

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. This data was provided by the New Zealand Institute for Public Health and Forensic Science (PHF Science)¹

Key facts

- Notification 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 incidence of the diseases.
- 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 overall and increase extremes of temperature, drought, and rainfall in different parts of the country. These shifts could also affect gastrointestinal disease frequency and distribution including campylobacteriosis, cryptosporidiosis, giardiasis and salmonellosis.

Studies show that cryptosporidiosis and giardiasis are affected by rainfall patterns and changes in temperature. 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. 2010). Drought conditions can also lead to a greater concentration of cysts in rivers due to low water flow and volume (Lal et al. 2013a).

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. 2010). Likewise, studies show a positive association with higher temperatures and heavy rainfall increasing the risk of campylobacteriosis outbreaks, such as in Havelock North in 2016 (Gilpin et al. 2020).

Campylobacteriosis outbreak triggered by extreme rain

Campylobacteriosis is the most common bacterial cause of diarrheal disease. It can have serious health implications for people with weakened immune systems. Campylobacteriosis notifications have been shown to increase with extreme precipitation but also with increasing temperatures (Austhof et al. 2024). In New Zealand the incidence has also been shown to be influenced by reliance on a private water supply and on the proximity of dairy cattle (Pourzand et al. 2025). However, the links between climate and campylobacteriosis remain poorly understood with the transmission mechanism still being a 'black box' (Lake

¹ The Institute for Environmental Science and Research changed its name to the New Zealand Institute for Public Health and Forensic Science (PHF Science) on July 1 2025

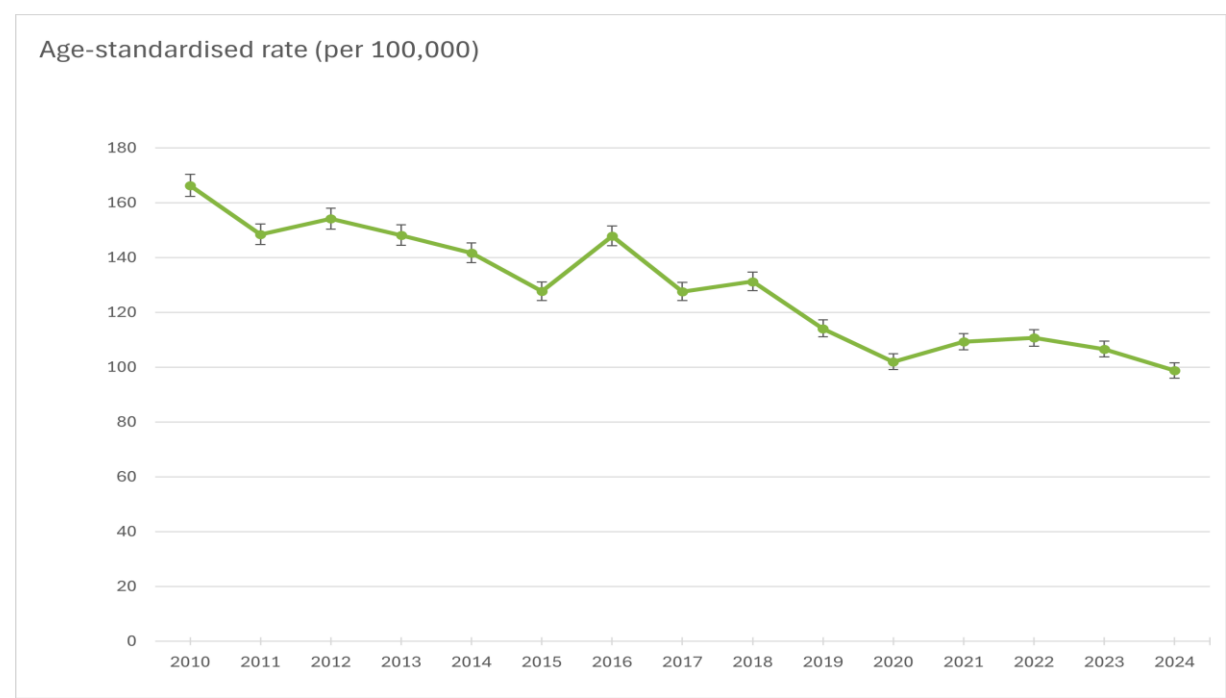
2017).

The spike in 2016 (Figure 1) was 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 et al. 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).

By the end of the century it is predicted that 40% of New Zealand will experience at least a doubling in the frequency of historically extreme rainfall events (once in a decade). (Sigid et al. 2026). This will lead to increased risk of similar events to the one in Havelock North, particularly in more rural areas. Figure 2, on page 5, 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 2024 (age-standardised rate per 100,000)



Note: 95% confidence intervals are shown as vertical bars.
Source: PHF Science 2025

In the three-year period 2022–24, 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):

- Southland District (Southland) 279.0 per 100,000 (95% CI 247.0-314.1)
- Central Hawke’s Bay District (Hawke’s Bay) 264.6 per 100,000 (95% CI 220.2-315.2)
- Waimate District (Canterbury) 237.4 per 100,000 (95% CI 180.7-306.7)

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, especially as there were only 32 cases in 2024. Along with the Clutha and Hastings districts the three districts above also have the highest rate of notifications over the 2015–24 period.

Cryptosporidiosis

The incidence of cryptosporidiosis and its links with temperature and rainfall have been extensively studied although the effects of the climate on cryptosporidium seem to vary between environments. Warmer temperatures may increase the viability of the cryptosporidium oocysts and also lead to people swimming or being close to water more. Heavy rainfall run-off may contaminate drinking water sources particularly in areas with high density of livestock (Ikiroma and Pollock 2021). In New Zealand cryptosporidiosis rates increase with rainfall but the association with temperature has been found to be both positive (Lal et al. 2013b) and negative (Britton et al. 2010), making prediction of the effect of climate change more complex.

In the three-year period 2022–24, the highest crude rates of cryptosporidiosis notifications were in rural areas, particularly in the bottom half of the South Island. (Figure 3, page 6):

- Waimate District (Canterbury): 84.5 per 100,000 (95% CI 52.3-129.2)
- Queenstown-Lakes District (Otago) 51.9 per 100,000 (95% CI 41.1-64.7)
- Otorohanga District (Waikato) 47.2 per 100,000 (95% CI 26.4-77.9)

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 (Ministry for the Environment 2024; Sigid et al. 2026)

Waimate, and Clutha districts have had high rates of cryptosporidiosis notifications historically.

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. The outbreak was subsequently linked to human faecal contamination of a water source and thus was not the result of a climate event.

Giardiasis

In the three-year period 2022–24, the highest crude rates of giardiasis notifications were in eastern parts of the North Island (Figure 4, page 7):

- Carterton District (Wellington) 35.8 per 100,000 (95% CI 17.9-64.0)
- Gisborne District (Tairāwhiti): 35.7 per 100,000 (95% CI 27.0-46.3)
- Matamata-Piako District (Waikato) 33.2 per 100,000 (95% CI 23.5-45.6)

Gisborne and Matamata-Piako districts were strongly affected by Cyclone Gabrielle and associated flooding in 2023, but this does not appear to have had a major impact on the rate of disease in these areas.

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. Conversion of land to dairy farming may also lead to increased infestation of the *Giardia* parasite (Winkworth 2010). Most of the North Island is projected to have more dry

days and lower annual rainfall by 2090 (Ministry for the Environment 2024).

Salmonellosis

Salmonellosis notifications are affected by weather conditions. Numerous studies have found that the incidence of Salmonellosis increases with the temperature (Manchal et al. 2024) and an increase of just 1°C can increase notifications of salmonellosis by 15% (Britton et al 2010b). Salmonella reproduces more quickly with higher ambient temperatures. 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 (Ministry for the Environment 2024).

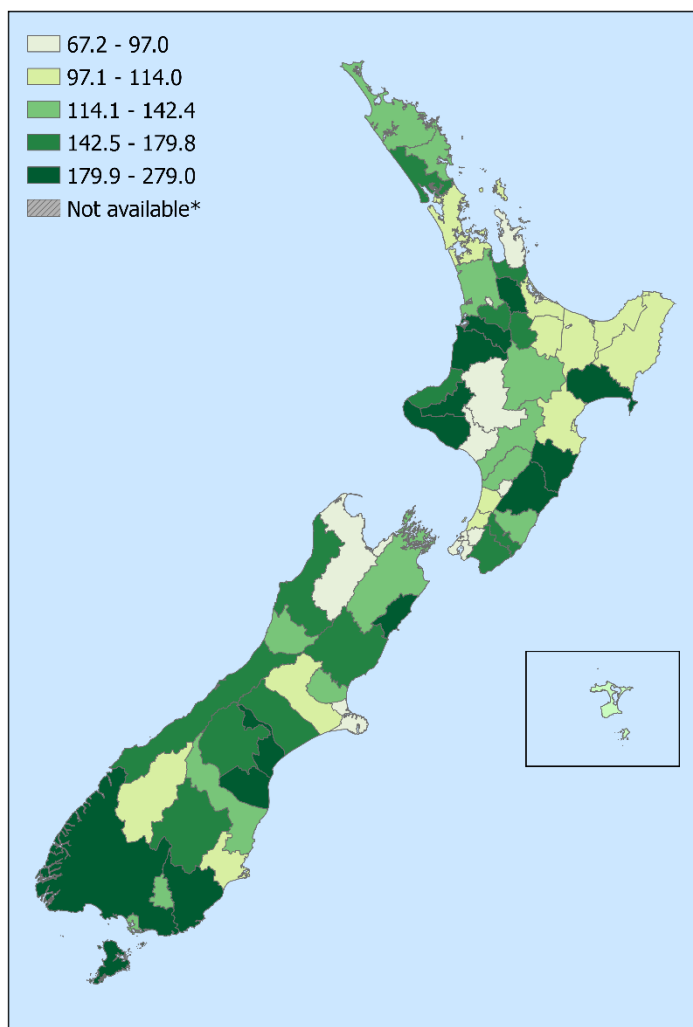
It follows that those areas of the country where rates of salmonellosis are already high will experience a significant increase in the next 20 years, as will areas that have previously enjoyed relatively low rates – especially if those areas are prone to high temperatures such as is the case in northern regions of the North Island. (See the [‘Temperature’](#) indicator for more information.)

In the three-year period 2022–24, 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) 56.6 per 100,000 (95% CI 25.9-107.5)
- Opotiki District (Bay of Plenty) 42.3 per 100,000 (95% CI 22.5-72.3)
- Southland District (Southland) 33.6 per 100,000 (95% CI 23.1-47.2)

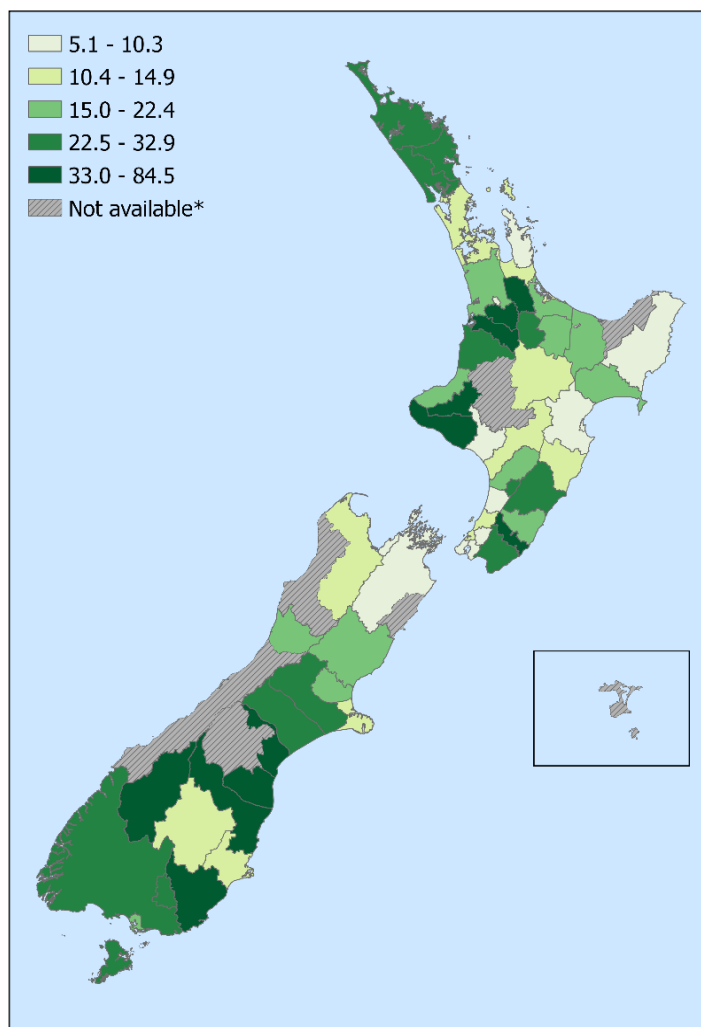
Figure 2:

**Campylobacteriosis notifications (crude rate per 100,000 people)
by territorial authority 2022–2024**



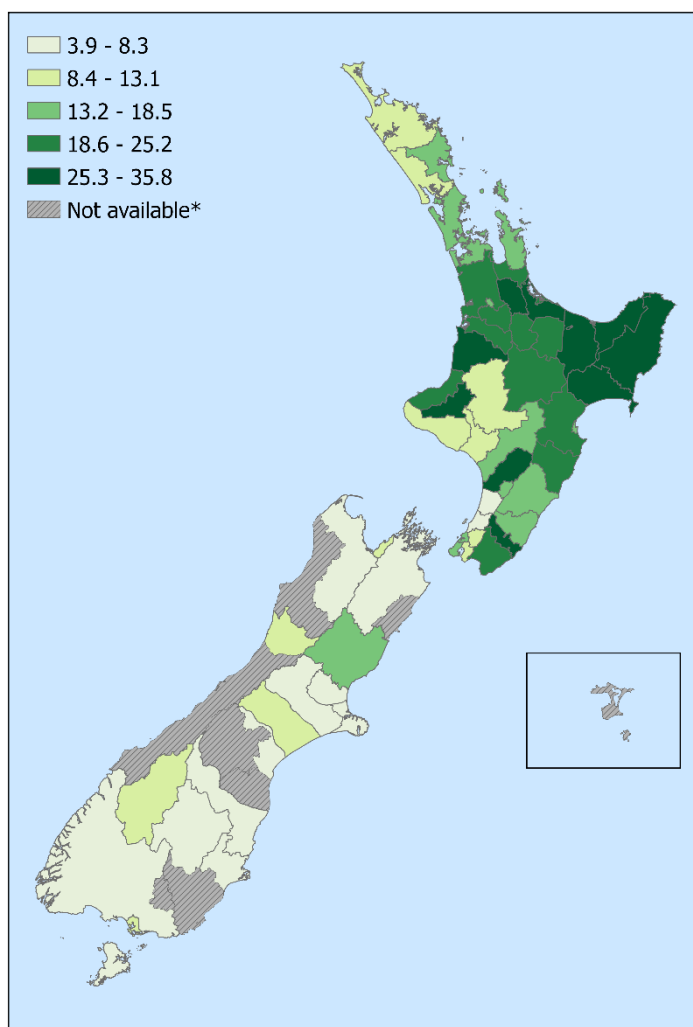
Source: PHF Science 2025

Figure 3: Cryptosporidiosis notification rate (crude rate per 100,000 people), by territorial authority 2022–24



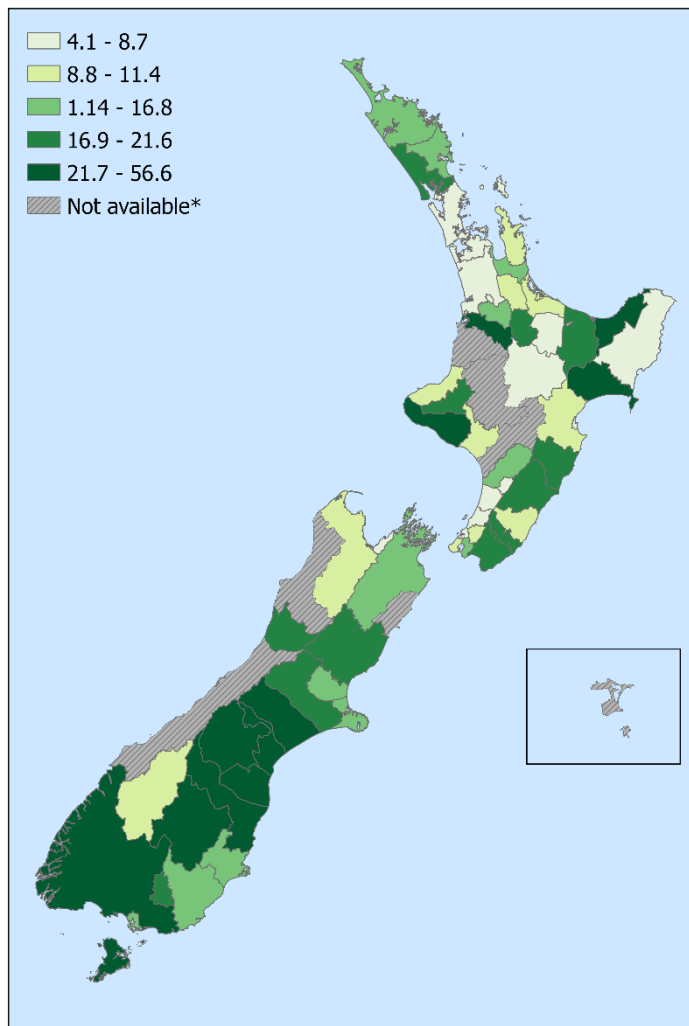
Source: PHF Science 2025

Figure 4: Giardiasis notification rate (crude rate per 100,000 people), by territorial authority 2022–24



Source: PHF Science 2025

Figure 5: Salmonellosis notification rate (crude rate per 100,000 people), by territorial authority 2022–24



Source: PHF Science 2025

Data for this indicator

This indicator presents giardiasis, cryptosporidiosis, salmonellosis and campylobacteriosis notifications from EpiSurv data from PHF Science for 2001–2024. 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.

For additional information, see the [Metadata](#) sheet.

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