenty, Marlborough, and northern Canterbury regions.

In 2019, New Zealand experienced, on average, 47.1 (39.7–54.4) hot days. The climate station representing Kawerau District in the Bay of Plenty had the highest number of hot days (105) in 2019.

Northland, the east coast of the North Island, and parts of the Bay of Plenty are likely to be regions where people will be particularly affected by the direct health effects of temperature extremes, as their resident populations are more vulnerable to heat.

New Zealand is becoming warmer

It is very likely that with climate change, there will be an increase in the number of hot days (where the maximum temperature exceeds 25°C), particularly in the north of the North Island. Additionally, there will be a decrease in the number of cold days (where minimum temperatures fall below 0°C), particularly in the South Island (Ministry for the Environment 2018; Royal Society Te Apārangi 2017).

Since 1909: **+1.13°C (±0.27)**	**The annual average temperature in New Zealand has risen by 1.13°C since 1909** (Ministry for the Environment & Stats NZ 2020).
By 2040: **+0.7–1.0°C**	**Climate scientists predict that relative to 1986–2005, New Zealand will continue to warm by 0.7–1.0°C by the year 2040** (Ministry for the Environment 2018).
By 2090: **+0.7–3.0°C**	**Climate scientists predict that relative to 1986–2005, New Zealand will continue to warm by 0.7–3.0°C by the year 2090** (Ministry for the Environment 2018).

A warmer climate has several effects on health

A warmer climate alters biological processes in our environment that can affect our health. Increased temperatures can affect health in several ways.

- **Gastrointestinal infections:** The rate of gastrointestinal infections is affected by temperature. Research suggests that periods of higher temperatures are linked to an increase in salmonellosis notifications (Lal et al. 2016).
- **Infectious diseases:** Increasing temperatures can change the geographical distribution of some mosquitoes, which may carry infectious diseases (Smith et al. 2014).
- **Respiratory problems:** Increasing temperatures bring a longer pollen season and increased fire risk, associated with increases in respiratory problems.
- **Cardiac (heart) problems:** Heat is linked to worsening of heart problems and to an increase in overall death rates (Hales et al. 2007; McMichael et al. 2003).

Our '**Health effects of climate change**' indicator covers these in more detail.

Hot days were more common in the north and east

Data from 2019 show hot days (days with temperatures above 25°C) were more common in the north and east of both islands (Figure 1). Regions particularly affected by warm temperatures were Hawke's Bay as well as the Waikato and Coromandel region. Cold days (days with temperatures below 0°C) were most frequent in parts of the South Island (Figure 2), such as Otago and Canterbury. In the North Island, the highest number of cold days were experienced in the Wairarapa region.

In 2019, New Zealand experienced, on average, 47.1 (95% confidence interval: 39.7–54.4) hot days and 17.2 (11.3–23.1) cold days. The TAs with the highest number of hot and cold days in 2019 were:

Regions	Number of days with max. temperatures above 25°C
Kawerau (Bay of Plenty)	102
Ōtorohanga (Waikato)	95
Wairoa (Hawke's Bay)	95
Waitomo (Waikato)	95
Regions	**Number of days with min. temperatures below 0°C**
Mackenzie (Canterbury)	105
Central Otago (Otago)	94
Queenstown Lakes (Otago)	60
Timaru (Canterbury)	57

Our **website** shows how these temperature extremes have changed year-by-year over the past 40 years (1981–2019) across territorial authorities (TAs) in New Zealand.

Figure 1: Number of days with max. temperatures above 25°C, by TA, 2019

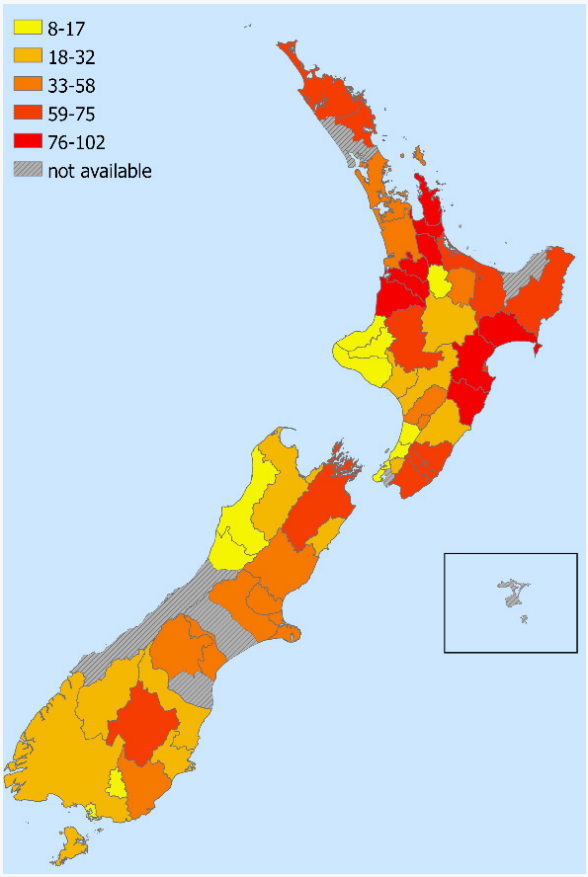
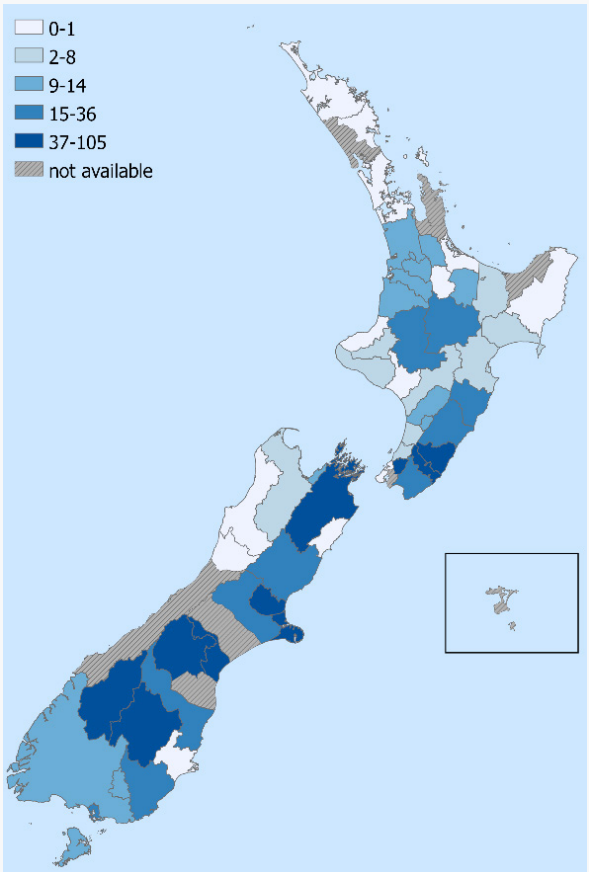


Figure 2: Number of days with min. temperatures below 0°C, by TA, 2019

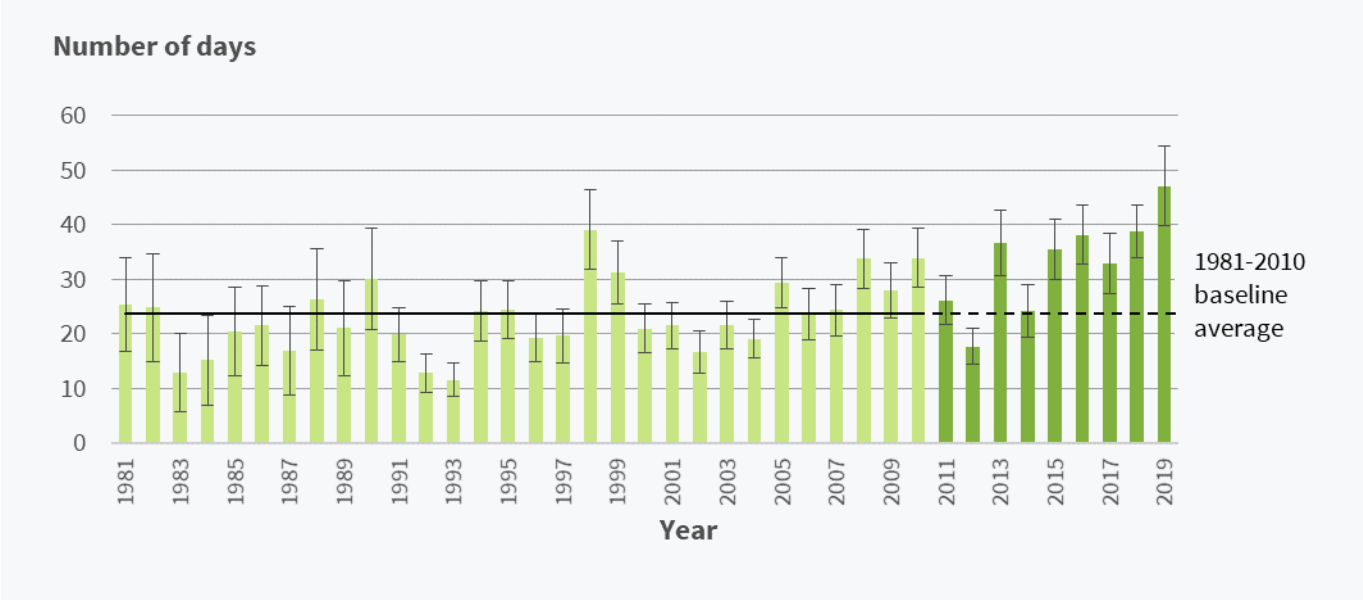


Note: One climate station per TA is selected. Data may, therefore, not be representative of the whole district.
Source: National Climate Database (CliFlo), NIWA

More hot days and fewer cold days in 2019 compared to 1981

The average number of hot days in New Zealand rose from 25.4 (16.8–33.9) in 1981 to 47.1 (39.7–54.4) in 2019. In the climate normal period from 1981–2010 (WMO 2017), New Zealand experienced an average of 23.8 hot days per year. From 2015 onward, the number of annual hot days was consistently higher than this average. In 2019, the number of hot days was almost double the normal period average.

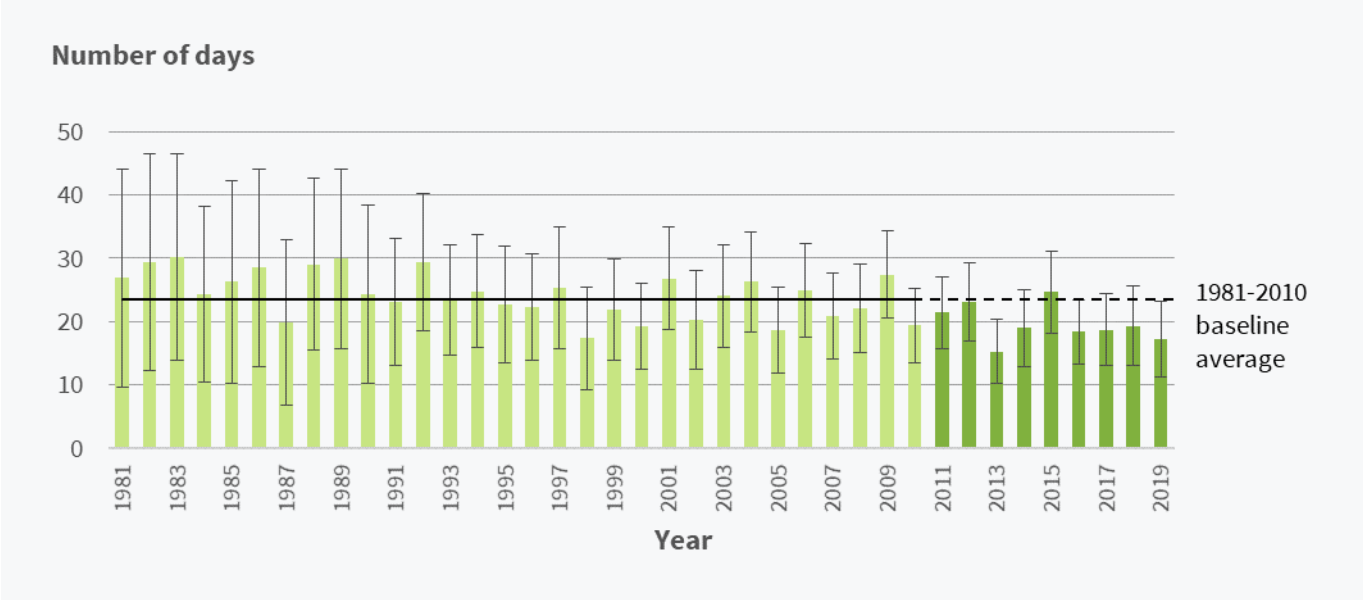
Figure 3: Average number of days with maximum temperatures above 25°C, 1981–2019



Note: The baseline average period refers to the most recent Climate Normal Period, 1981–2010 (WMO 2017). Thirty years of data were averaged to act as a benchmark against which current or recent observations can be compared.
Source: National Climate Database (CliFlo), NIWA

In the 30-year climate normal period from 1981–2010, New Zealand experienced on average 23.6 cold days per year.

Figure 4: Average number of days with minimum temperatures below 0°C, 1981–2019



Note: The baseline average period refers to the most recent Climate Normal Period, 1981–2010 (WMO 2017). Thirty years of data are averaged to act as a benchmark against which current or recent observations can be compared.
Source: National Climate Database (CliFlo), NIWA

High temperatures and population vulnerability

Populations that are more vulnerable to temperature-related health effects are (Figures 5a-e):

- young children **aged 0–4 years** (e.g. through having fewer sweat glands than adults and being more quickly dehydrated from 'tummy bugs') (Smith et al. 2014, Gamble et al. 2016).
- older people **85 years and over** (e.g. through taking medications that cause water loss and being more quickly dehydrated from' tummy bugs') (Smith et al. 2014)
- **Māori** communities (with high employment rates in outdoor occupations and primary industries) (Te Puni Kōkiri, 2007)
- People employed in **primary industries**. Working in primary industries (and other outdoor occupations) increases a person's exposure to the potential health effects of elevated temperatures (e.g. hyperthermia or occupational heat stress) (Royal Society Te Apārangi, 2017).
- those on **low incomes** (for instance, if someone lacks money for transport, it can be hard to get to a swimming pool or beach to cool down) (Smith et al. 2014).
- those with **chronic disease or disability** (e.g. cardiovascular diseases or mental illness)

For more information, see the '**Vulnerability to climate change**' and '**Population vulnerability**' topics.

People in Northland, the east coast of the North Island and parts of Bay of Plenty are likely to experience health effects of temperature rise

Combining temperature and population data shows that **Northland**, the **east coast of the North Island**, and **parts of the Bay of Plenty** are likely to be regions where people will be particularly affected by the direct health effects of temperature increases. For example, many Māori live in the north and east of New Zealand, where hot days are projected to increase (Ministry for the Environment 2018). There are also many older people aged 85 years and over living in northern and eastern areas such as Christchurch city, Auckland city, Whangārei and Hastings.

Figure 5a: Children aged 0–4 years, by TA, 2018 (percentage of total population)

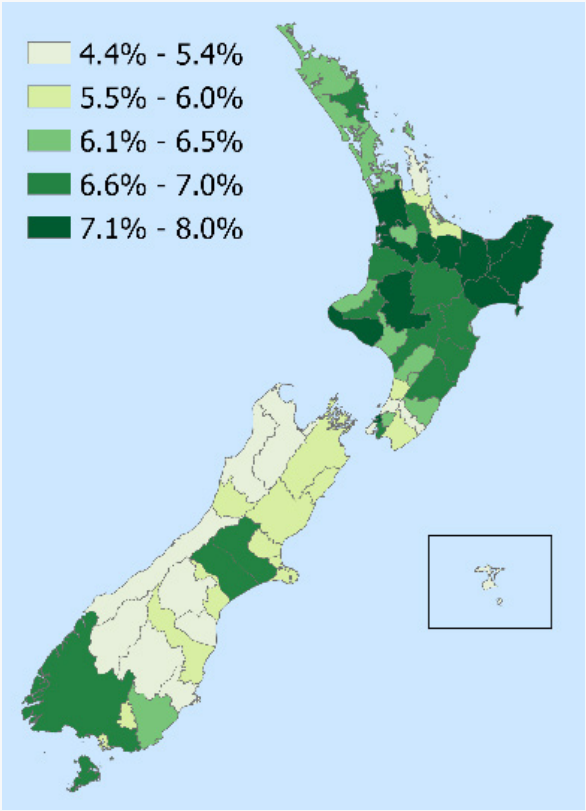


Figure 5b: Older adults aged 85+ years, by TA, 2018 (percentage of total population)

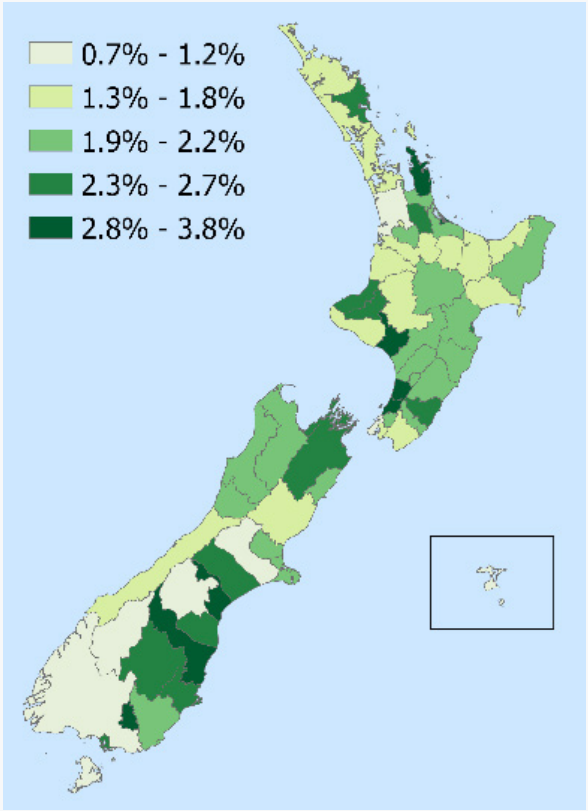


Figure 5c: Māori population, by TA, 2018 (percentage of total population)

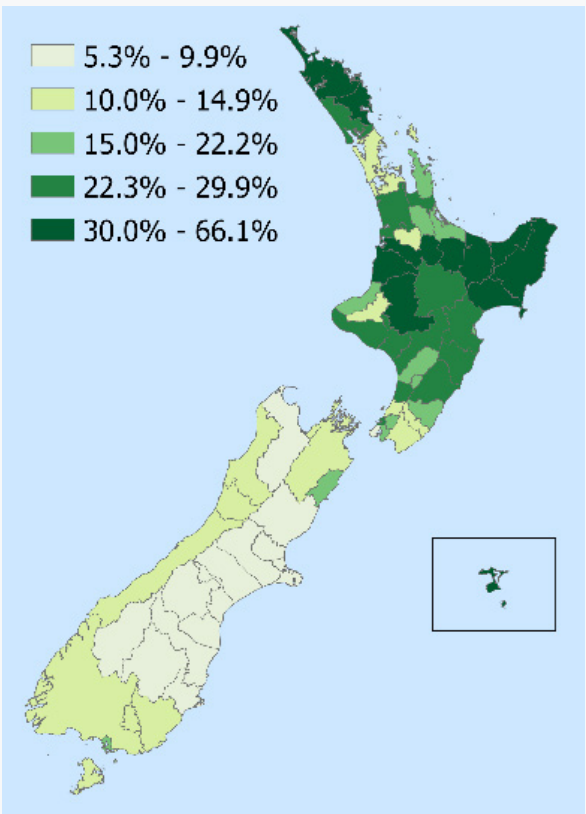


Figure 5d: People working in primary industries, by TA, 2018 (percentage of population aged 15+ years)

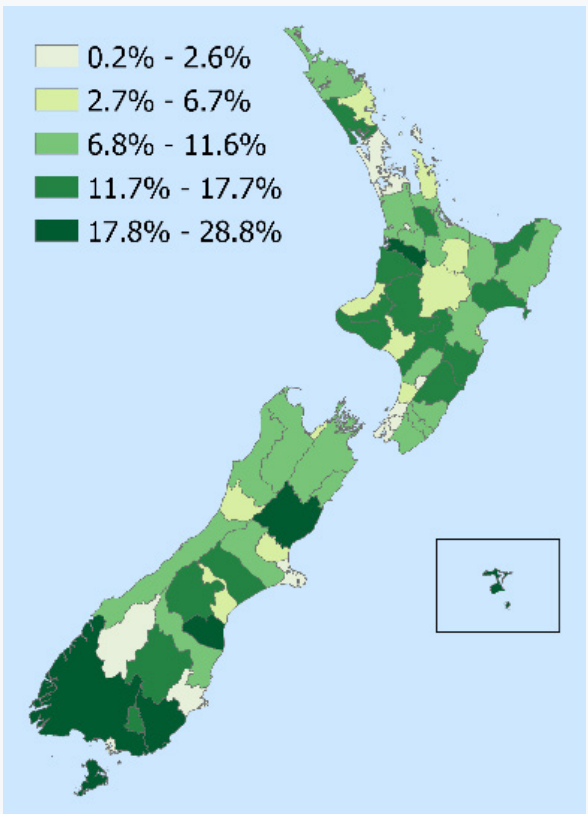
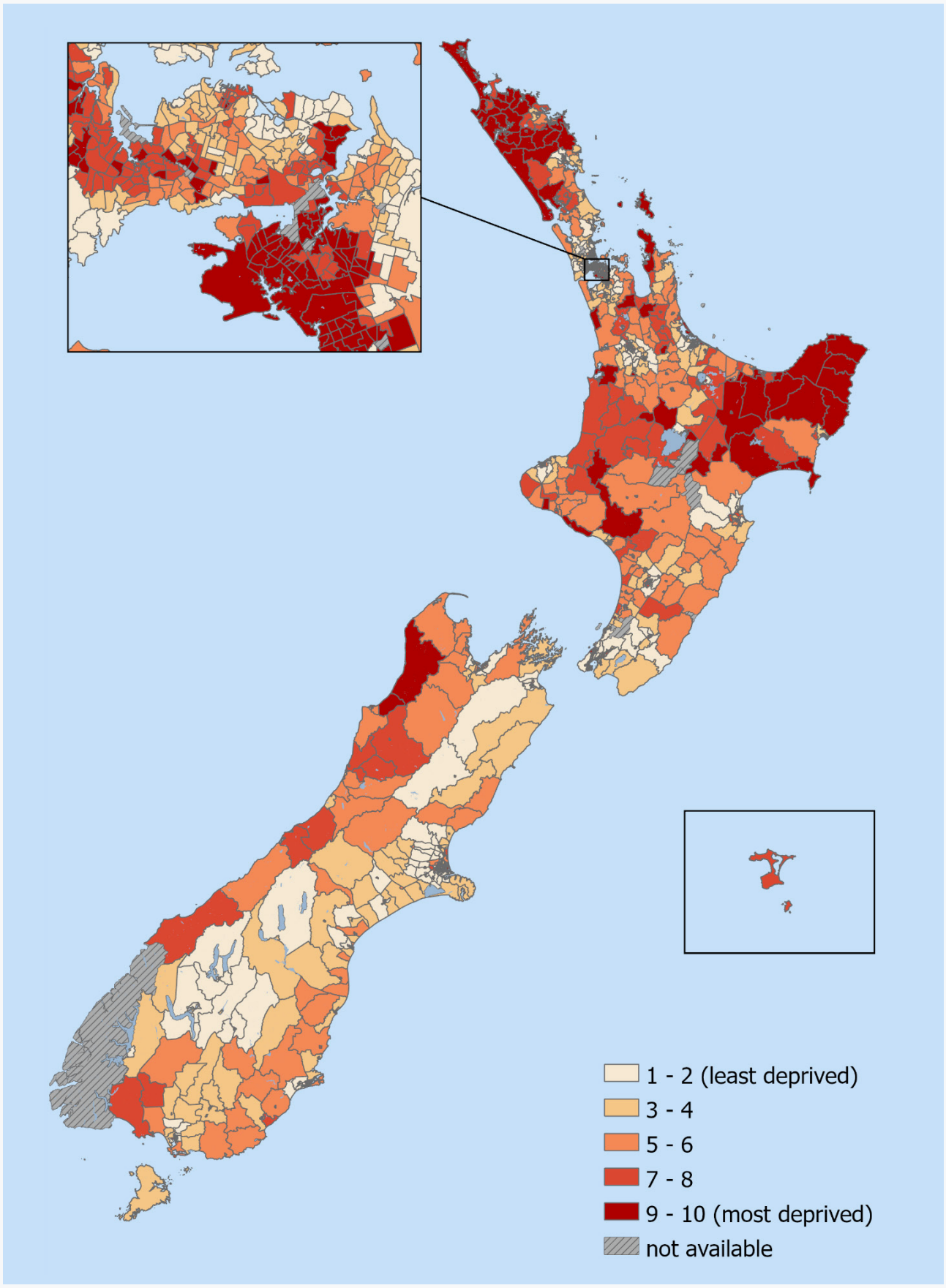


Figure 5e: Socioeconomic deprivation index (NZDep2018 decile), by statistical area 2 (SA2)



Source: Stats NZ, New Zealand 2018 Census of Populations and Dwellings.

Data for this indicator

Number of hot days and number of cold days

Climate station data of the daily maximum and minimum temperatures from around New Zealand was sourced from the National Climate Database CliFlo, a web service provided by the National Institute of Water and Atmospheric Research (NIWA). One climate station was selected per territorial authority, based on their proximity to each TA's population-weighted centroid (2018 Census data). The number of hot days (days with a maximum air temperature above 25°C) and the number of cold days (days with a minimum temperature below 0°) was counted for each year by TA. Only years with more than 90% of valid data were counted. Data was compared to the most recent Climate Normal Period, 1981–2010, where the 30-year average acts as a benchmark against which more recent observations can be compared.

All 95% confidence intervals have been presented as error bars on graphs. Unless otherwise stated, all differences mentioned in the text between two values are statistically significant at the 5% level or less.

For additional information, see the metadata link below.

References

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Other related topics include:

Extreme rainfall and drought

Health effects of climate change

Vulnerability to climate change

Author

The author of this factsheet is Carolin Haenfling ehinz@massey.ac.nz

Citation

Environmental Health Intelligence. 2021. Extreme temperature. [Factsheet]. Wellington: Environmental Health Intelligence NZ, Massey University.

Further information

For descriptive information about the data Hot days Cold days

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