Climate-sensitive gastrointestinal diseases

This surveillance report presents indicators of gastrointestinal diseases related to climate change. Notifications of salmonellosis and campylobacteriosis are associated with increasing temperatures. Notifications of cryptosporidiosis and giardiasis are associated with changes in rainfall patterns and drought conditions.

Key facts

- Rates of gastrointestinal diseases are high in areas of the country that are expected to experience significant changes in their local climate - which may further increase the prevalence of the diseases.
- Despite causing widespread flooding and the potential for widespread contamination of water sources, Cyclone Gabrielle does not appear to have produced unusually high rates of disease in the northern and eastern parts of the North Island in 2023.
- Giardiasis notifications were high in parts of the country that are drier on average, and are expected to become drier over time

Certain gastrointestinal diseases are climate-sensitive

Climate change is expected to warm the country and increase extremes of temperature, drought, and rainfall in different parts of the country. These shifts could also affect gastrointestinal disease frequency and distribution.

Studies show that cryptosporidiosis and giardiasis are affected by rainfall patterns. Cryptosporidiosis and giardiasis can be caught by drinking water contaminated with *Cryptosporidium* and/or *Giardia* cysts which can be washed into waterways by heavy rainfall (Britton et al 2010a). Drought conditions can also lead to a greater concentration of cysts in rivers due to low water flow and volume (Lal et al 2013).

Higher temperatures are linked to an increase in salmonellosis notifications. An increase of 1°C in monthly average temperatures has been associated with 15% more salmonellosis notifications in that month (Britton et al 2010b). Likewise, studies show a positive association with higher temperatures and heavy rainfalls increasing the risk of campylobacteriosis outbreaks, such as in Havelock North in 2016 (Gilpin et al 2020).

Campylobacteriosis outbreak triggered by extreme rain

Since 2010, the annual age-standardised notification rate for campylobacteriosis has only significantly increased once. Moreover, this increase can be directly linked to a single weather event.

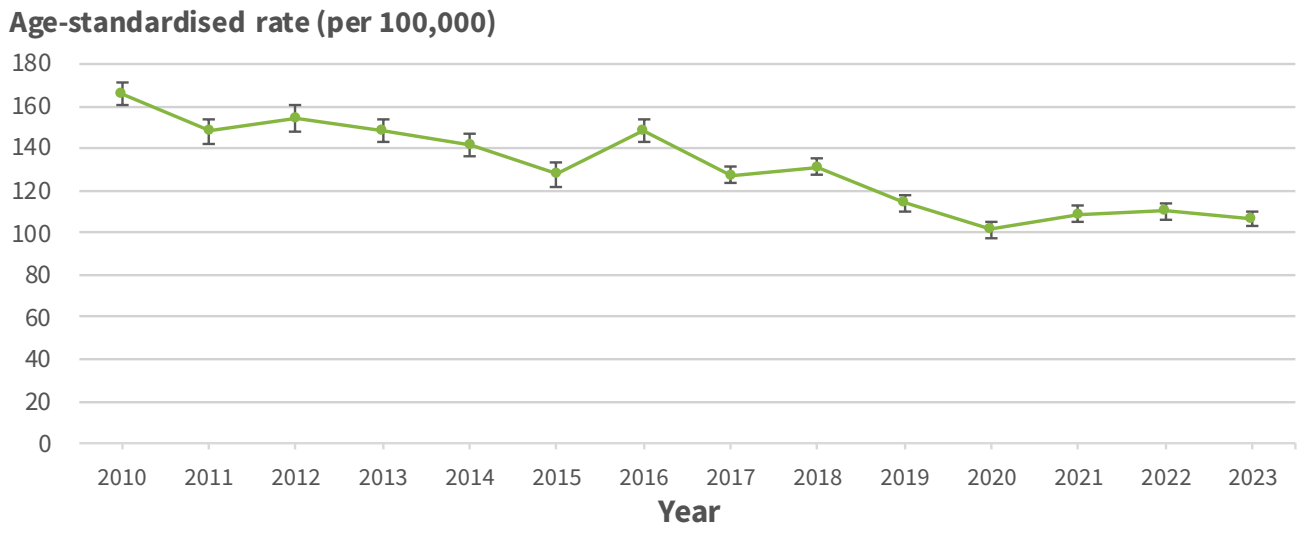
The spike in 2016 (Figure 1) is due to a campylobacteriosis outbreak in Havelock North. This outbreak most likely occurred after a period of extreme rainfall washed faecal matter from grazing sheep into a nearby waterway, which was hydrologically connected to a drinking water supply (Gilpin, 2020).

A single day of heavy rain resulted in an estimated 5,540 cases of campylobacteriosis among Havelock North's 14,118 residents. Counting cases that occurred outside the town, some estimates put the total cases

caused by the contamination at over 8,000 (Gilpin et al 2020).

Days with extreme rainfall events are predicted to increase by as much as 20% by 2090 in parts of the South Island (Ministry of Health 2018). This will lead to increased risk of similar events to the one in Havelock North, particularly in more rural areas. Figure 2, on page 4, shows that these parts of the South Island already display higher notification rates for campylobacteriosis, so a wetter climate is likely only to worsen this. See the 'Drought and rainfall' indicator for more information.

Figure 1: Campylobacteriosis notification rate, 2010 to 2023 (age-standardised rate per 100,000)



Source: ESR 2024

In the three-year period 2021–23, the highest crude rates of campylobacteriosis notifications were in rural areas, particularly in the bottom half of the South Island and the Hawke's Bay region of the North Island (Figure 2):

- Central Hawke's Bay District (Hawke's Bay): 313.7 per 100,000
- Waimate District (Canterbury): 280.8 per 100,000
- Clutha District (Otago): 276.0 per 100,000

While Central Hawke's Bay was much affected by extreme rainfall and flooding linked to Cyclone Gabrielle, it does not appear that this led to an unusually high number of cases of campylobacteriosis for 2023. However, it cannot be conclusively ruled out that the origin of at least some of the 56 cases in the district that year was connected to the extreme weather event.

Cryptosporidiosis

In the three-year period 2021–23, the highest crude rates of cryptosporidiosis notifications were in rural areas, particularly in the bottom half of the South Island and the Hawke's Bay region of the North Island (Figure 3, page 5):

- Waimate District (Canterbury): 68.1 per 100,000
- Stratford District (Taranaki): 55.6 per 100,000
- Queenstown Lakes District (Otago): 50.7 per 100,000

These areas of the country are in line for as much as a 20% increase in days with extreme rainfall. The Canterbury region, being prone to drought, will be placed at higher risk of cryptosporidium cysts becoming more concentrated in depleted waterways.

While high rates of cryptosporidiosis have historically been observed in the Waimate and Stratford districts, Queenstown has not previously had high rates. In 2020-22, the rate in that district was only 9.7 per 100,000 people (14 notified cases).

An outbreak in 2023 produced 68 notified cases between September and December, leading to a total of 76 cases for the district that year. Though the outbreak was subsequently linked to human faecal contamination of a water source and thus was not the result of a climate event, were it not for this incident, Queenstown Lakes would likely have occupied the lowest quintile of rates for the 2021-23 period.

Giardiasis

In the three-year period 2021–23, the highest crude rates of giardiasis notifications were in rural areas, particularly in the eastern parts of the North Island (Figure 4, page 6):

- Wairoa District (Tairāwhiti): 54.5 per 100,000
- Gisborne District (Tairāwhiti): 46.1 per 100,000
- Carterton District (Wellington region): 42.6 per 100,000

Though both Wairoa and Gisborne were strongly affected by Cyclone Gabrielle and associated flooding in 2023, this does not appear to have had any impact on the rate of disease in these areas. In fact, both districts had higher rates in 2020–22 than in 2021–23, while the counts of notifications in each district differed by just one between 2022 and 2023. These two districts have consistently had high rates relative to the rest of the country.

Similar to cryptosporidiosis, the parts of the Eastern North Island that are already drier on average may experience greater concentrations of the *Giardia* parasite in their waterways, as reduced rainfall and water flow will not 'flush' the parasites away.

Salmonellosis

An increase of just 1°C can increase notifications of salmonellosis by 15% (Britton et al 2010b). Climate scientists predict that New Zealand's average temperature will have risen by one degree by around 2040 and as much as three degrees by 2090.

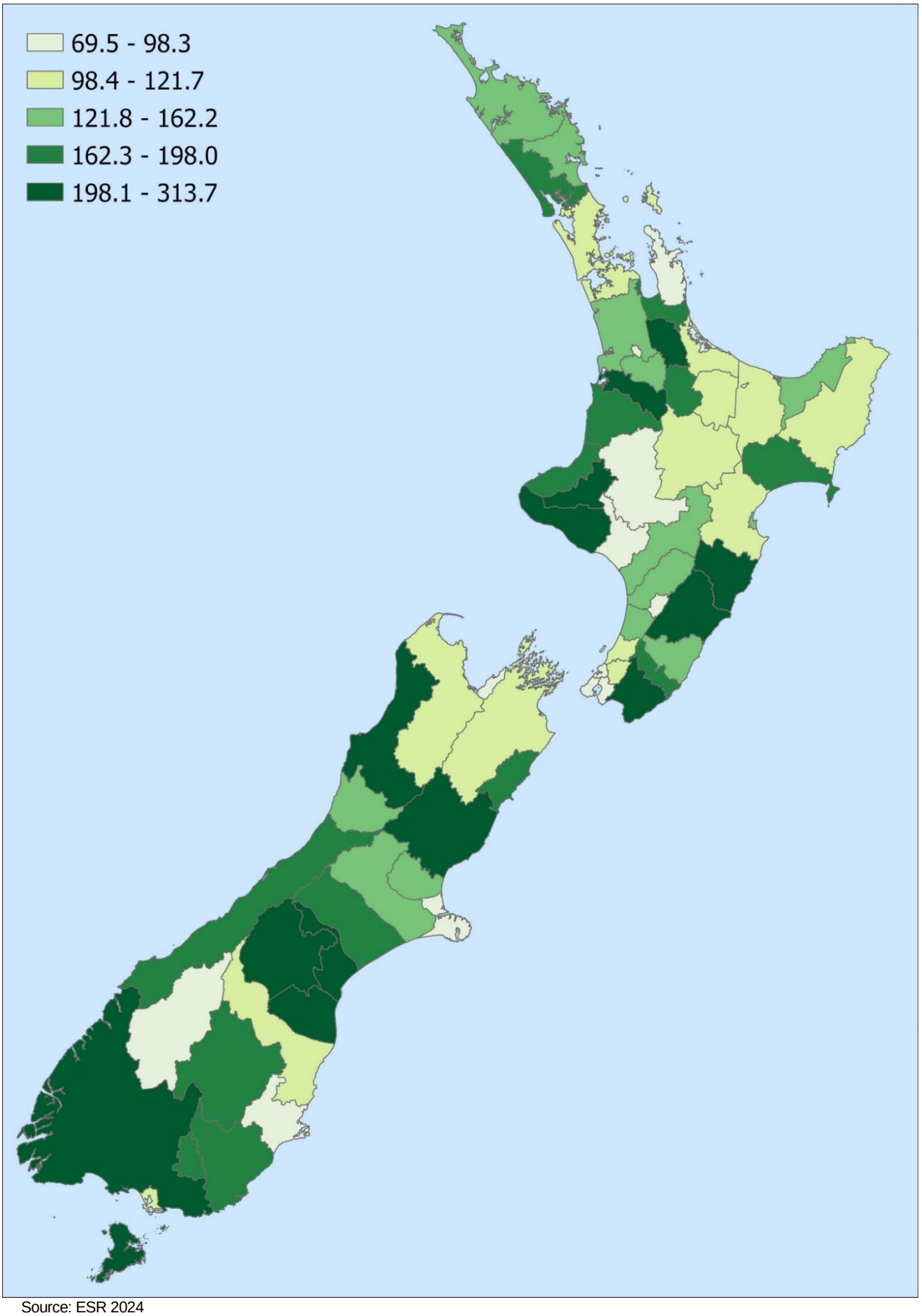
It follows that those areas of the country where rates of salmonellosis are already high will experience a significant increase in the next 20 years, as will areas that have previously enjoyed relatively low rates – especially if those areas are prone to high temperatures such as is the case in northern regions of the North Island.

See the 'Temperature' indicator for more information.

In the three-year period 2021–23, the highest crude rates of salmonellosis notifications were in rural areas, particularly in the bottom half of the South Island (Figure 5, page 7):

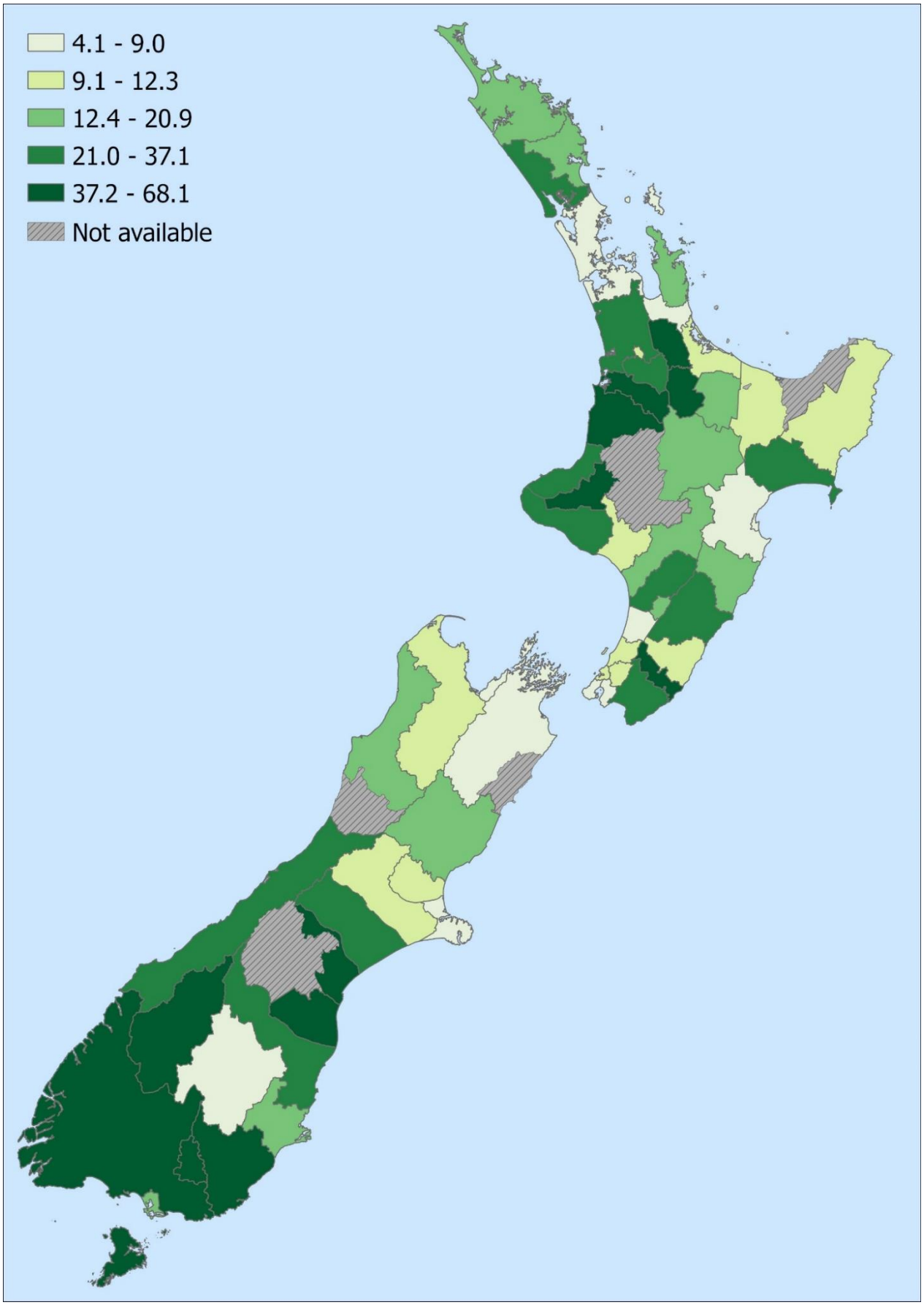
- MacKenzie District (Canterbury): 54.2 per 100,000
- Gore District (Southland): 33.3 per 100,000
- Southland District (Southland): 32.1 per 100,000

Figure 2: **Campylobacteriosis notifications (crude rate per 100,000 people) by territorial authority 2021–23**



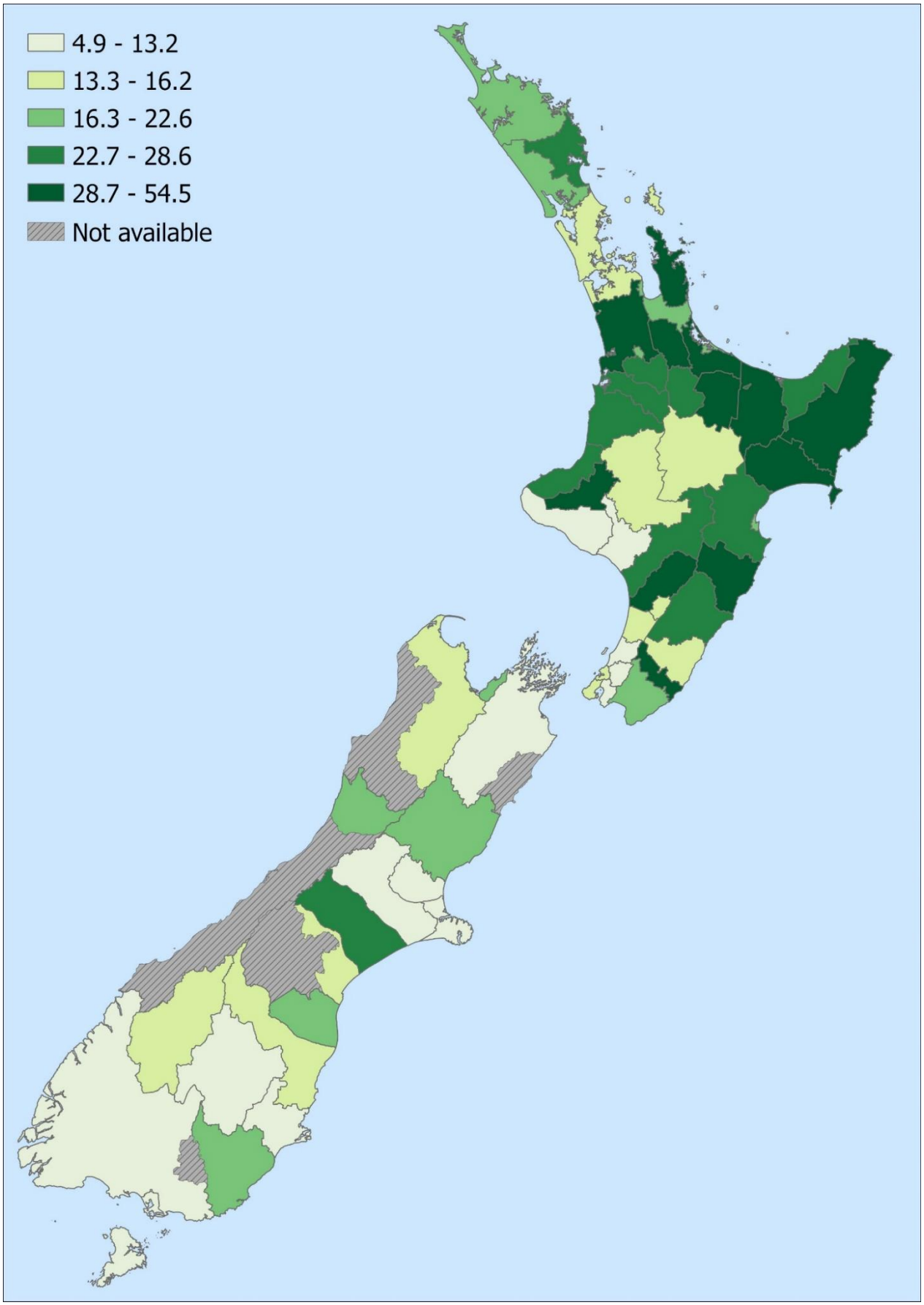
Source: ESR 2024

Figure 3: **Cryptosporidiosis notification rate (crude rate per 100,000 people), by territorial authority 2021–23**



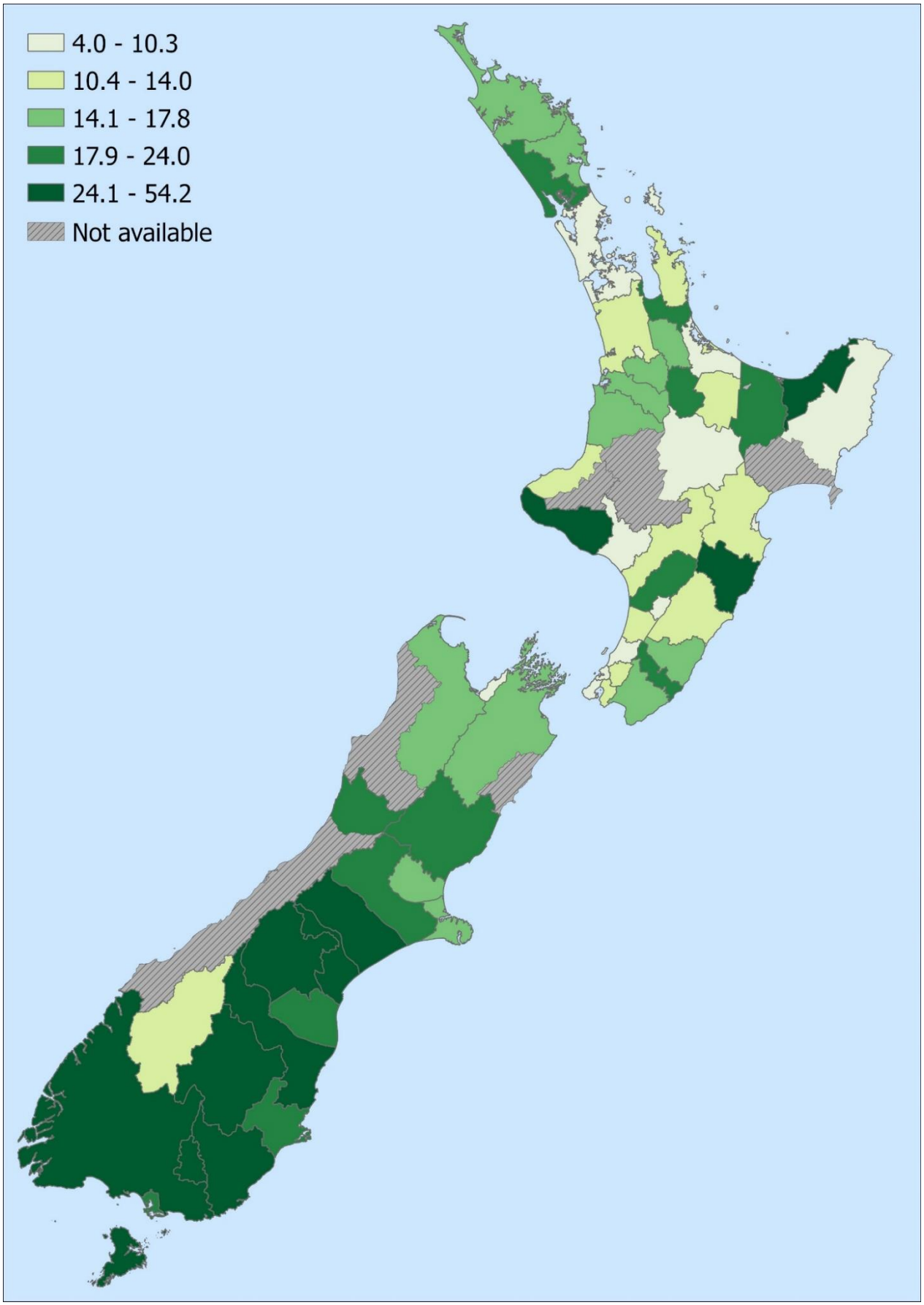
Source: ESR 2024

Figure 4: **Giardiasis notification rate (crude rate per 100,000 people), by territorial authority 2021–23**



Source: ESR 2024

Figure 5: **Salmonellosis notification rate (crude rate per 100,000 people), by territorial authority 2021–23**



Source: ESR 2024

Data for this indicator

This indicator presents giardiasis, cryptosporidiosis, salmonellosis and campylobacteriosis notifications from EpiSurv data from ESR for 2001–2023. Notifications where the person was overseas during the incubation period have been excluded. Notifications only cover those people who visited a GP or hospital for treatment, and may therefore underestimate the disease rate. Specific change over time corresponding with climate change cannot be shown as the common baseline period in climate change science is 1981–2010, for which comparable health data is not available.

For additional information, see the Metadata sheet.

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