Carolin Haenfling & Patrick Hipgrave
Intelligence Analysts

Gastrointestinal diseases linked to climate change

This factsheet 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.

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.

An extreme weather event in 2016 led to an outbreak of around 5,500 cases of campylobacteriosis.

Salmonellosis cases can be expected to increase significantly by 2040 as temperatures increase.

Cryptosporidiosis notifications were high in both drought-prone parts of the South Island, and in parts expected to become much wetter by 2090.

Giardiasis notifications were high in parts of the country that are drier on average, and are expected to become drier over time

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. As these climatic shifts take effect, gastrointestinal disease frequency and distribution are likely to change concurrently.

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

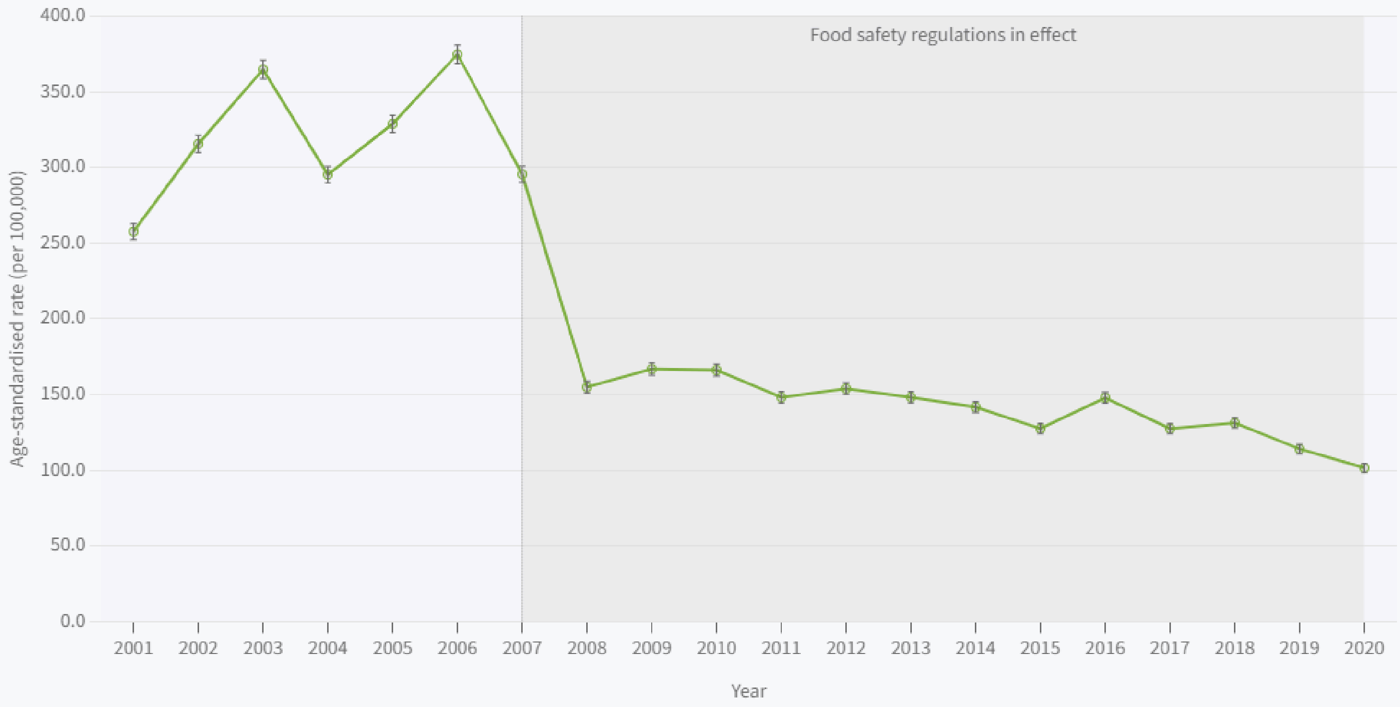
Since 2010, the annual age-standardised notification rate for campylobacteriosis has only significantly increased once. Moreover, this increase can be directly linked to a single weather event.

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. 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 (Ministry of Health 2018) in parts of the South Island. This will lead to increased risk of similar events to the one in Havelock North, particularly in more rural areas. Figure 2 below 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.

The large decrease in the campylobacteriosis rate from 2008 onward has been attributed to the introduction of food safety regulations for poultry production in 2007 and 2008 (Duncan 2014). Consequently, the decline represents a drop in the number of food-related cases.

Figure 1 Campylobacteriosis notifications, 2001-2020 (age-standardised rate per 100,000)



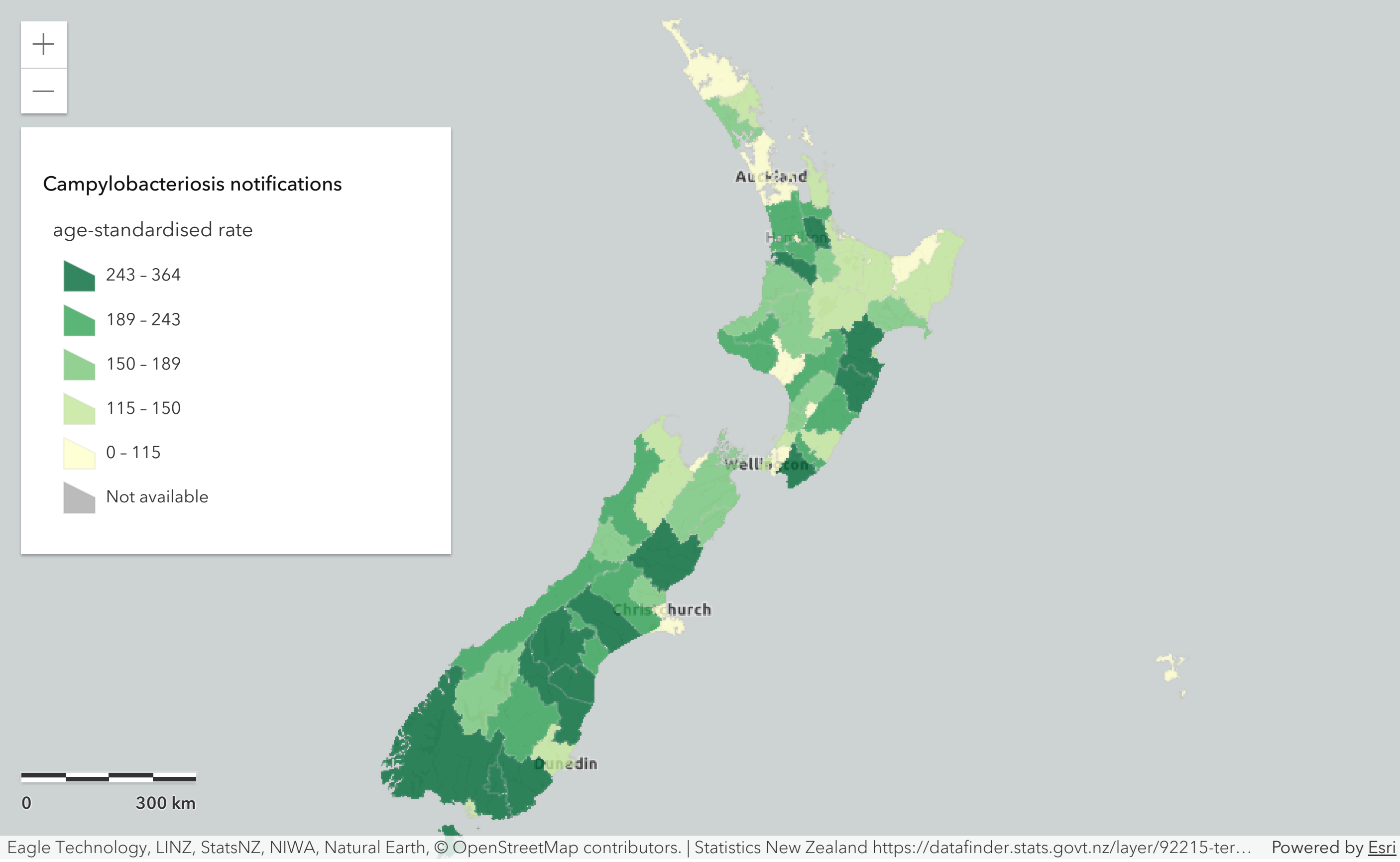
Note: 95% confidene interval are displayed as error bars on graphs.

Source: ESR 2021

In the ten-year period 2011–20, the highest age-standardised 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):

- Clutha District (Otago): 364.3 per 100,000
- Waimate District (Canterbury): 343.6 per 100,000
- Central Hawke's Bay District (Hawke's Bay): 324.6 per 100,000

Figure 2 Campylobacteriosis notifications, by Territorial Authority (TA), 2011-20 (age-standardised rate per 100,000)



Salmonellosis

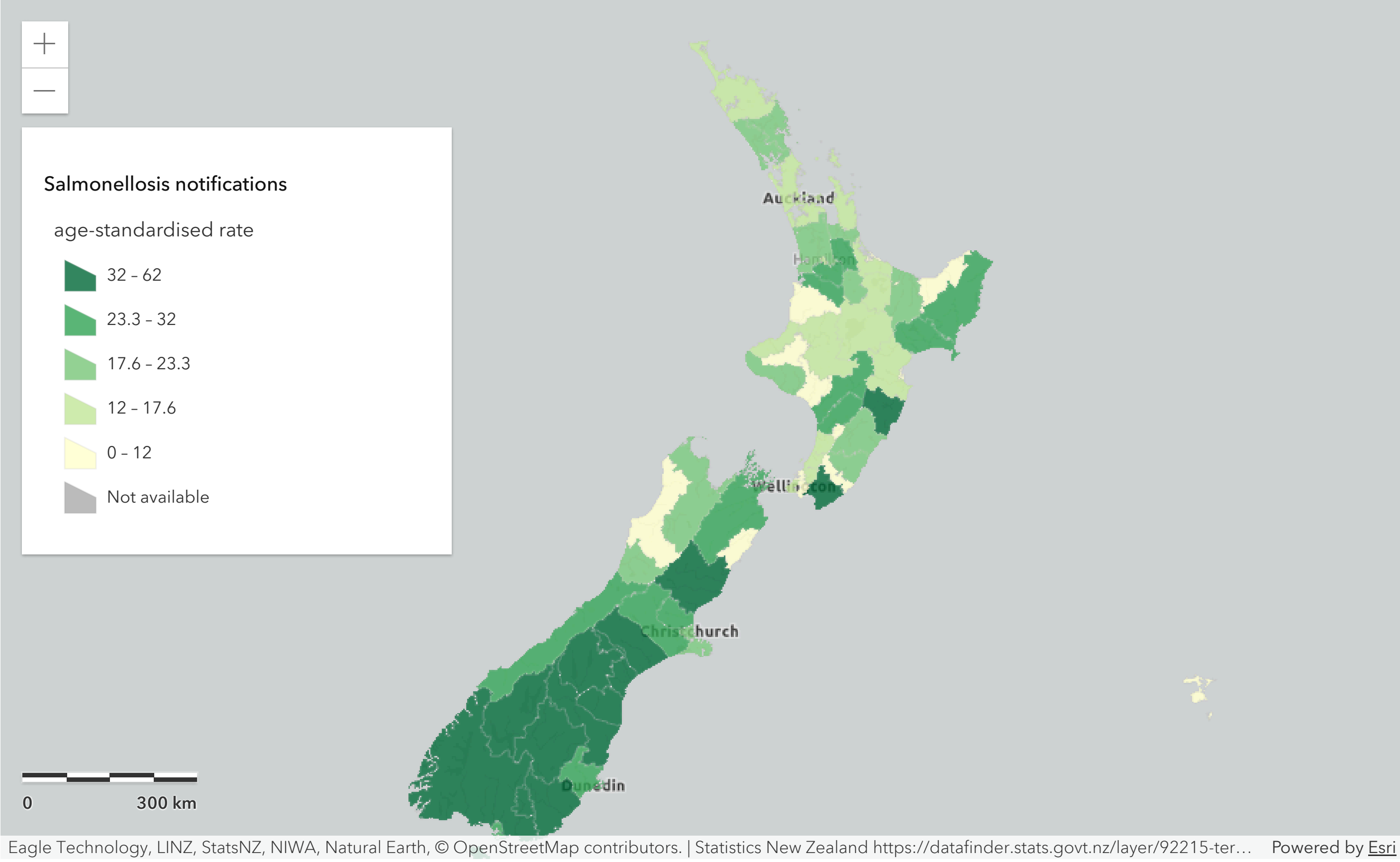
An increase of just 1°C can increase notifications of salmonellosis by 15% (Britton et al 2010b). Climate scientists predict that New Zealand's average temperature will have risen by one degree by around 2040 and as much as three degrees by 2090. It follows that those areas of the country where rates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

See the 'Temperature' indicator for more information.

In the ten-year period 2011–20, the highest age-standardised rates of salmonellosis were in the lower part of the South Island (Figure 3):

- Clutha District (Otago): 62.5 per 100,000
- Mackenzie District (Canterbury): 60.9 per 100,000
- Central Otago District (Otago): 58.8 per 100,000

Figure 3 Salmonellosis notifications, by Territorial Authority (TA), 2011-20 (age-standardised rate per 100,000)



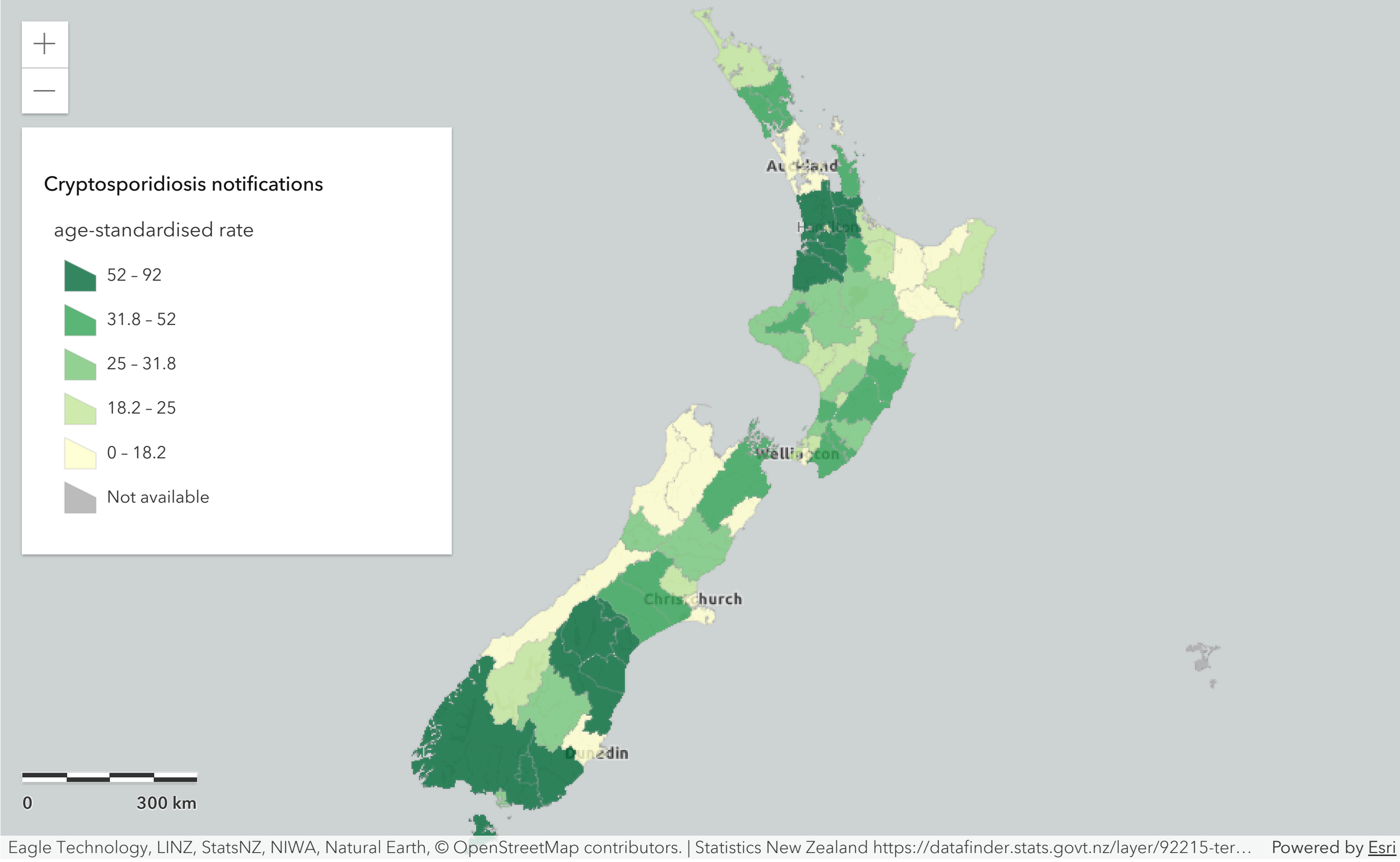
Cryptosporidiosis

In the ten-year period 2011–20, the highest age-standardised rates of cryptosporidiosis notifications were in rural areas, particularly in the bottom half of the South Island and the Waikato region of the North Island (Figure 4):

- Waimate District (Canterbury): 92.7 per 100,000
- Waitaki District (Canterbury): 90.4 per 100,000
- Otorohanga District (Waikato): 75.0 per 100,000

These areas of the South Island are in line for a 20% increase in days with extreme rainfall. The Canterbury region being prone to drought will also place it at higher risk of cryptosporidium cysts becoming more concentrated in depleted waterways.

Figure 4 Cryptosporidiosis notifications, by Territorial Authority (TA), 2011-20 (age-standardised rate per 100,000)



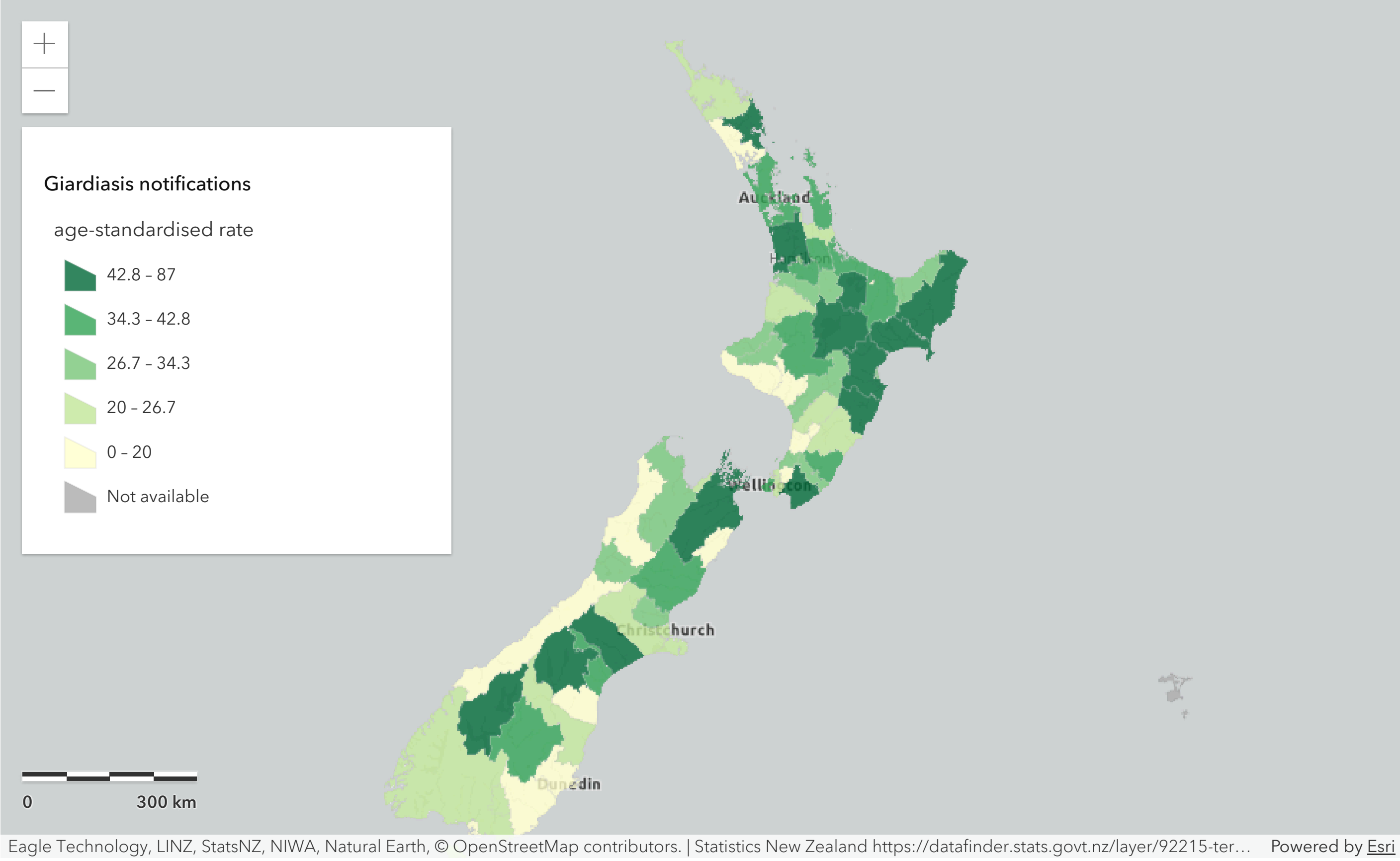
No increasing trend for giardiasis

In the ten-year period 2011–20, the highest age-standardised rates of giardiasis notifications were in eastern parts of the North Island (Figure 5):

- Queenstown-Lakes District (Otago): 87.2 per 100,000
- Central Hawke's Bay District (Hawke's Bay): 61.3 per 100,000
- Gisborne District (Gisborne): 60.0 per 100,000

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 does not 'flush' the parasites away.

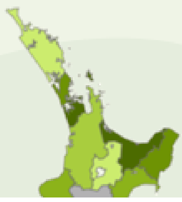
Figure 5 Giardiasis notifications, by Territorial Authority (TA), 2011-20 (age-standardised rate per 100,000)



Ongoing monitoring of the health effects of climate change needed

Long term health data are needed to robustly examine changes in disease occurrence and severity due to climate change. However, it is important to have ongoing monitoring of health effects in anticipation of possible increases as climate change makes itself felt.

Interactive regional dashboard



Data for this indicator

This indicator presents giardiasis, cryptosporidiosis, salmonellosis and campylobacteriosis notifications from EpiSurv data from ESR for 2001–2020. 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 data is not available.

Rates presented are per 100,000 people (or 100,000 people per year for combined data over 10-year periods). Age-standardised rates have been presented where possible, to take into account the population age structures of different population groups. 95% confidence intervals are displayed as error bars on graphs.

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Other related topics include:

Drought and rainfall | Hot and cold days | Vulnerability to climate change

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Contact
ehinz@massey.ac.nz

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Further information
For descriptive information about the data Metadata Sheet

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