

Faecal indicator bacteria at recreational bathing sites

This report presents an analysis of the suitability of recreational bathing sites for swimming. Information is based on concentrations of faecal indicator bacteria recorded during the October-March summer bathing seasons from 2018 to 2023 as presented by Land, Air, Water, Aotearoa's recreational bathing raw water quality dataset. The Auckland region has been excluded from the analyses for reasons outlined in the 'Data for this indicator' section.

Key facts

- The Gisborne, Hawkes Bay, and Southland regions had the highest proportion of unsafe freshwater bathing sites, with 100% of their sites receiving 'poor' grades. The Taranaki region had the highest rate of unsafe beaches, with 67% of all beaches being graded 'poor'.
- Based on monitoring undertaken between 2018–23, 51.2% of freshwater bathing sites (rivers and lakes) and 6.8% of marine bathing sites (beaches) could be considered unsafe for swimming at any time.
- During the 2022/23 bathing season, 82.3% of monitored river swimming sites, 60.0% of beach sites and 47.5% of lake sites were unsafe to swim at on at least one occasion.
- In the 2022/23 bathing season, 32.5% of monitored river swimming sites, 7.3% of beach sites and 1.7% of lake sites were frequently unsuitable for swimming, with 20.0% or more of routine monitoring results showing they were unsafe to swim.

Faecal indicator bacteria and health

Faecal indicator bacteria (FIB) are bacteria that grow in the gut of warm-blooded animals, including humans. They can be introduced into the environment through animal or bird excrement, stock effluent, wastewater discharge, and stormwater run-off from contaminated soil. Identification of FIB in waterways indicates the potential for the presence of other bacteria that may be harmful to human health by causing gastrointestinal illnesses and infections of the ears, eyes, nasal cavity, skin, and upper respiratory tract (Land, Air, Water Aotearoa 2022).

It is difficult to test for the full range of pathogens that may be present in the water. Instead, bacteria like *E. coli* and Enterococci are used as indicators as their presence implies that other microorganisms such as *Campylobacter*, *Cryptosporidium* or *Giardia* may also be present (McBride & Soller 2017).

While the presence of a small amount of FIB (typically measured in terms of the number of bacteria per 100ml of water) may pose little to no danger to swimmers, higher concentrations may pose a risk to children, the elderly, or people with compromised immune systems.

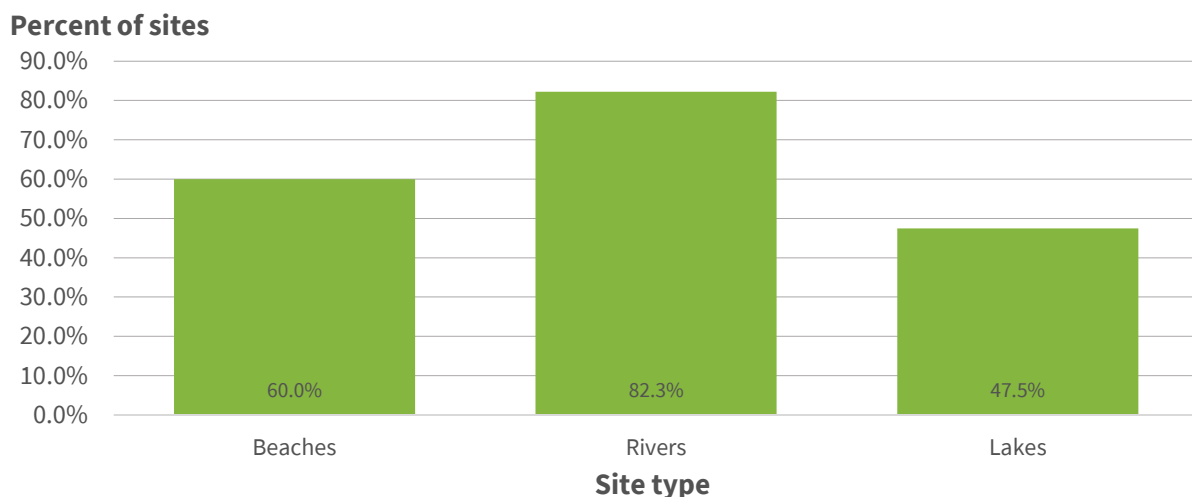
Cyclone Gabrielle

In February 2023, a severe tropical cyclone, Gabrielle, devastated parts of the North Island of New Zealand. Heavy rain warnings were issued for the Northland, Auckland, Coromandel (Waikato), Gisborne, and Hawkes Bay regions. Flooding and heavy rainfall had many ongoing effects in these regions, including causing a staggering number of landslides and a buildup of silt in waterways.

Many bathing sites were occasionally unsafe to swim at

In the 2022–23 bathing season, 68.3% of all tested sites were unsafe to swim at least once. Of these sites, 180 beaches (60.0% of those monitored) were unsafe to swim at on at least one occasion, as were 218 (82.3%) rivers and 28 (47.5%) lakes (Figure 1).

Figure 1: Percentage of sites that tested unsafe for swimming on at least one occasion, 2022–23

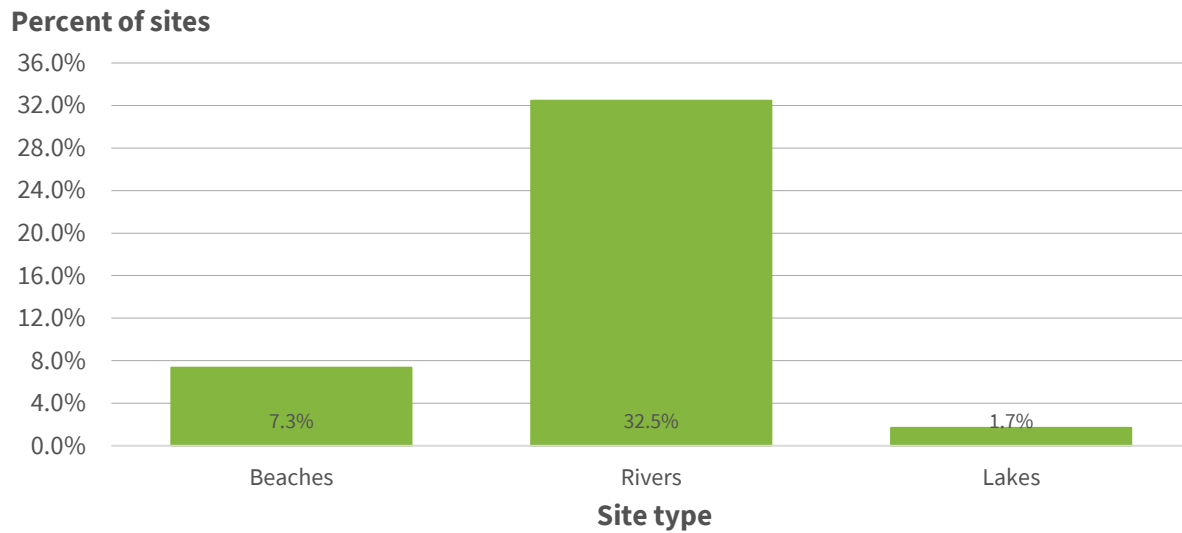


Source: Land, Air, Water Aotearoa 2023

Rivers were more likely to be frequently unsafe to swim

During the 2022–23 bathing season, 86 river sites (32.5% of those monitored) were found to be unsuitable for swimming on 20.0% or more of the occasions they were surveyed, along with 22 beach sites (7.3%) and one freshwater lake (1.7%) (Figure 2).

Figure 2: Percentage of sites that tested unsafe for swimming more than 20.0% of the time, 2022–23

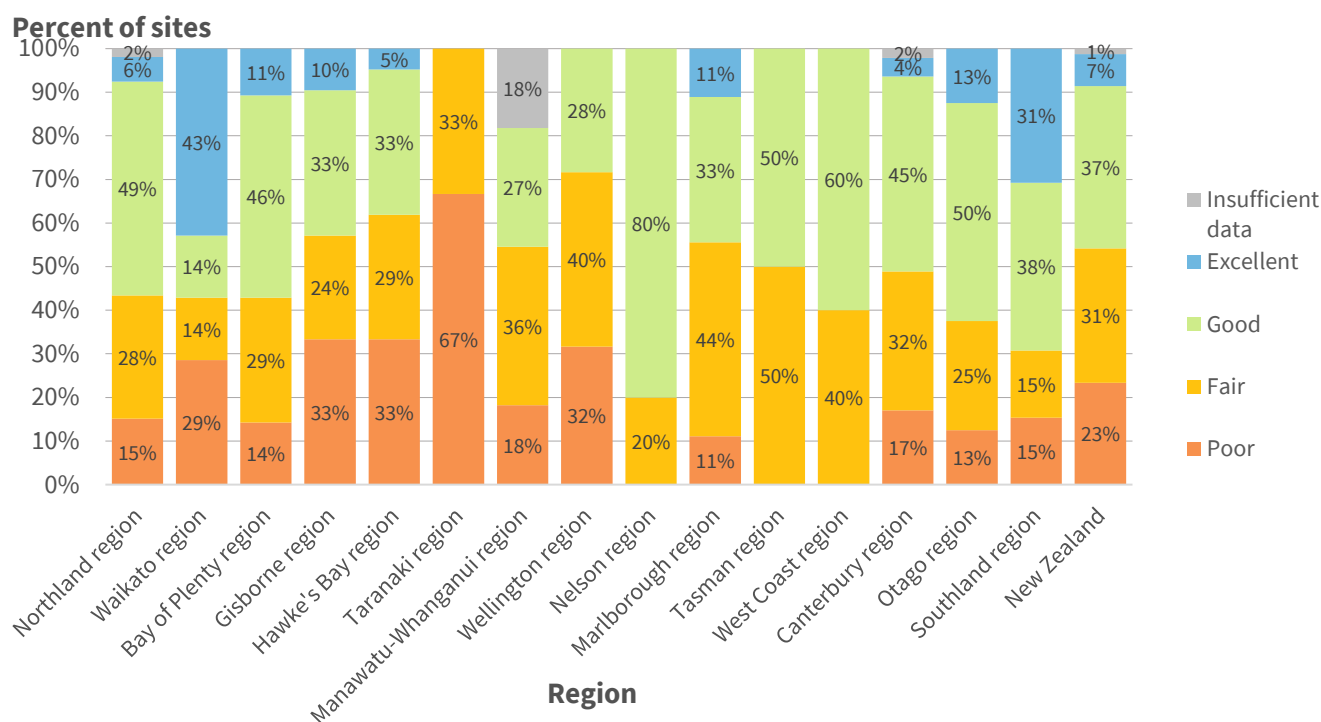


Source: Land, Air, Water Aotearoa 2023

Long term bacterial risk was generally low at coastal beaches

Between 2018–23, 23.4% of the 325 monitored marine bathing sites received a ‘poor’ grade making them unsuitable for swimming (Figures 3 & 4). Beaches tend to have lower concentrations of FIB as contaminants are more rapidly diluted by currents and the larger volume of water. The Taranaki region had the highest proportion of unsuitable beach sites (67%), with two-thirds of monitored sites in each region graded ‘poor’ (Figure 3), double the regions with the second highest proportion of ‘poor’ grades (Gisborne and Hawkes Bay regions with 33% ‘poor’ grades). The Wellington region had the highest number of sites receiving ‘poor’ grades (19), followed by the Taranaki region (12) (Table 1).

Figure 3: Bacterial risk for marine bathing sites, by regional council, 2018–23



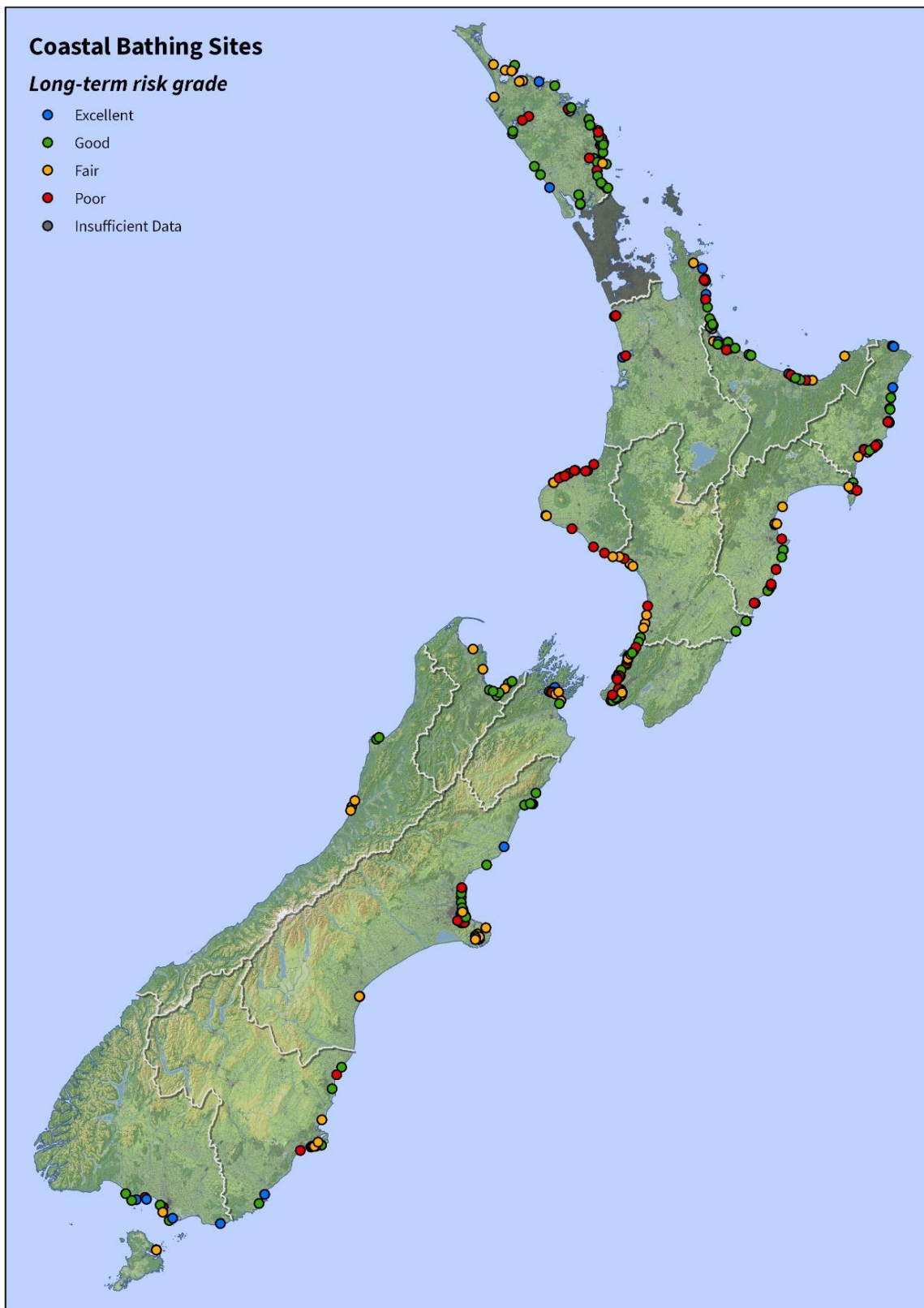
Note: New Zealand data excludes the Auckland region for reasons outlined in the 'Data for this indicator' section.
Source: Land, Air, Water Aotearoa 2023

Table 1: Bacterial risk for marine bathing sites, by regional council, 2018–23

Grade	Northland	Waikato	Bay of Plenty	Gisborne	Hawke's Bay	Taranaki	Manawatu-Whanganui	Wellington	Nelson	Marlborough	Tasman	West Coast	Canterbury	Otago	Southland	New Zealand
Insufficient data	1	0	0	0	0	0	2	0	2	0	0	0	1	0	0	4
Excellent	3	6	3	2	1	0	0	0	0	1	0	0	2	2	4	24
Good	26	2	13	7	7	0	3	17	4	3	2	3	21	8	5	121
Fair	15	2	8	5	6	6	4	24	1	4	2	2	15	4	2	100
Poor	8	4	4	7	7	12	2	19	0	1	0	0	8	2	2	76
Marine sites monitored	53	14	28	21	21	18	11	60	5	9	4	5	47	16	13	325

Note: New Zealand data excludes the Auckland region for reasons outlined in the 'Data for this indicator' section.
Source: Land, Air, Water Aotearoa 2023

Figure 4: Bacterial risk for marine bathing sites, by regional council, 2018–23

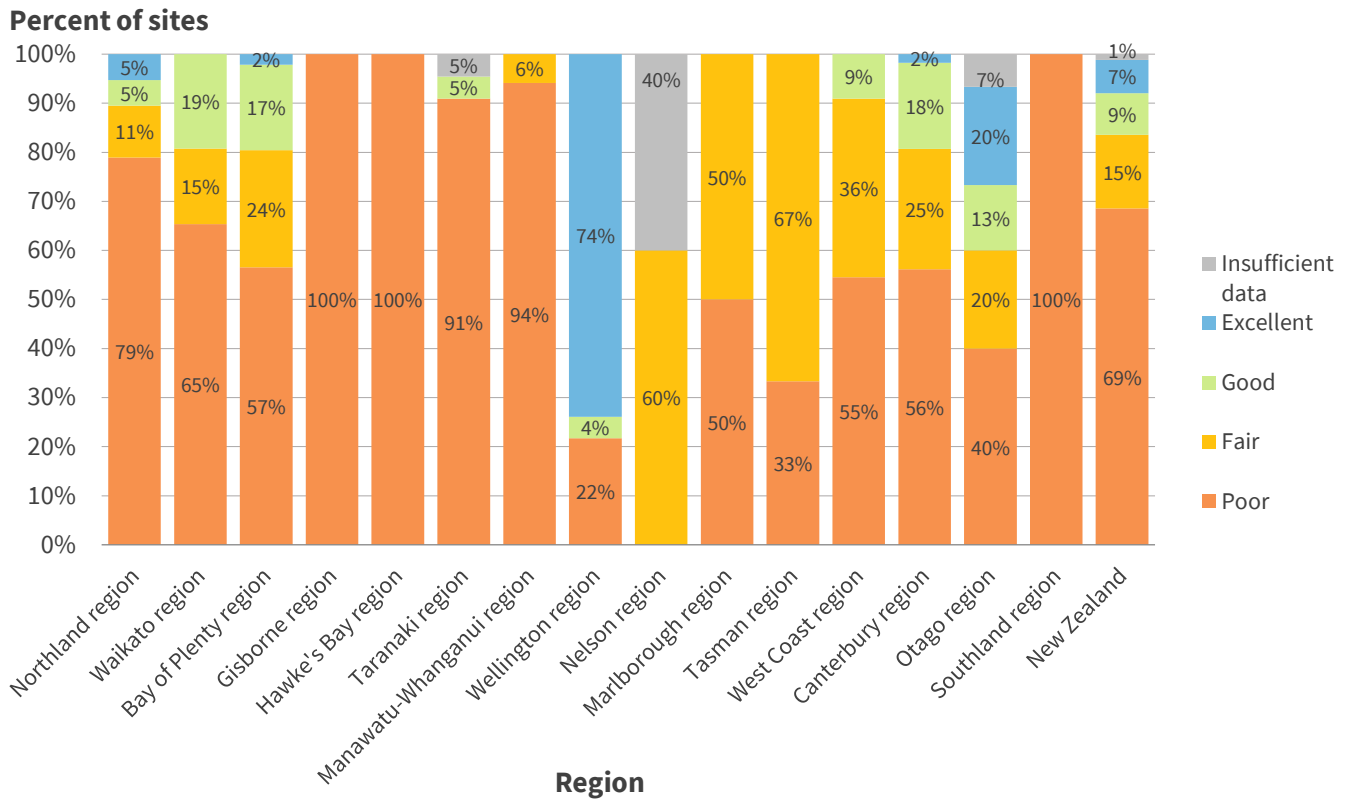


Source: Land, Air, Water Aotearoa 2023.

Long term bacterial risk was generally high at freshwater bathing sites

In contrast to marine bathing sites, most freshwater bathing sites were unsuitable for swimming, with 68.5% of all monitored river and lake sites receiving a 'poor' grade between 2018–23 (Figures 5 & 6). The Gisborne, Hawke's Bay, and Southland regions had the greatest proportion of unsafe sites, with all their freshwater bathing sites being graded 'poor'. The Manawatu-Whanganui region had the highest number of 'poor' grades overall (64) (Table 2).

Figure 5: Bacterial risk for freshwater bathing sites, by regional council, 2018–23



Note: New Zealand data excludes the Auckland region for reasons outlined in the 'Data for this indicator' section
 Source: Land, Air, Water Aotearoa 2023

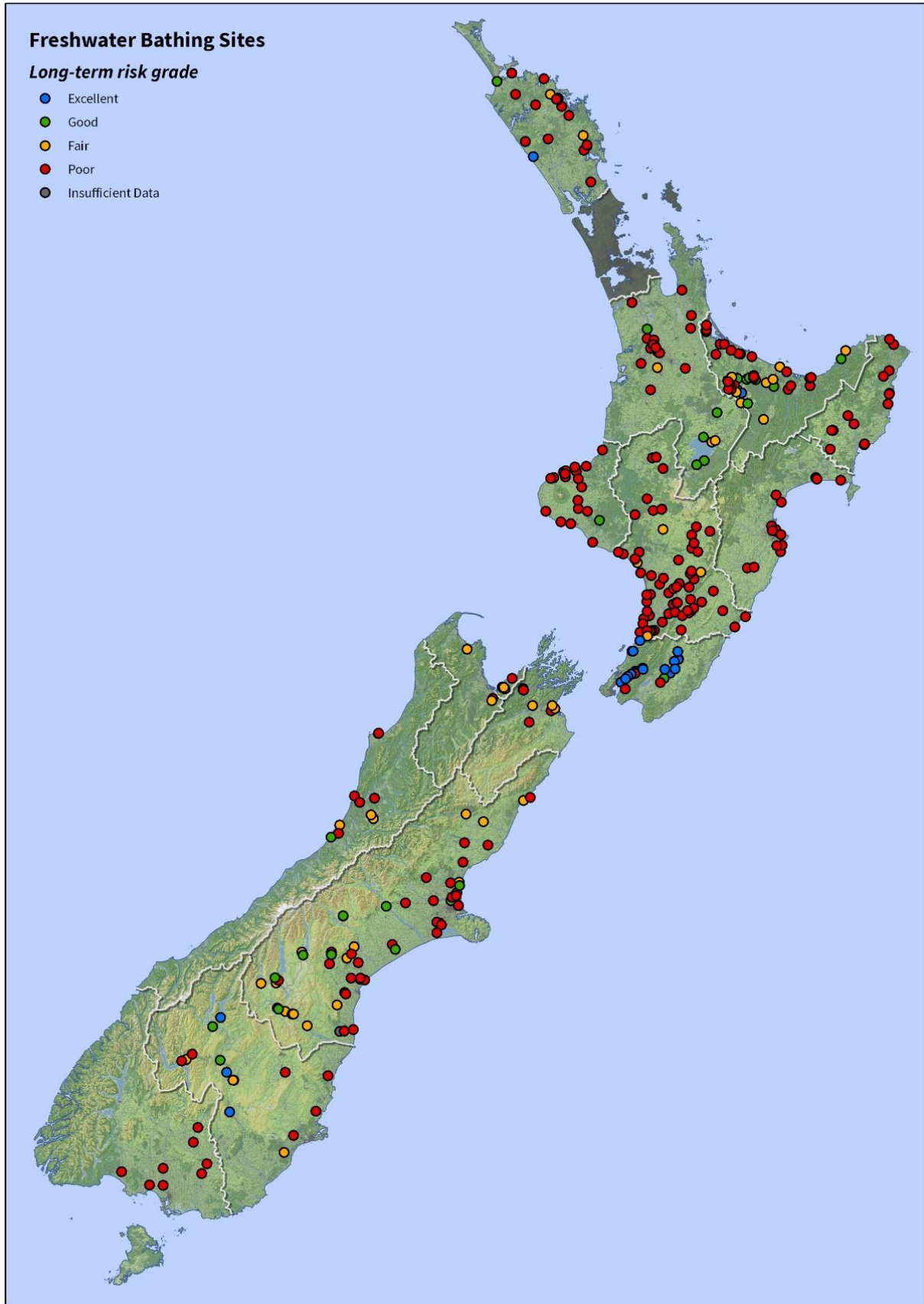
Table 2: Bacterial risk for freshwater bathing sites, by regional council, 2018–23

Grade	Northland	Waikato	Bay of Plenty	Gisborne	Hawke' s Bay	Taranaki	Manawatū-Whanganui	Wellington	Nelson	Marlborough	Tasman	West Coast	Canterbury	Otago	Southland	New Zealand
Insufficient data	0	0	0	0	0	1	0	0	2	0	0	0	0	1	0	4
Excellent	1	0	1	0	0	0	0	17	0	0	0	0	1	3	0	23
Good	1	5	8	0	0	1	0	1	0	0	0	1	10	2	0	29
Fair	2	4	11	0	0	0	4	0	3	4	2	4	14	3	0	51
Poor	15	17	26	14	15	20	64	5	0	4	1	6	32	6	8	233
Freshwater sites monitored	19	26	46	14	15	22	68	23	5	8	3	11	57	15	8	340

Note: New Zealand data excludes the Auckland region for reasons outlined in the 'Data for this indicator' section

Source: Land, Air, Water Aotearoa 2023

Figure 6: Bacterial risk for freshwater bathing sites, by regional council, 2018–23

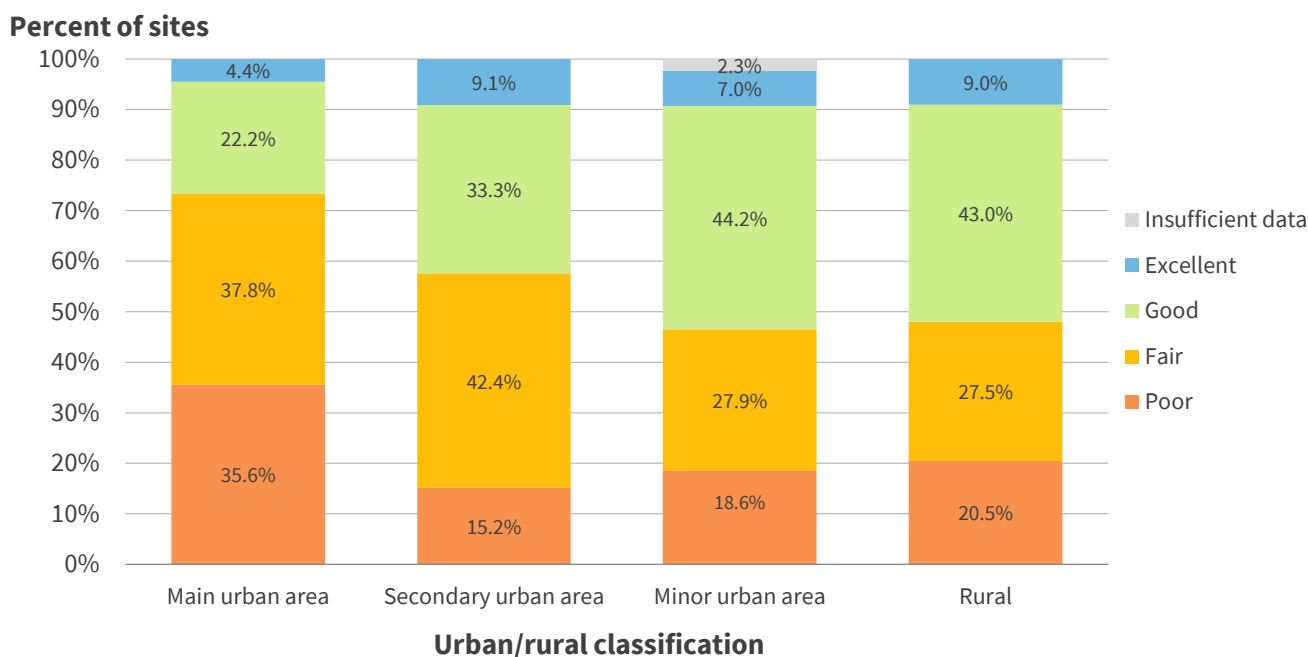


Source: Land, Air, Water Aotearoa 2023

Bathing sites in urban areas are less likely to receive excellent risk grades

Monitored marine swimming sites in secondary urban and rural areas received the highest proportions of 'excellent' grades at 9.1% and 9.0% respectively, followed by minor urban areas (7.0%). Main urban areas had the lowest proportion of marine swimming sites receiving 'excellent' grades (4.4%) (Figure 7). Minor urban and rural areas showed similar distributions of 'good', 'fair', and 'poor' grades in monitored marine swimming sites, with a higher proportion of these being 'good' (44.2% and 43.0%) than in secondary urban and main urban areas (33.3% and 22.2% respectively). Monitored marine swimming sites in main urban areas received the highest proportion of 'poor' grades at 35.6%.

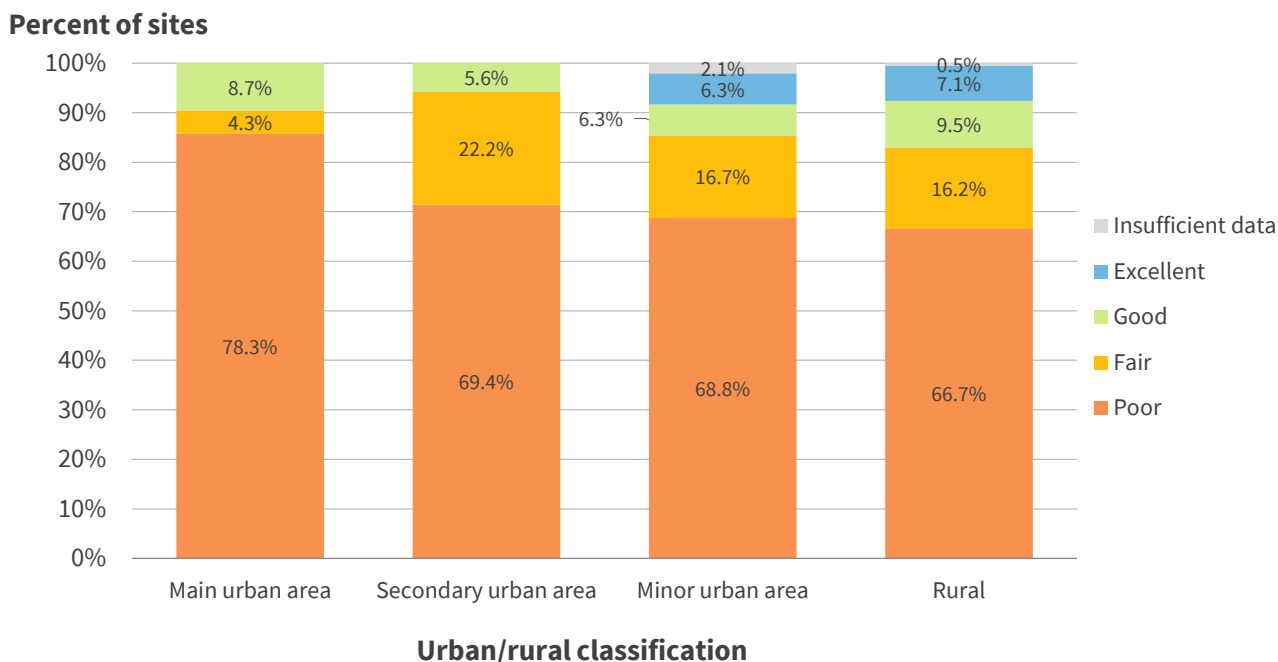
Figure 7: Bacterial risk at marine bathing sites, by urban/rural classification, 2018–23



Source: Land, Air, Water Aotearoa 2023

No freshwater bathing sites in the main or secondary urban areas received an 'excellent' grade. Main urban areas had the highest proportion of monitored freshwater bathing sites receiving 'poor' grades (78.3%) and the lowest proportion of sites receiving 'fair' grades (4.3%). Freshwater swimming sites in secondary urban areas, minor urban areas, and rural areas received similar proportions of 'poor' grades, with 69.4%, 68.8%, and 66.7% respectively (Figure 8).

Figure 8: Bacterial risk at freshwater bathing sites, by urban/rural classification, 2018–23



Source: Land, Air, Water Aotearoa 2023

Data for this indicator

This indicator analyses the most recent data available from Land, Air Water Aotearoa (LAWA)'s recreational bathing dataset, published online in October 2023.

Data availability

As the Auckland region does not supply water quality sampling results to LAWA, the region has been excluded from the recreational bathing data set and, consequently, from all analyses in this factsheet, as field measurements and predicted data are not comparable.

Grading of sites

Two measurements of swim site quality are presented in this fact sheet. Firstly, the regular monitoring results, which are passed to LAWA by regional councils and are based on regular field sampling at each site. A grade is assigned to every measurement based on the concentration of FIB at the time of measurement. Sampling is usually conducted at least once per week during the summer bathing season (the last week in October to the end of March). Grades are assigned to each measurement as below:

Grade	Criteria (<i>E. coli</i>)	Criteria (Enterococci)
Green	The site was safe to swim at the time of measurement.	
	Equal to or less than 260 <i>E. coli</i> per 100ml	Equal to or less than 140 Enterococci per 100ml
Amber	The site was generally safe at the time of measurement, but caution would be advised for children, the elderly, or those with compromised health	
	More than 260 <i>E. coli</i> per 100ml	More than 140 Enterococci per 100ml
Red	The site was not safe to swim at the time of measurement.	
	More than 550 <i>E. coli</i> per 100ml	More than 280 Enterococci per 100ml

Secondly, 'long-term bacterial risk' is calculated based on the 95th Hazen percentile value of all recorded FIB concentrations at a given swim site over the past five monitoring seasons. The overall risk is determined according to these criteria:

Grade	Criteria (<i>E. coli</i>)	Criteria (Enterococci)
Excellent	95 th percentile value of <i>E.coli</i> /100ml: 0–130	95 th percentile value of Enterococci /100ml: 0–40
Good	<i>Estimated risk of Campylobacter infection is <0.1%, 95% of the time.</i>	<i>Estimated risk of contracting an illness is <1% during the summer bathing period</i>
	95 th percentile value of <i>E.coli</i> /100ml: >130–260	95 th percentile value of Enterococci /100ml: >40–200
Fair	<i>Estimated risk of Campylobacter infection is >0.1–1%, 95% of the time.</i>	<i>Estimated risk of contracting an illness is <5% during the summer bathing period</i>
	95 th percentile value of <i>E.coli</i> /100ml: >260–500	95 th percentile value of Enterococci /100ml: >200–500
Poor	<i>Estimated risk of Campylobacter infection is 1%–5%, 95% of the time.</i>	<i>Estimated risk of contracting an illness is >5%–10% during the summer bathing period</i>
	95 th percentile value of <i>E.coli</i> /100ml: >500	95 th percentile value of Enterococci /100ml: >500
	<i>Estimated risk of Campylobacter infection is >5%, 95% of the time.</i>	<i>Estimated risk of contracting an illness is >5%–10% during the summer bathing period</i>

To receive a valid 'overall risk' grade, a site must have at least 50 sample results across the past five monitoring seasons (2018/19 – 2022/23) and must have been 'recently' monitored – i.e. it must have data recorded for the most recent two bathing seasons. Therefore, a site with more than 50 total measurements since 2018 but unmonitored in the 2022/23 swim season would be graded 'insufficient data'.

Samples taken as part of follow-up tests prompted by elevated FIB levels were excluded from the assessment. Where sites were monitored for both enterococci and *E.coli*, measurements of each FIB type were assessed separately, and the worse of the two resulting grades was assigned as the site's long-term grade. For additional information, see the [Metadata](#) sheet.

References

Land, Air, Water Aotearoa. 2023a. Factsheet: Coastal and freshwater monitoring. Retrieved from <https://www.lawa.org.nz/learn/factsheets/coastal-and-freshwater-recreation-monitoring/> on 13/11/2023

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Citation

Environmental Health Intelligence. 2021. *Access to safe drinking-water*. [Surveillance Report]. Wellington: Environmental Health Intelligence NZ, Massey University.

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