National Wastewater Surveillance Programme - COVID-19

Weeks 5 & 6 (Weeks Ending 5 February & 12 February 2023)

Report prepared on 17 February 2023

99%	70%	Omicron CH.1.1 (52%)
Sites tested in weeks 5 & 6 had SARS-CoV-2 detected (81/82 sites)	NZ population covered by wastewater testing	Most prevalent variant detected

Nationally, SARS-CoV-2 levels in wastewater have increased, although only to similar levels to those observed 2-3 weeks ago, and overall remain low. Variant analysis suggests that CH.1.1 and BA.2.75 continue to be the most common variant detected in wastewater.

- Comparing this week ending 12 February to week ending 30 January 2023, 55% of sites show an increase in SARS-CoV-2 levels while 30% sites showed a decrease in SARS-CoV-2.
- Comparing this week ending 12 February 2023 to one month ago (week ending 12 January 2023), 33% of sites show and increase in SARS-CoV-2 levels while 49% of sites showed a decrease in SARS-CoV-2 levels.
- The main variants detected in wastewater in the week ending 12 February 2023 (week 6) were CH.1.1 (~52%), and BA.2.75* (~33%). Minor contributions of BQ.1.1 (~1%), XBB (includes XBB.1.5, ~11%) and XBC (~3%). BA.4/BA.5 were not detected in week 6 (last detected in week 3).

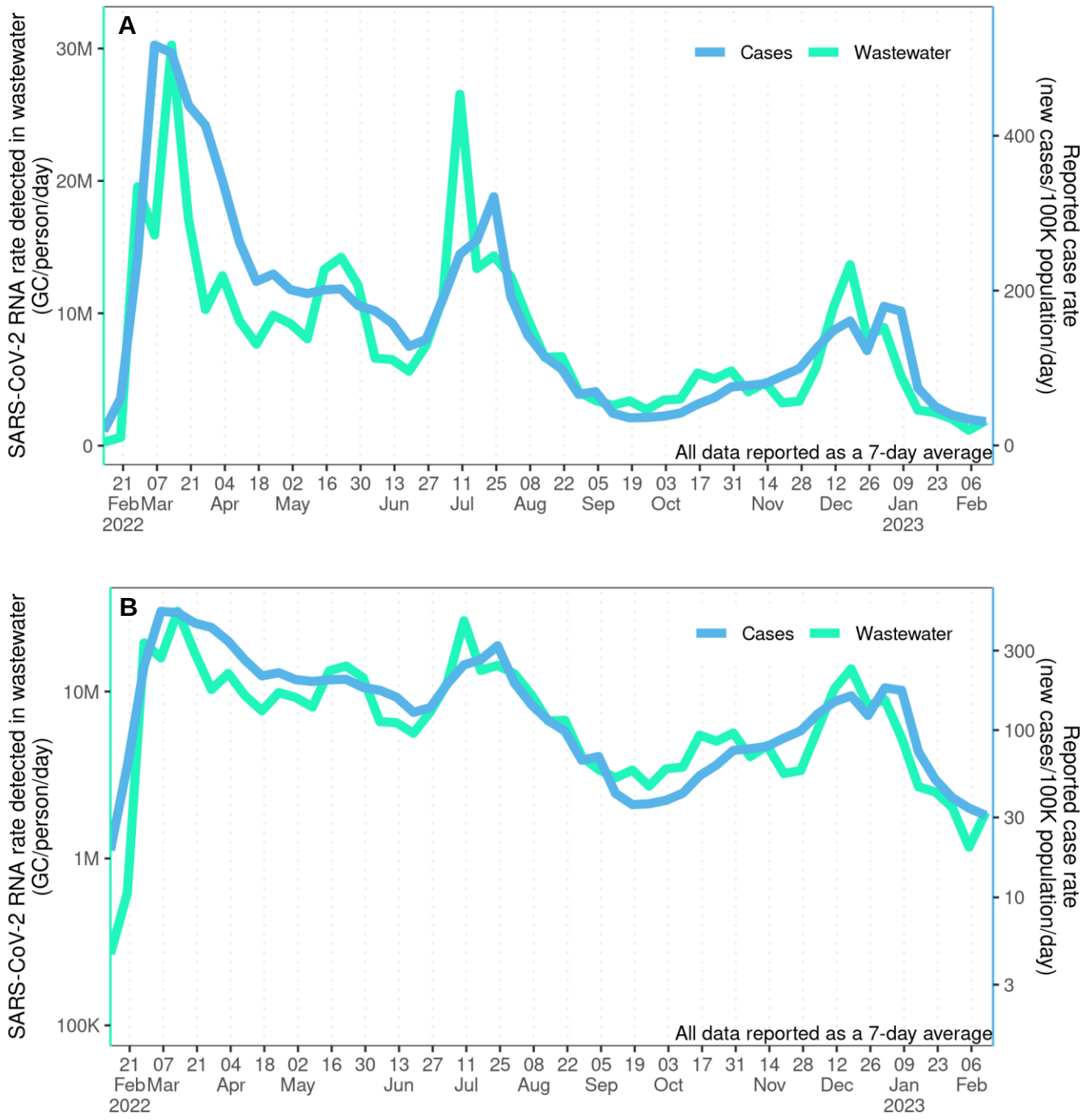


Figure 1. National timeseries of estimated SARS-CoV-2 genome copies (GC) in wastewater rate (GC/person/day, green line) and reported case rate (new cases/100,000 population/day, blue line) on a linear scale (**A**) and Log_{10} scale (**B**). Data reported as 7-day average.

Results for Weeks 5 & 6 (Weeks ending 5 February & 12 February 2023)

In the two weeks ending 12 February 2023, 211 samples were collected from 82 locations across New Zealand.

SARS CoV-2 RNA was **detected** in 204/211 (97%) of tested samples from 81/82 (99%) sites (Figure 2, Table 2).

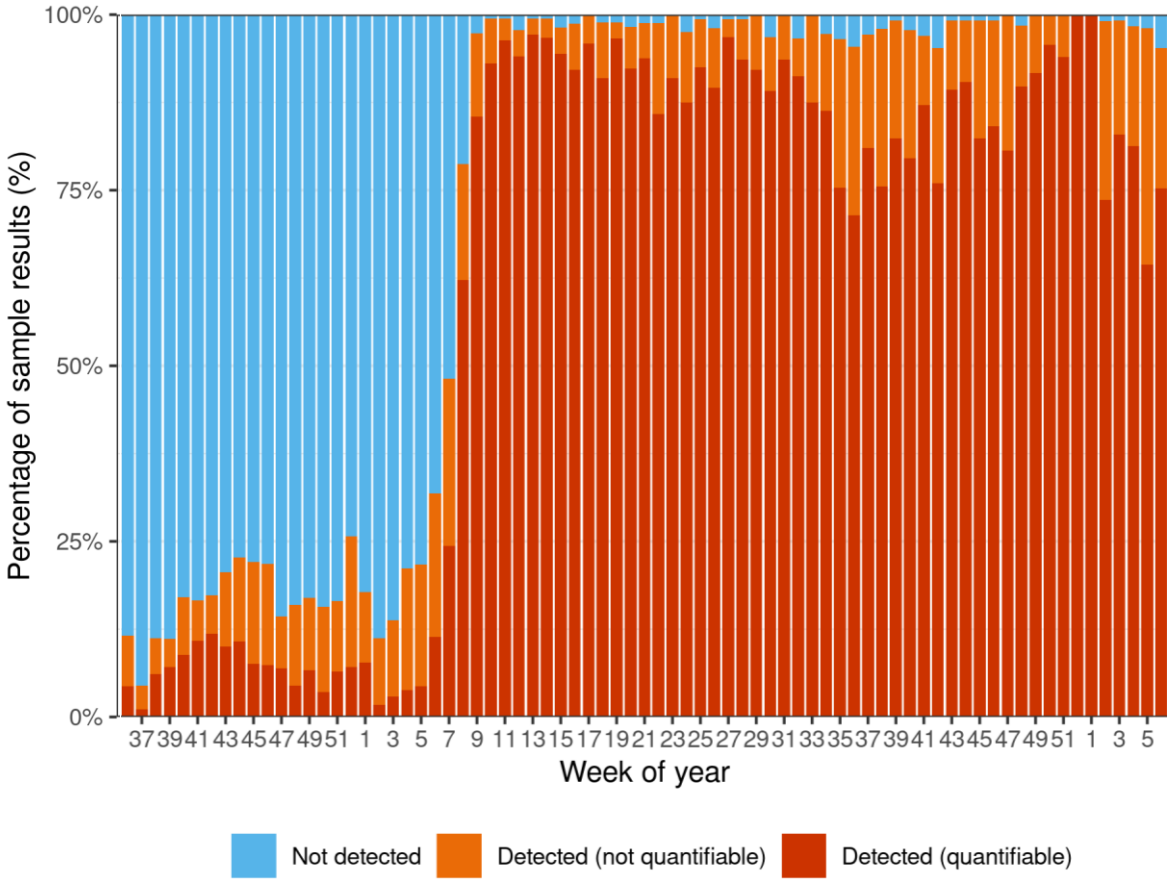


Figure 2. Results for SARS-CoV-2 RNA in wastewater collected across New Zealand.

Regional Trends

Regional summaries (Figure 3) of the wastewater data indicate an increase in levels across most regions, although it should be noted that levels are similar to 2-3 weeks ago, and remain low. Note that regional trend analysis for week 52 (2022) and week 1 (2023) was only possible for Auckland Metro, as there were limited samples collected during the holiday period. Viral quantitation for the other regions were therefore not available during this period.

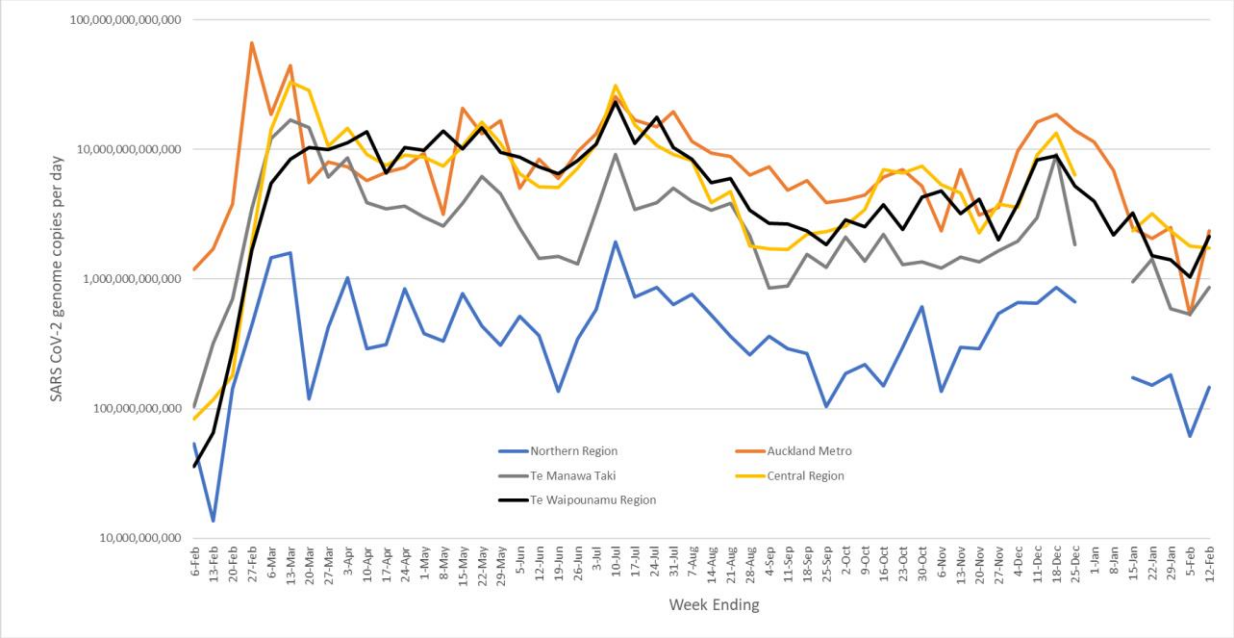


Figure 3. Total SARS-CoV-2 genome copies detected per day in the five Ministry of Health regions.

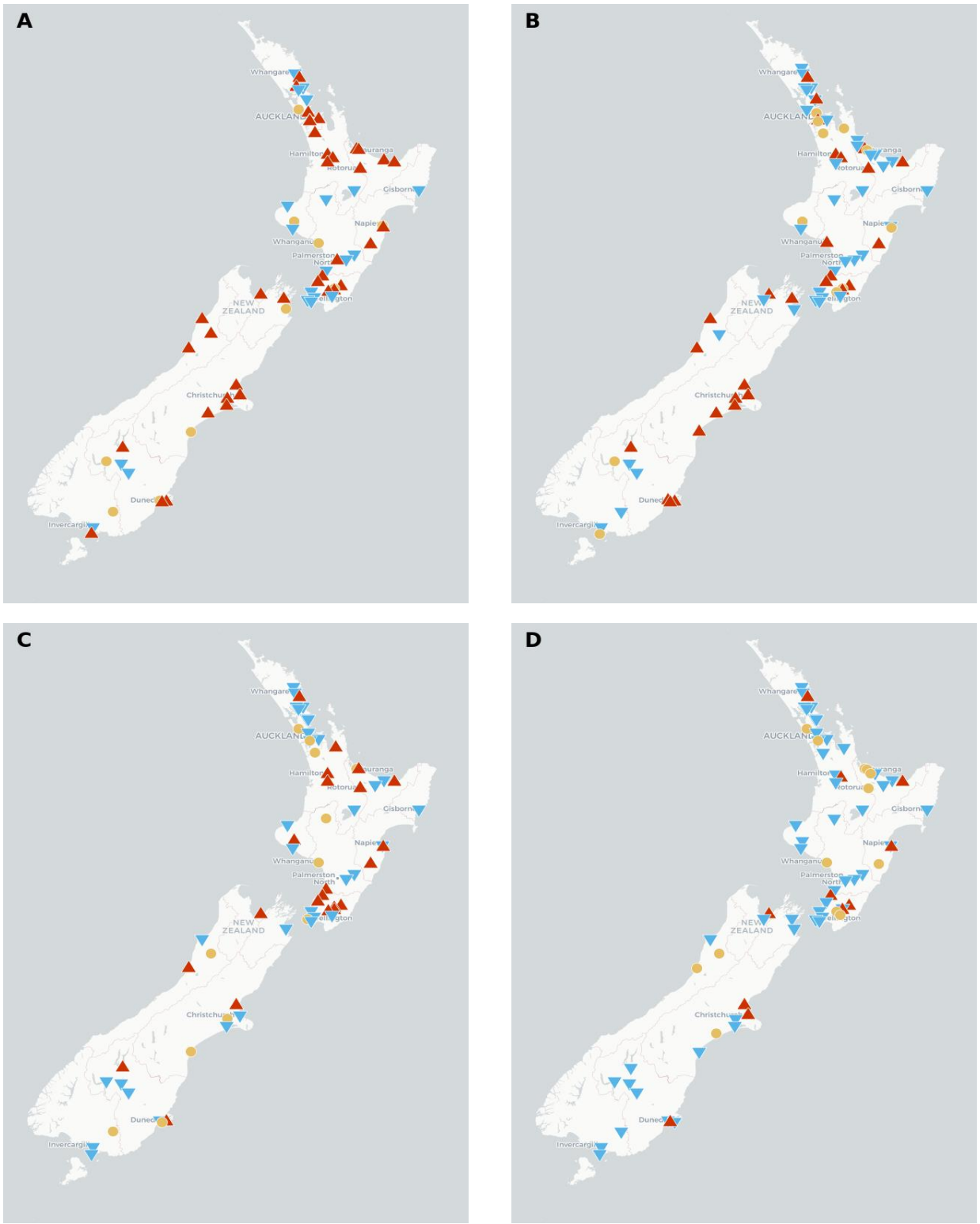


Figure 4. Comparison of SARS-CoV-2 levels for the week ending 12 February 2023, compared to levels measured: A) 1 week ago; B) 2 weeks ago; C) 4 weeks ago; D) 12 weeks ago. Only sites with results for both time points are included. When the viral quantity is 30% or more higher this is labelled as increased (red up arrow on map). When the viral quantity is 30% or more lower, this is labelled as decreased (blue down arrow on map). If viral levels have changed less than this in the compared weeks, this is labelled as no change (yellow circle on map). Interactive map of weekly results available publicly at https://www.poops.nz/

Wastewater Variant Analysis

In collaboration with Wilderlab, ESR generated the variant analysis results from sentinel sites in week 5 (ending 30 January 2023) and week 6 (ending 12 February 2023). Note that the generally low viral levels in wastewater in weeks 5 and 6 mean that variant detection may be less reliable.

Wastewater variant analysis is based on sequencing a short fragment of the spike gene and therefore provides less resolution than WGS from clinical cases. As such, some specific lineages cannot be distinguished from each other, and are reported as variant groups. The following variants/groups are reported: BA.4/BA.5, BA2.75* (includes BA.2.75/XBF/BR.2 subvariants), CH.1.1, BQ.1.1, XBB (includes XBB.1.5) and XBC.

Consistent with the WGS of clinical cases, the **CH.1.1 subvariant** will now be reported separately from other BA.2.75* subvariants.

CH.1.1 was the most widespread and common variant in wastewater in weeks 5 and 6. Where variants could be determined, **CH.1.1** was detected at all the week 5 sites, and in 15/18 of the week 6 sites. CH.1.1 comprised ~54% (week 5) to ~52% (week 6) of sequencing reads nationally. Other subvariants in the BA.2.75* group (includes BM.4, BR.2, XBF and BA.2.75) accounted for another ~30% (week 5) to ~33% (week 6) of sequencing reads nationally, being detected at 11/17 (week 5) and 10/18 (week 6) sites. Thus, as a whole, the BA.2.75* constellation represented ~85% of sequencing reads nationally in both weeks.

The BA.4/BA.5 variant group (includes **BF.7**) was not detected at any site in weeks 5 and 6.

Levels of BQ.1.1 in wastewater have declined being only being detected in 4 sites in week 5 and 2 different sites in week 6 (Figure 5).

The XBB variant (includes XBB.1.5) accounted for ~5-11% of reads nationally in weeks 5 and 6. The wastewater assay cannot distinguish XBB.1.5 from other XBB variants.

The XBC variant also remains at relatively low levels. In week 5, it accounted for ~4% of sequence reads and ~3% of reads in week 6.

Due to the increasing complexity of variants in the population, each at relatively low levels, the current approach for sequencing wastewater samples needs to be more precise to report percentages for each variant at the sentinel site level. Instead, the presence of each lineage will currently be reported. ESR is actively testing and developing methods to address the current uncertainty and increase the resolution to identify variants in wastewater.

	Week 5						Week 6					
	BA.4/BA.5	BA.2.75*	CH.1.1	BQ.1.1	XBB	XBC	BA.4/BA.5	BA.2.75*	CH.1.1	BQ.1.1	XBB	XBC
Whangarei												
North Shore												
Auckland East												
Auckland Southwest												
Auckland West												
Mt Maunganui												
Tauranga												
Rotorua												
Taupo												
Gisborne												
New Plymouth												
Palmerston North												
Porirua												
Hutt Valley												
Wellington (Moa Point)												
Nelson												
Christchurch												
Queenstown												
Dunedin (Tahuna)												
Dunedin (Mosgiel)												
All Sites (national)		30	54	7	5	4		33	52	1	11	3

Table 1. Data from 19 wastewater sentinel sites sampled in week 5 (ending 5 February 2023) and week 6 (ending 12 February 2023) using a S-gene (spike) barcoding assay able to 'call' the BA.4/BA.5, the BA2.75* constellation (includes BA.2.75/XBF/BR.2 subvariants), CH.1.1, BQ.1.1, XBB (includes XBB.1.5) and XBC (sub)variants. Coloured box denotes that the variant was detected at that site that week, and white box denotes that the variant was not detected. Grey box denotes site was not sequenced/no sample. Numbers in the bottom row denote the estimated percentage of each variant at the national scale. No sequence reads mapped to variants for Auckland East or Dunedin (Tahuna) in week 5, and Gisborne in week 6.

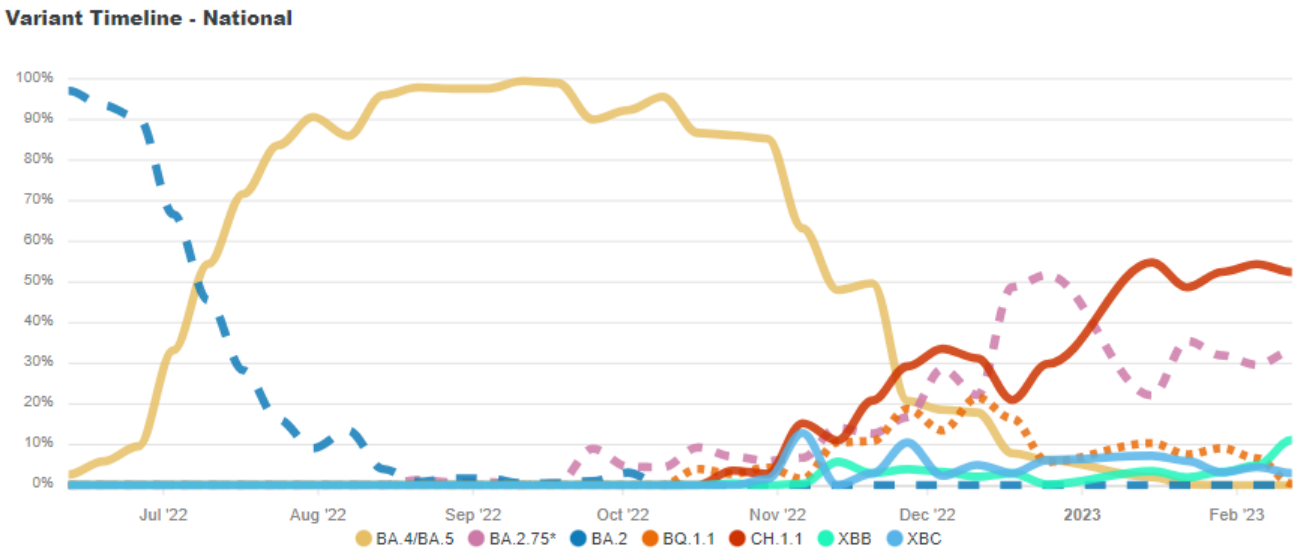
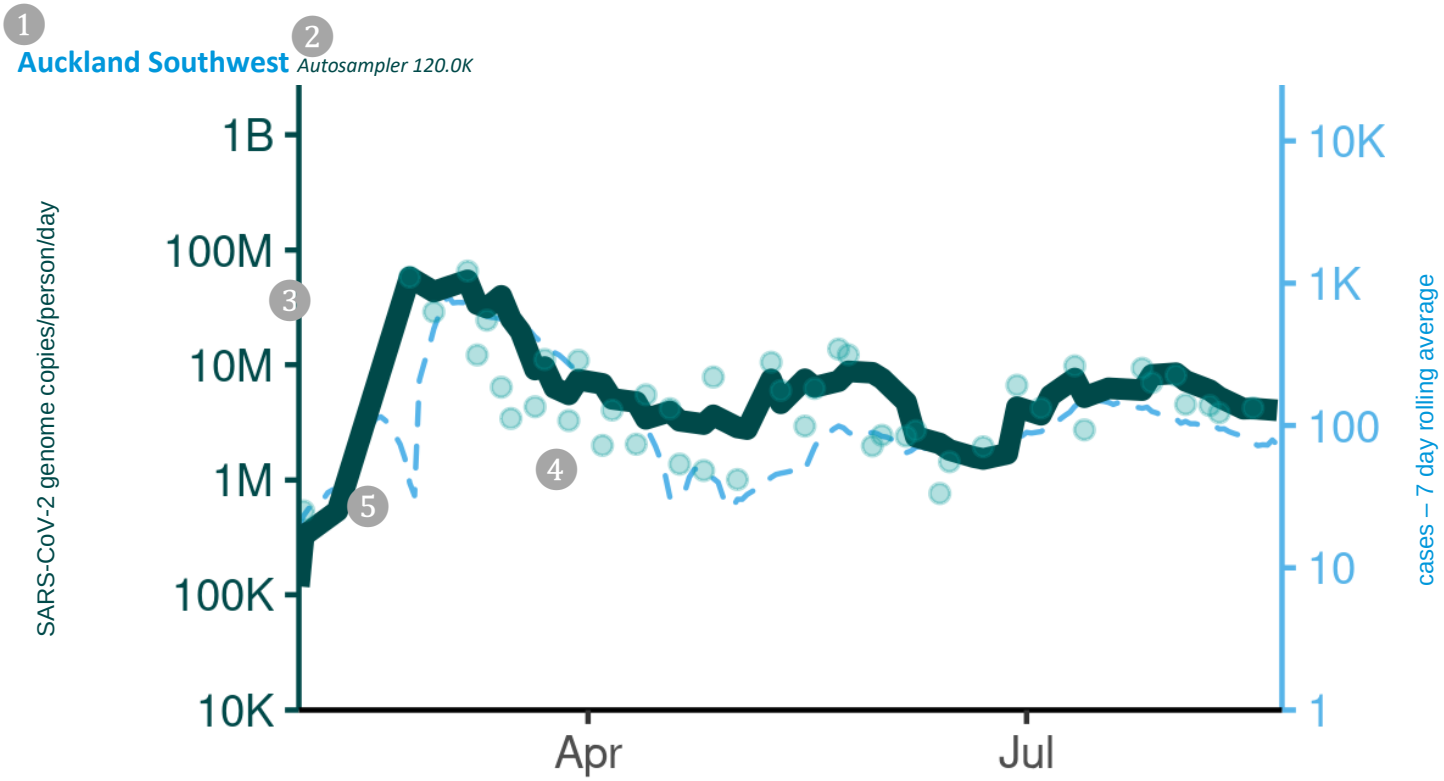


Figure 5. Change in variant prevalence over time at a national scale. Data are collected from up to 20 sentinel sites each week.

Interpreting Sites Graphs

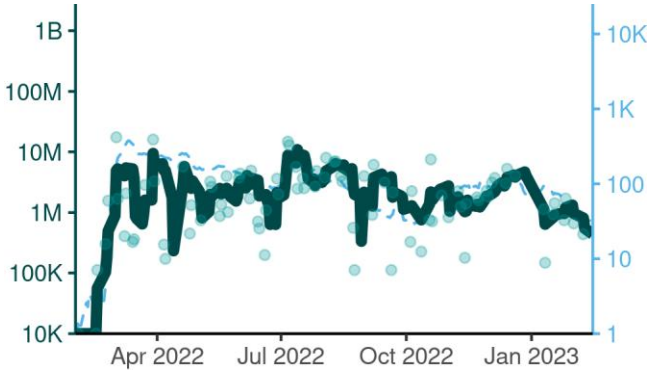


1. Site Name
2. Sample collection method and population. Results based on autosampler may be more representative than grab sample-based results.
3. Wastewater results shown as solid line | 14-day average of genome copies/person/day on a $\log_{10}$ scale.
4. Individual results samples shown as circles | Rolling 14-day average of genome copies/person/day on a $\log_{10}$ scale.
5. Rolling 7-day average of new cases shown as dashed line | New cases reported in a catchment based on reported date of illness on a $\log_{10}$ scale. This data is not available for all sites and subject to change.

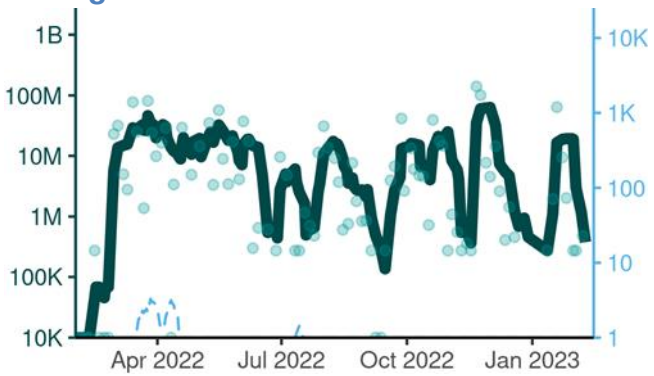
Note: Wastewater and cases data are on a $\log_{10}$ scale. Scales on all graphs have been normalised to cover the same scale on every graph. Care should be taken when interpreting the data.

Northland

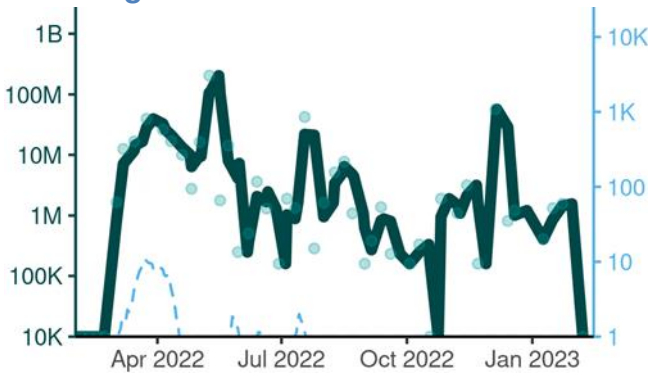
Whangarei *Autosampler 65.0K*



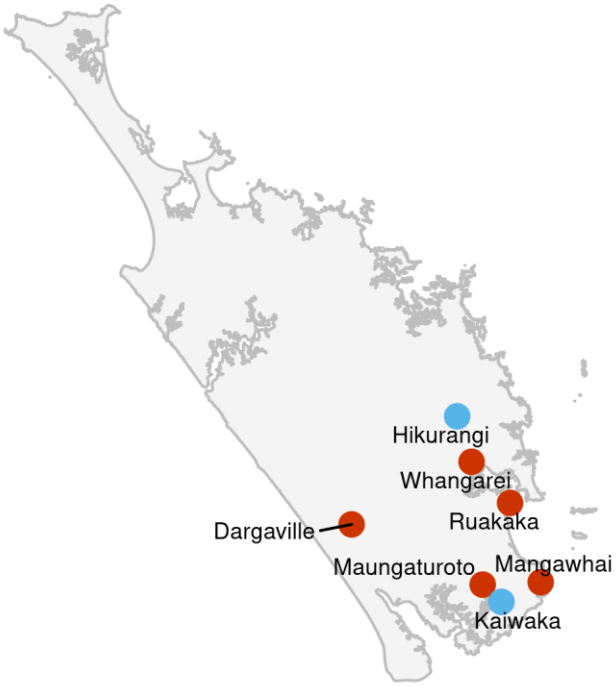
Maungaturoto *Grab 1.3K*



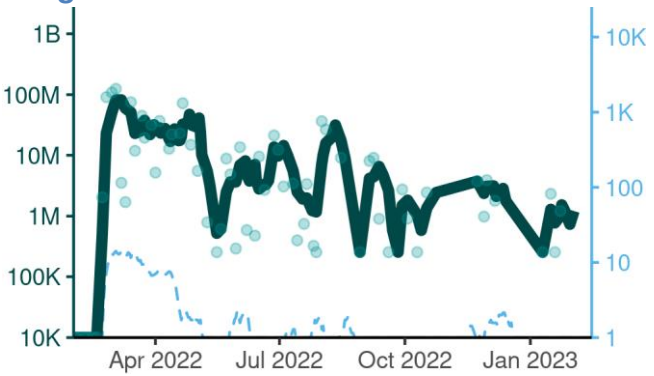
Hikurangi *Grab 1.7K*



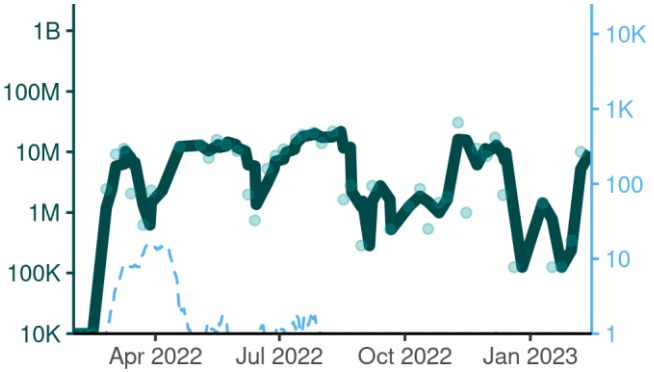
SARS-CoV-2 genome copies / day / person



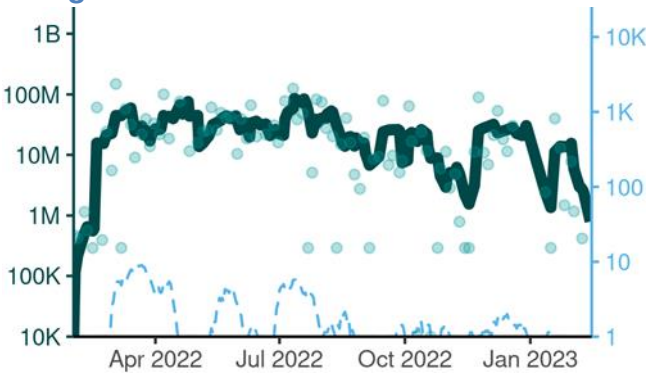
Dargaville *Grab 5.0K*



Ruakaka *Grab 4.5K*

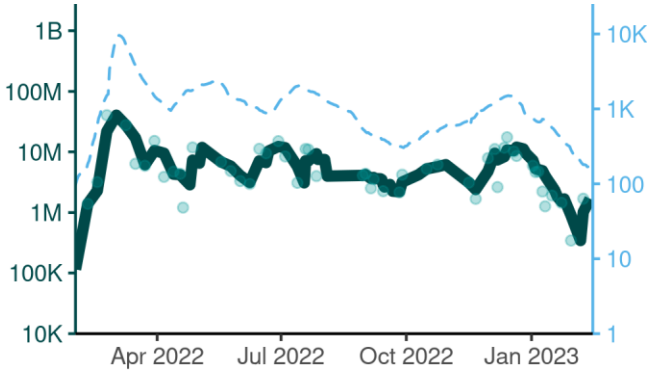


Mangawhai *Grab 1.1K*

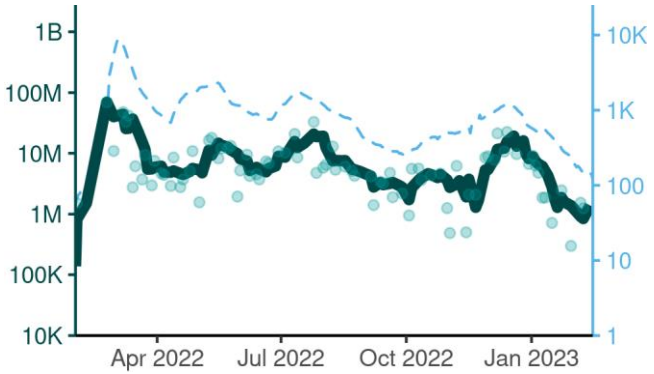


Auckland

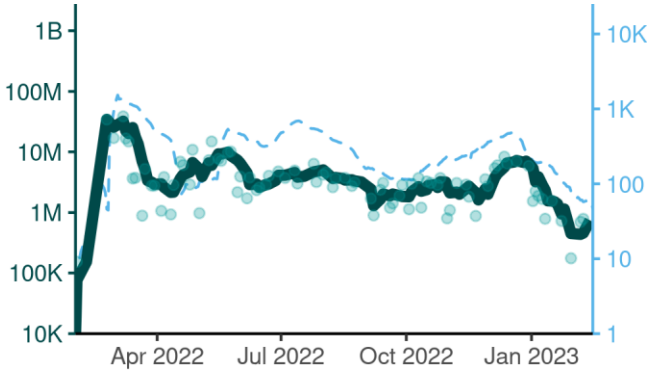
Auckland (Combined) *Autosampler 1.1M*



Auckland East *Autosampler 680.0K*

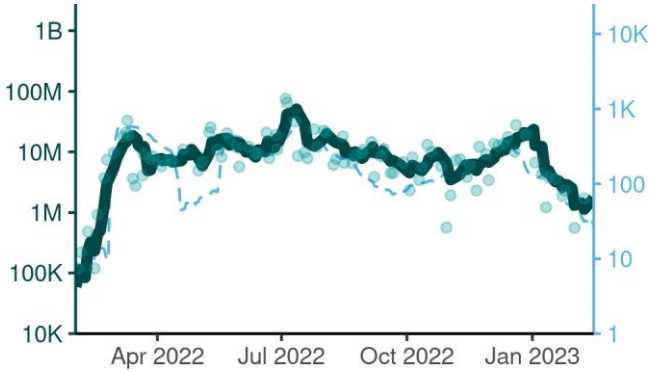


Auckland West *Autosampler 315.0K*

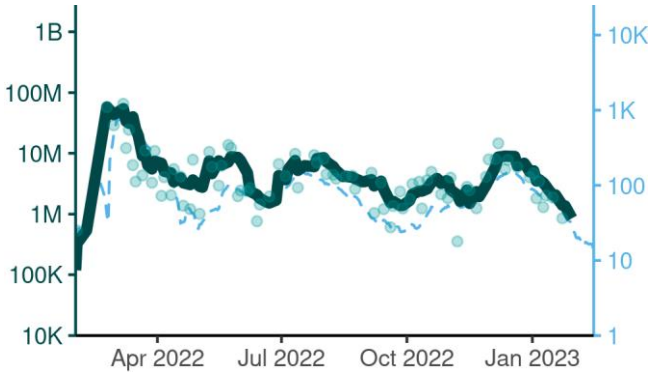


SARS-CoV-2 genome copies / day / person

North Shore *Autosampler 240.0K*

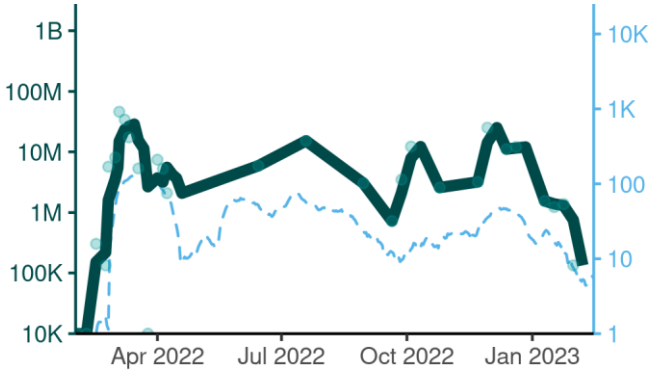


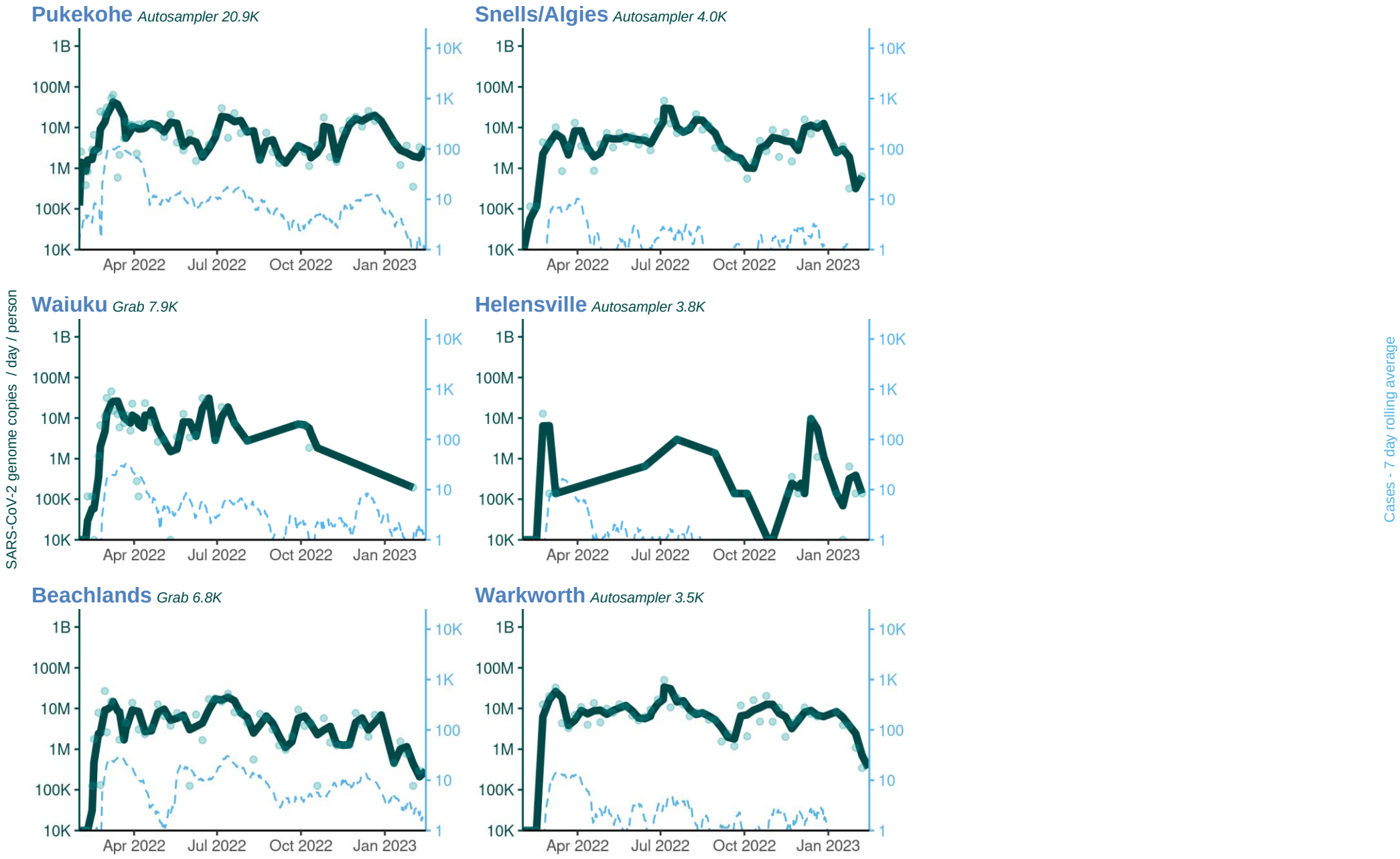
Auckland Southwest *Autosampler 120.0K*



Cases - 7 day rolling average

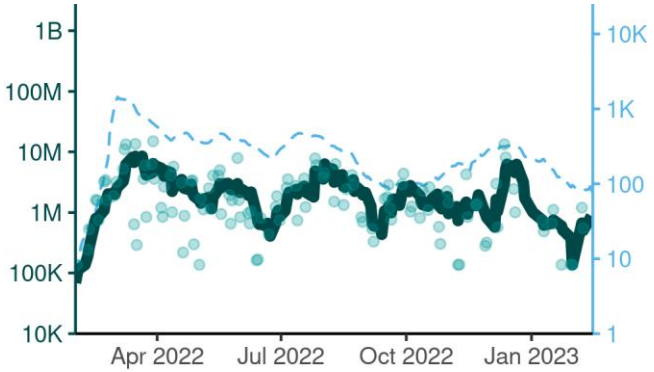
Army Bay *Autosampler 42.0K*



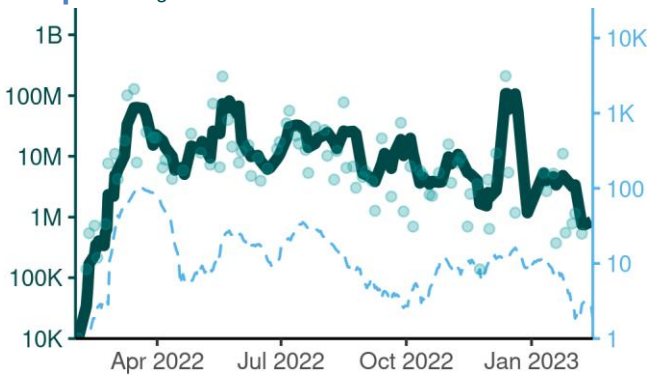

Pukekohe Autosampler 20.9K
Snells/Algies Autosampler 4.0K
Waiuku Grab 7.9K
Helensville Autosampler 3.8K
Beachlands Grab 6.8K
Warkworth Autosampler 3.5K
SARS-CoV-2 genome copies / day / person
Cases - 7 day rolling average
1B
100M
10M
1M
100K
10K
1K
100
10
1
Apr 2022
Jul 2022
Oct 2022
Jan 2023

Waikato

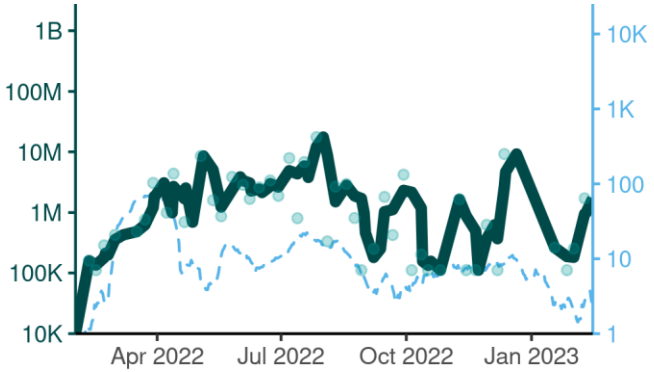
Hamilton *Autosampler 169.0K*



Taupo *Auto/grab 23.0K*

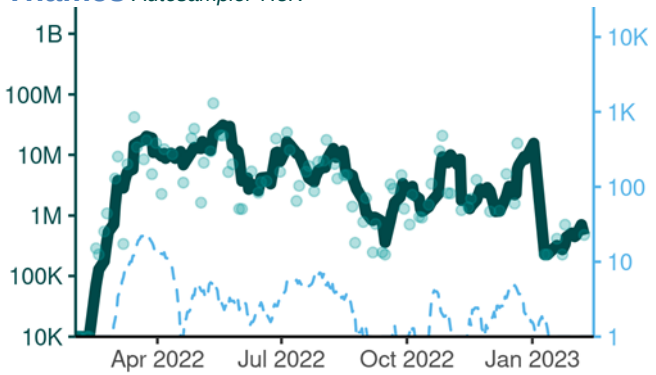


Cambridge *Autosampler 20.1K*

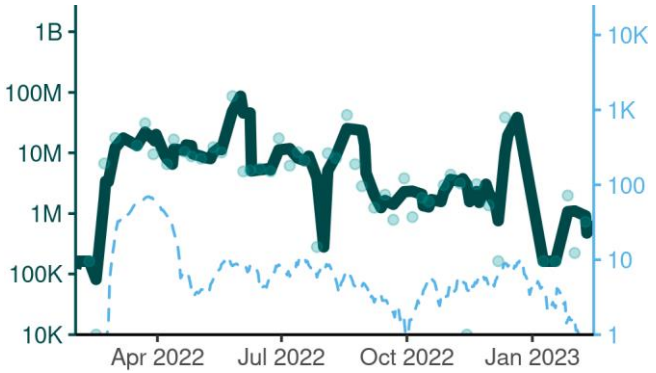


SARS-CoV-2 genome copies / day / person

Thames *Autosampler 7.5K*

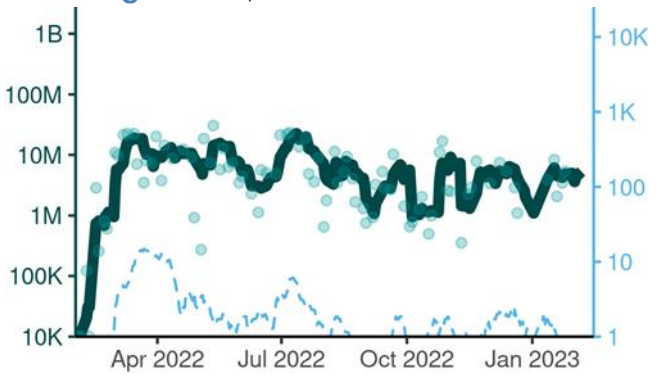


Te Awamutu *Autosampler 13.1K*

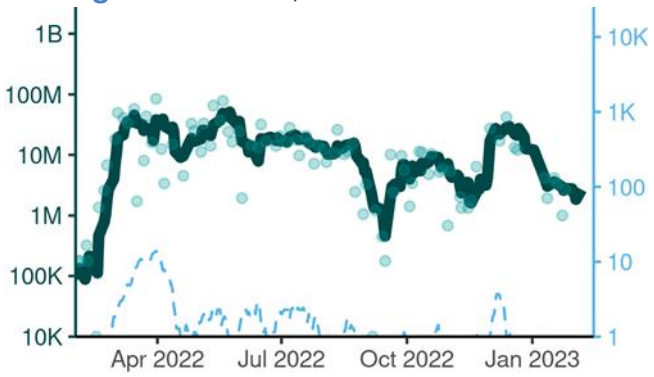


Cases - 7 day rolling average

Whitianga *Autosampler 6.6K*



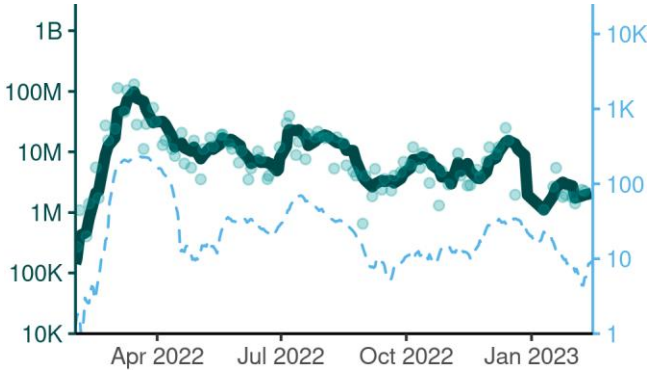
Whangamata *Autosampler 4.0K*



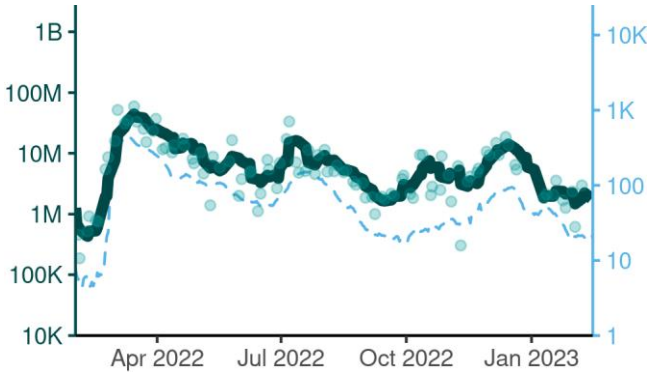
SARS-CoV-2 genome copies / day / person

Bay of Plenty and Gisborne

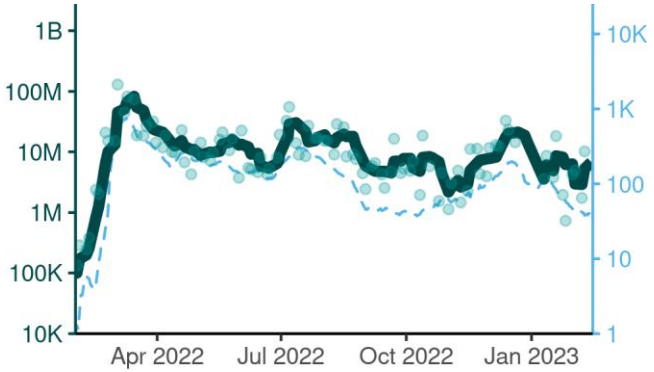
Mt Maunganui/Papamoa *Autosampler 65.0K*



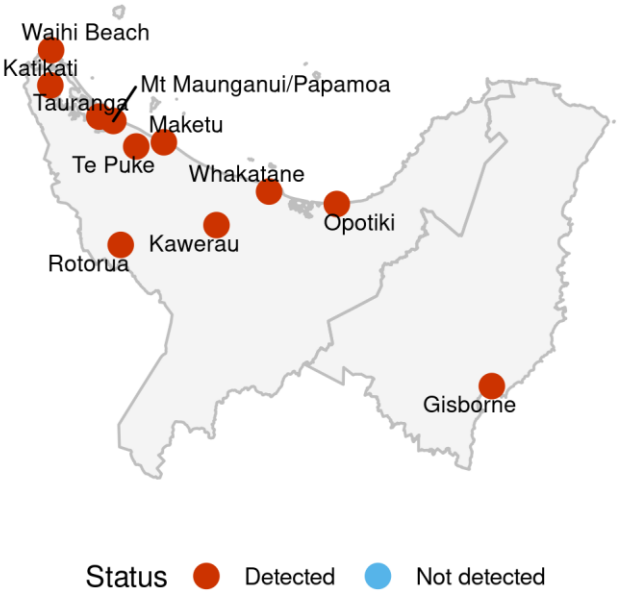
Rotorua *Autosampler 59.0K*



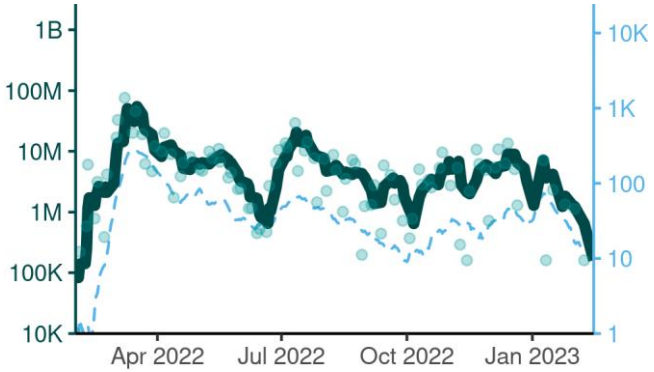
Tauranga *Autosampler 50.0K*



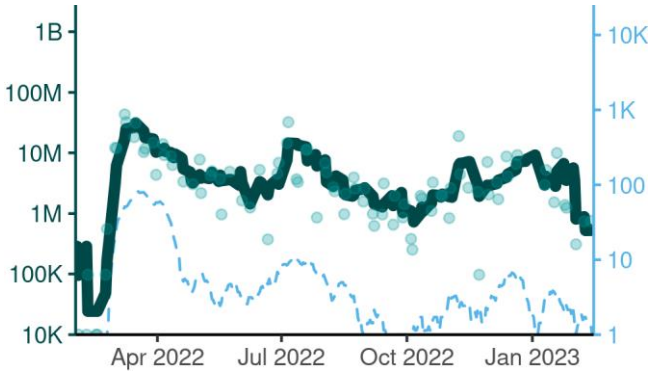
SARS-CoV-2 genome copies / day / person



Gisborne *Autosampler 37.0K*

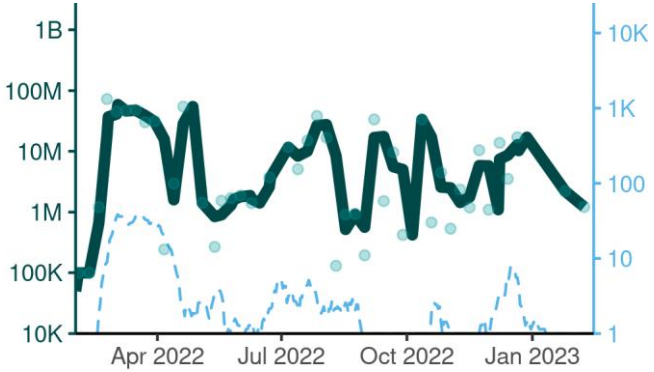


Whakatane *Autosampler 21.0K*

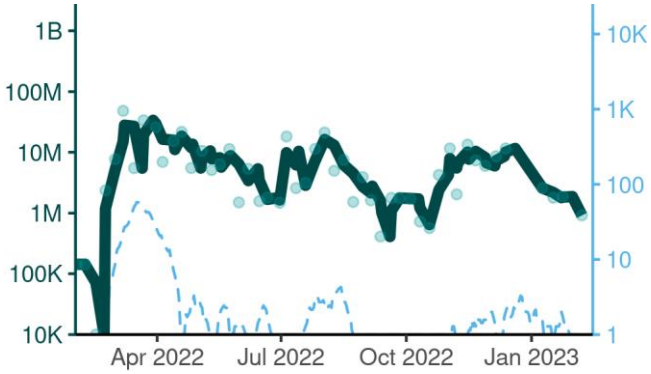


Cases - 7 day rolling average

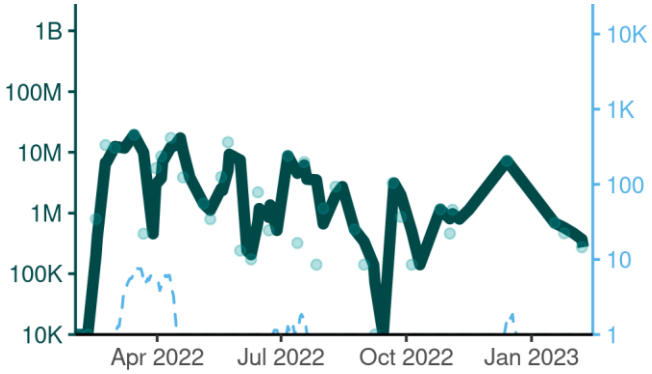
Te Puke *Autosampler 9.7K*



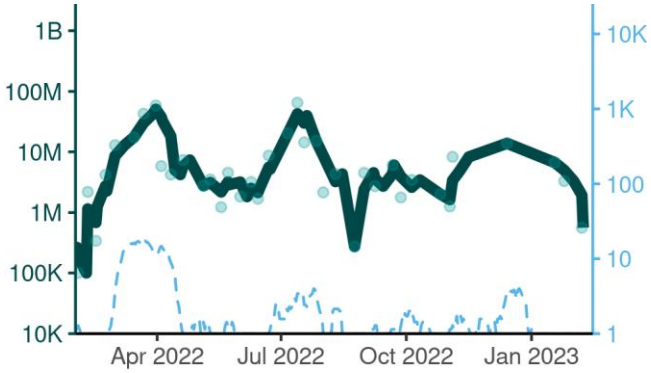
Kawerau *Autosampler 7.0K*



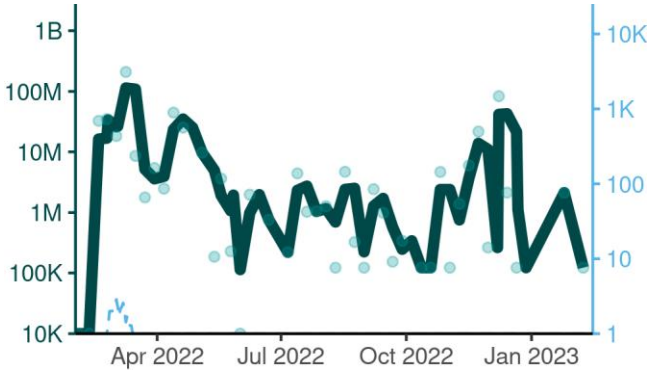
Waihi Beach *Autosampler 3.6K*



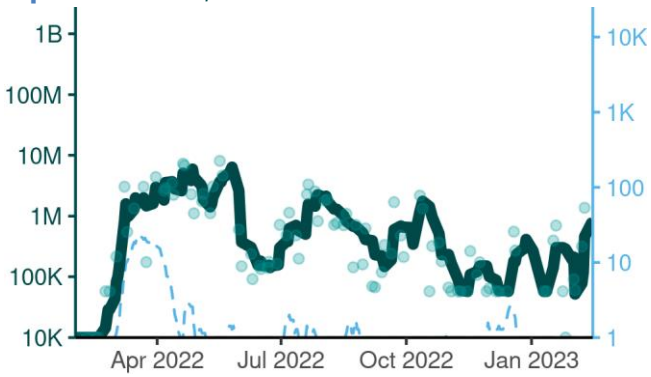
Katikati *Autosampler 5.5K*



Maketu *Autosampler 1.3K*



Opotiki *Autosampler 3.8K*

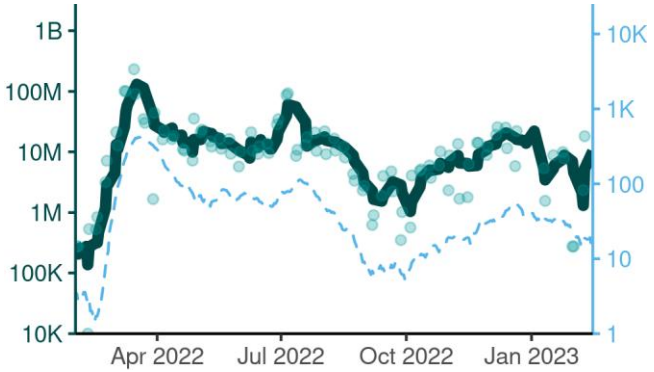


SARS-CoV-2 genome copies / day / person

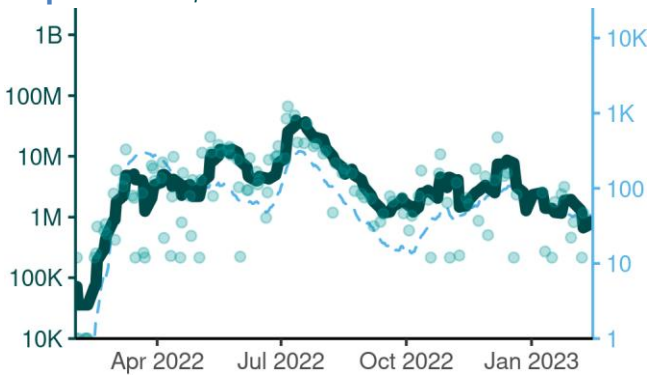
Cases - 7 day rolling average

Hawke's Bay

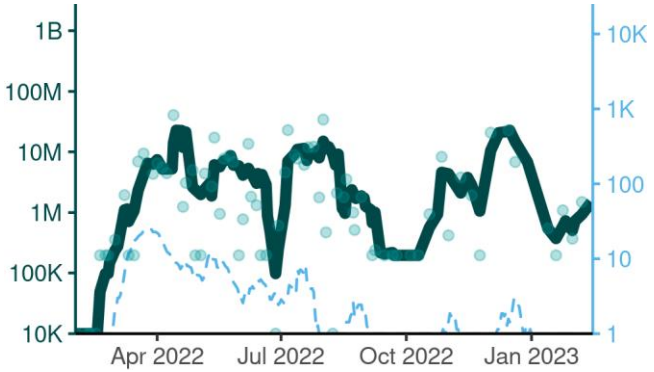
Hastings *Autosampler 80.0K*



Napier *Autosampler 55.0K*

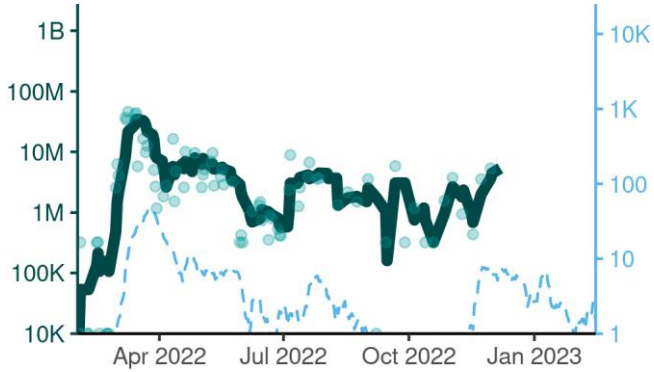


Waipukurau *Autosampler 4.6K*

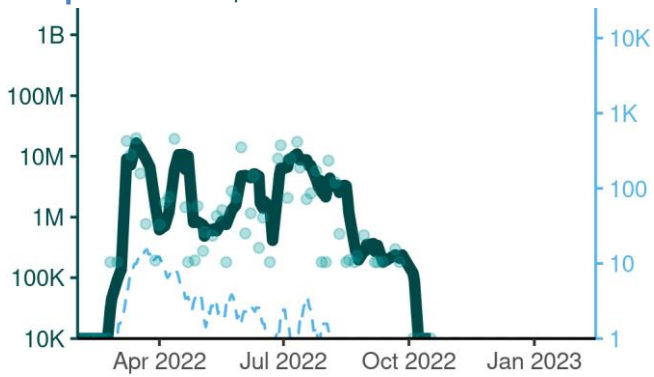


SARS-CoV-2 genome copies / day / person

Wairoa *Grab 4.4K*



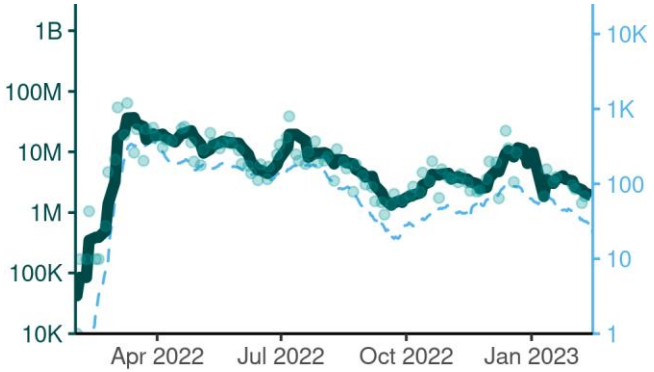
Waipawa *Autosampler 2.2K*



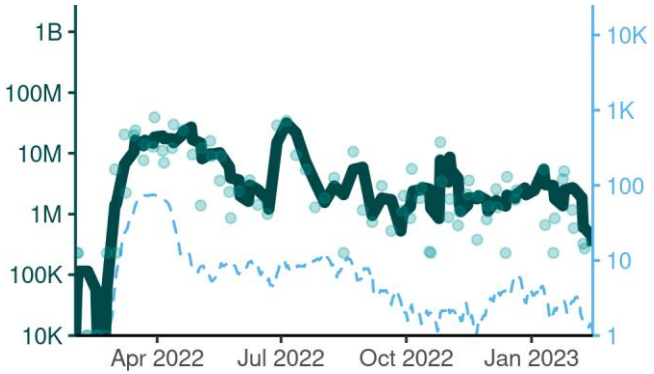
Cases - 7 day rolling average

Taranaki

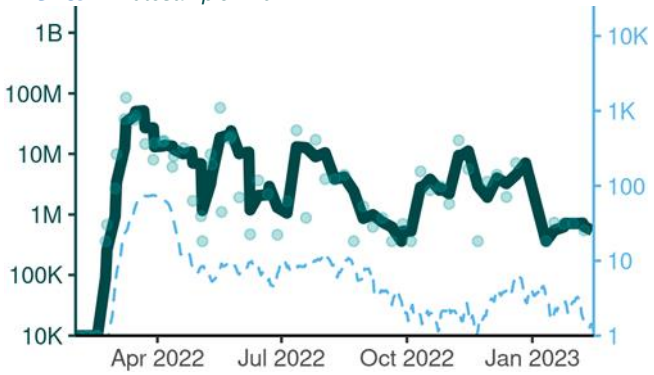
New Plymouth *Autosampler 88.0K*



Hawera *Autosampler 12.0K*



Eltham *Autosampler 2.0K*

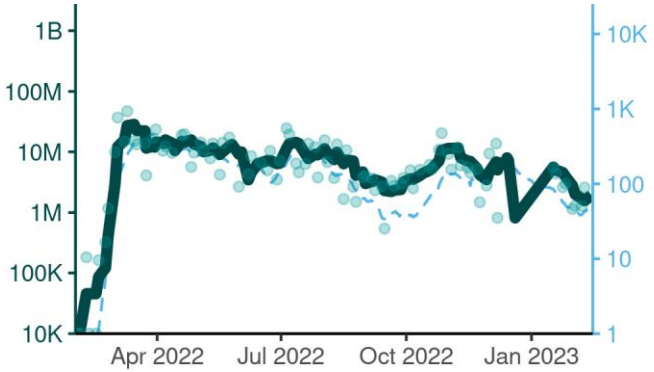


SARS-CoV-2 genome copies / day / person

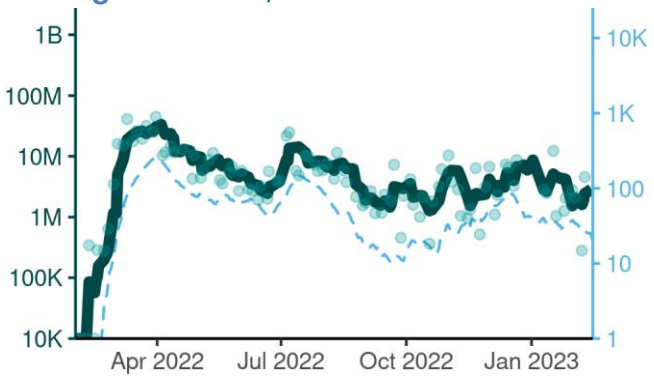
Cases - 7 day rolling average

Manawatu-Whanganui

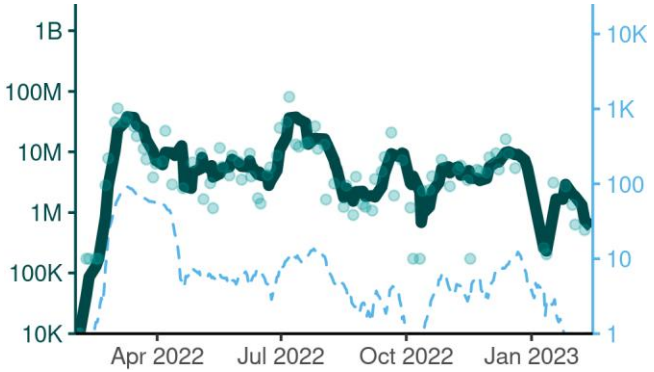
Palmerston North *Autosampler 90.0K*



Whanganui *Autosampler 44.5K*

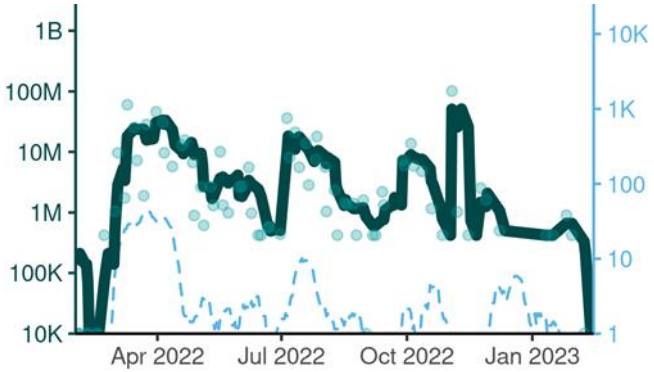


Levin *Autosampler 21.2K*

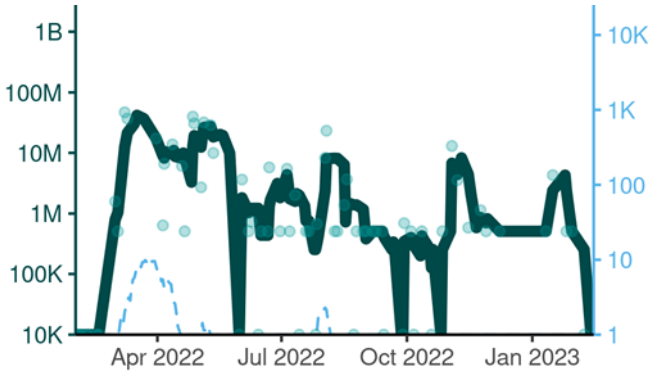


SARS-CoV-2 genome copies / day / person

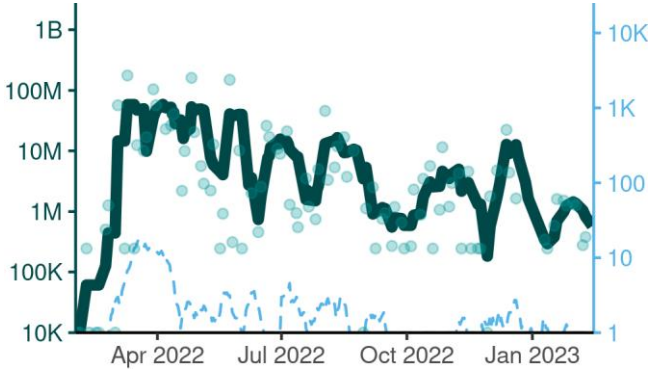
Dannevirke *Grab 5.7K*



Woodville *Grab 1.7K*

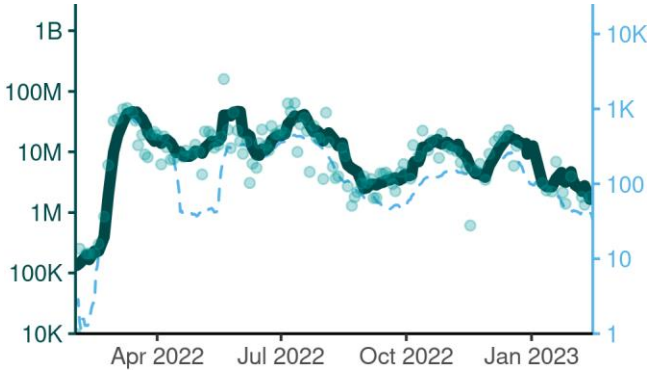


Taumarunui *Grab 4.0K*

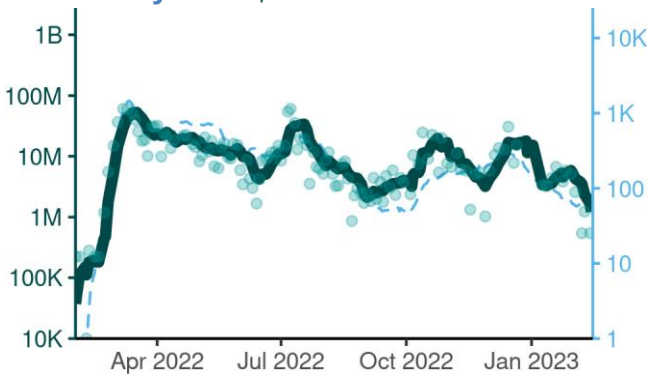


Wellington

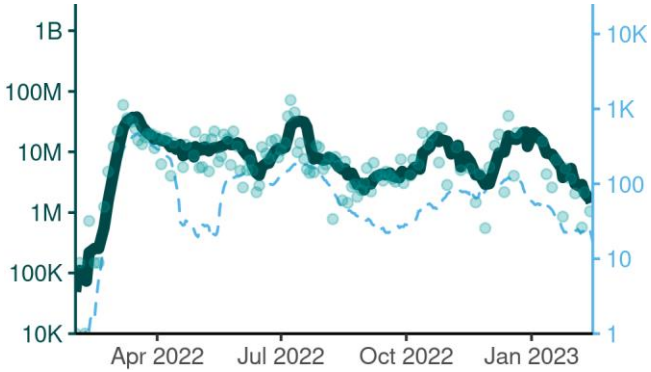
Wellington (Moa Point) *Autosampler 168.0K*



Hutt Valley *Autosampler 133.0K*

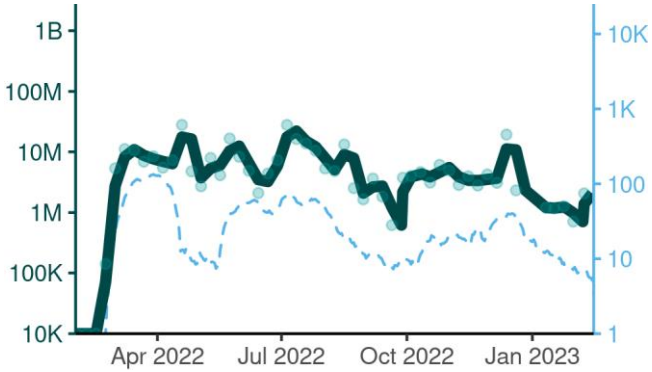


Porirua *Autosampler 85.0K*

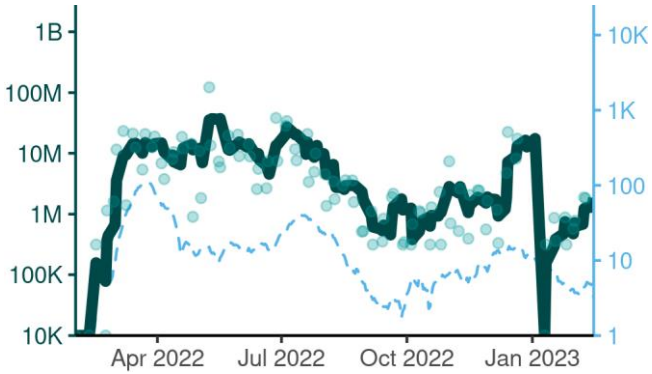


SARS-CoV-2 genome copies / day / person

Paraparaumu *Autosampler 49.0K*

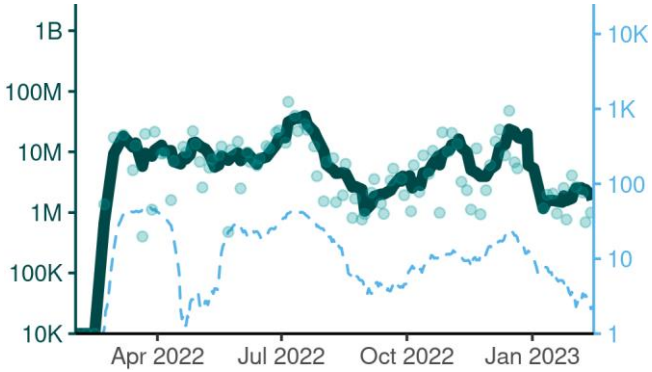


Masterton *Auto/grab 20.7K*

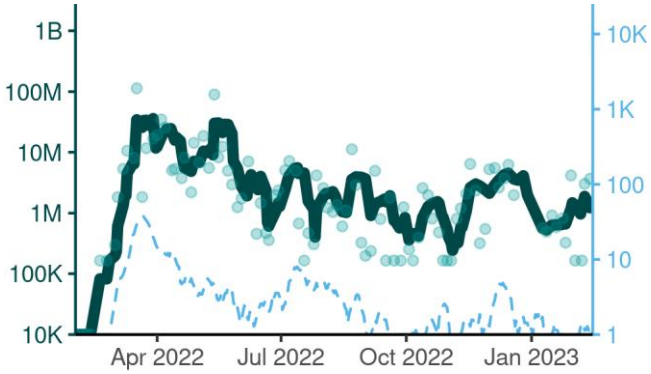


Cases - 7 day rolling average

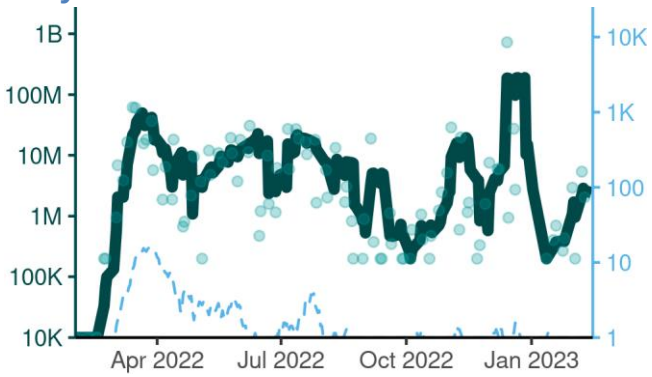
Wellington (Western) *Autosampler 14.0K*



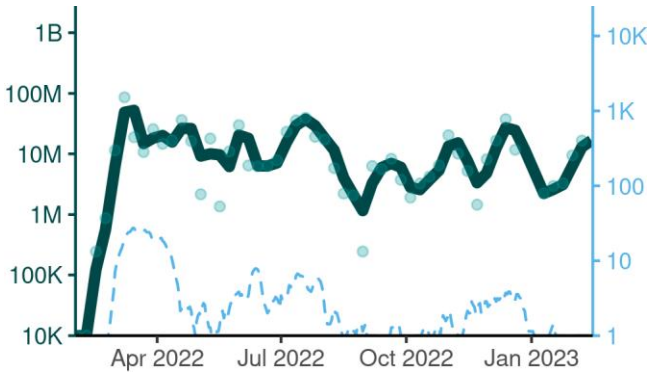
Carterton *Grab 5.8K*



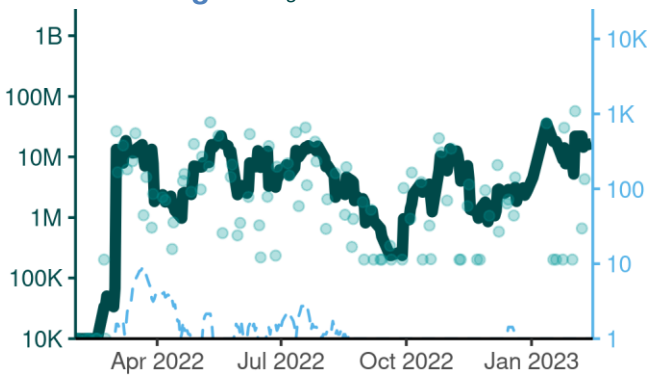
Greytown *Grab 2.4K*



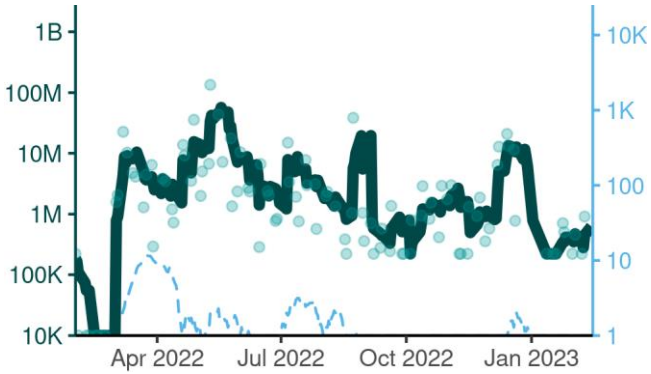
Otaki *Autosampler 3.5K*



Martinborough *Auto/grab 1.6K*



Featherston *Grab 2.5K*

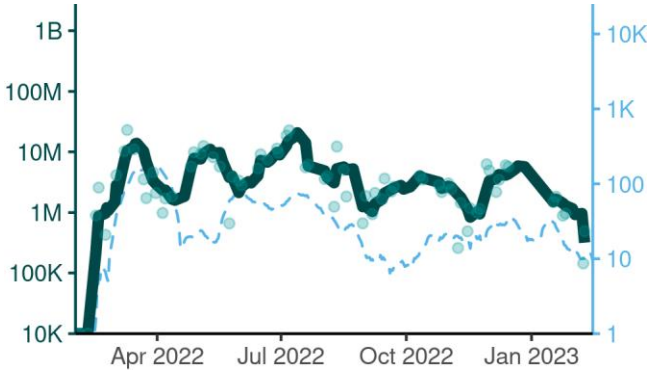


SARS-CoV-2 genome copies / day / person

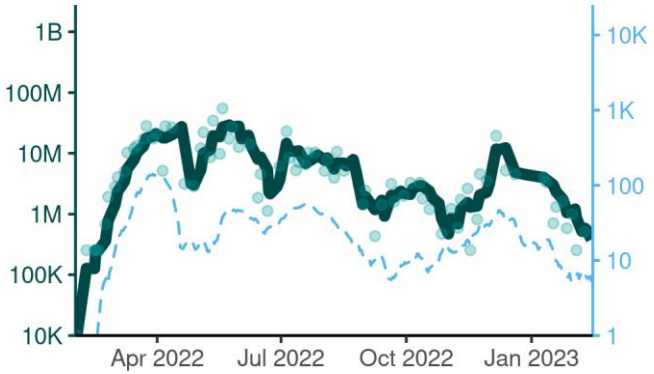
Cases - 7 day rolling average

Tasman, Nelson, and Marlborough

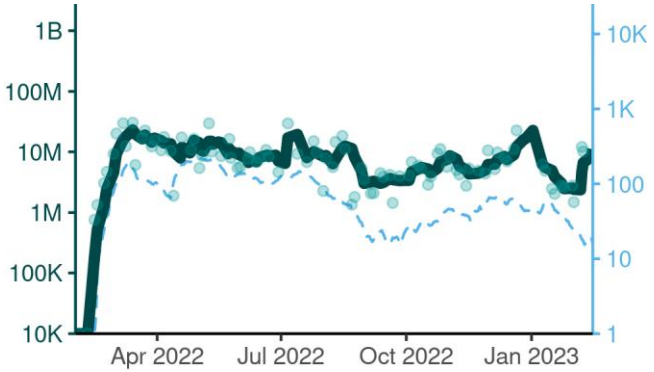
Richmond/Nelson South *Autosampler 60.0K*



Blenheim *Autosampler 31.0K*

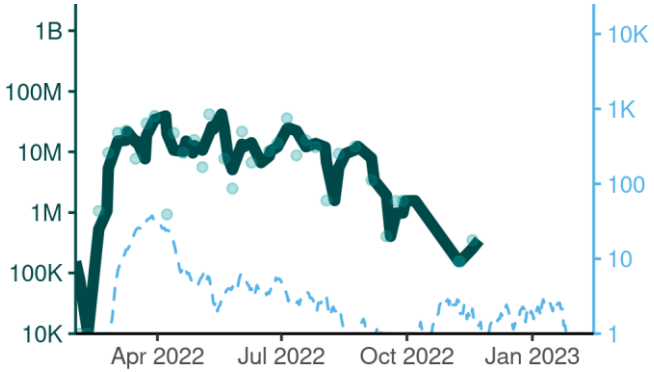


Nelson Central/North *Autosampler 26.0K*

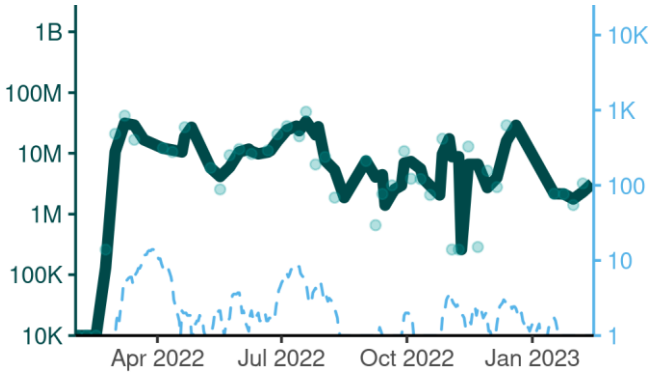


SARS-CoV-2 genome copies / day / person

Motueka *Autosampler 8.3K*



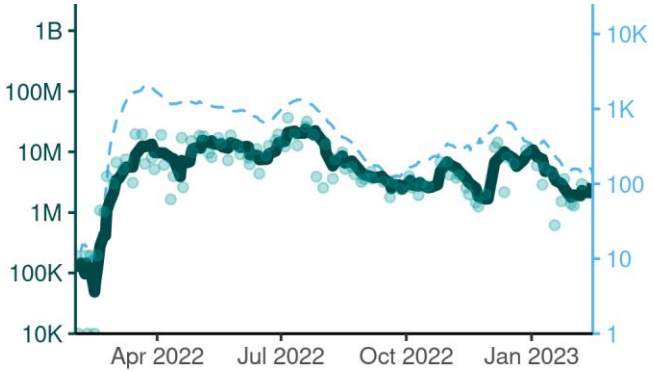
Picton *Autosampler 5.0K*



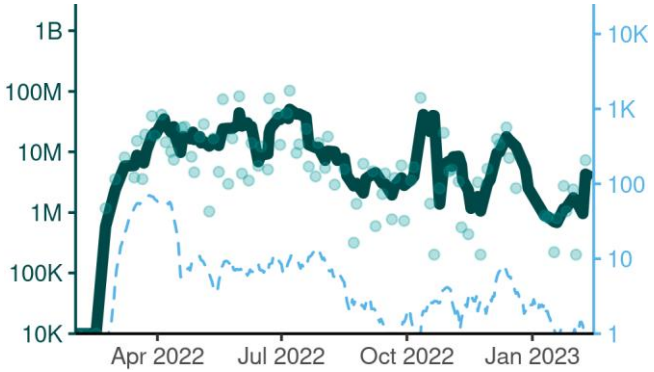
Cases - 7 day rolling average

West Coast and Canterbury

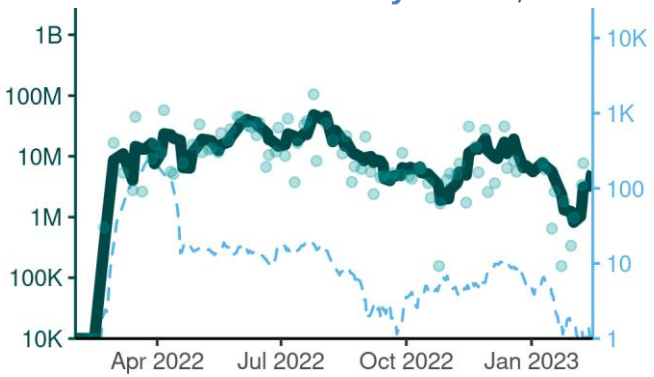
Christchurch *Autosampler 368.0K*



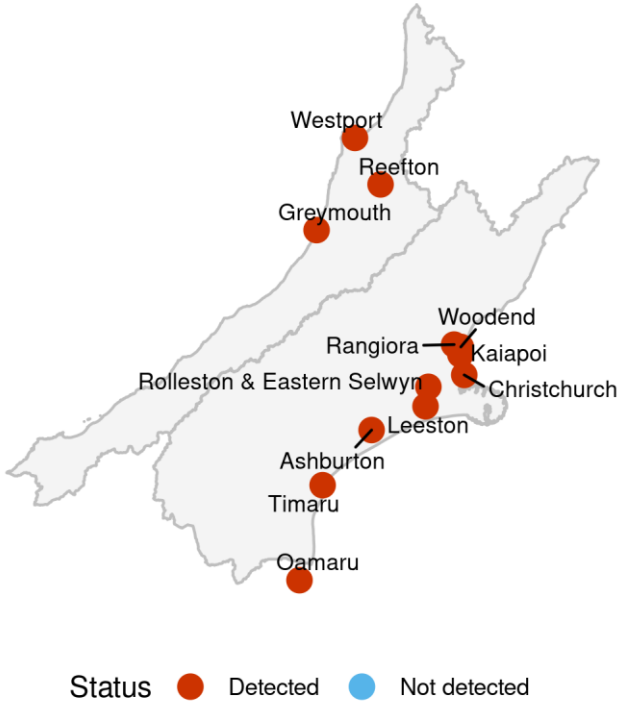
Rangiora *Grab 19.0K*



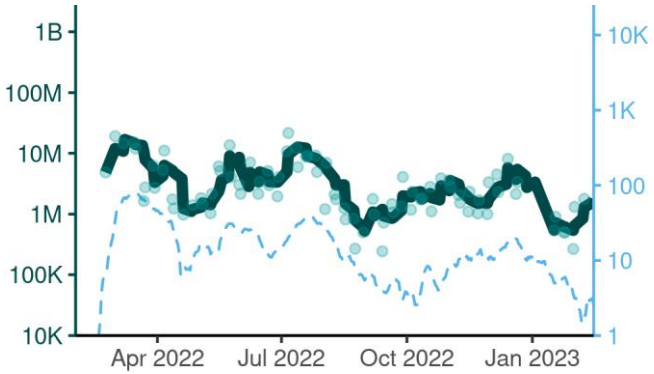
Rolleston & Eastern Selwyn *Autosampler 35.0K*



SARS-CoV-2 genome copies / day / person

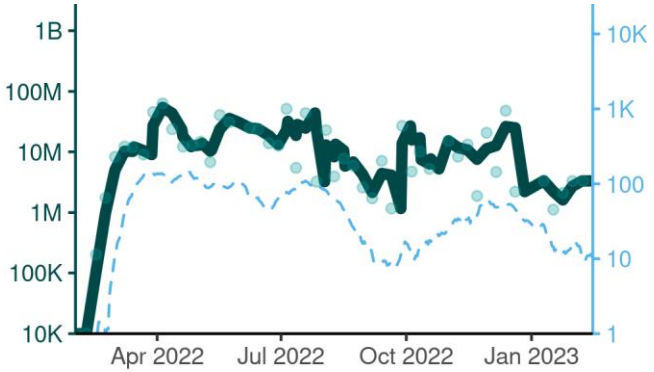


Ashburton *Autosampler 18.0K*

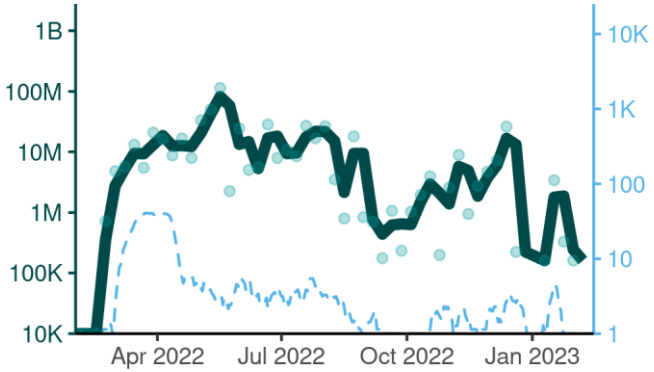


Cases - 7 day rolling average

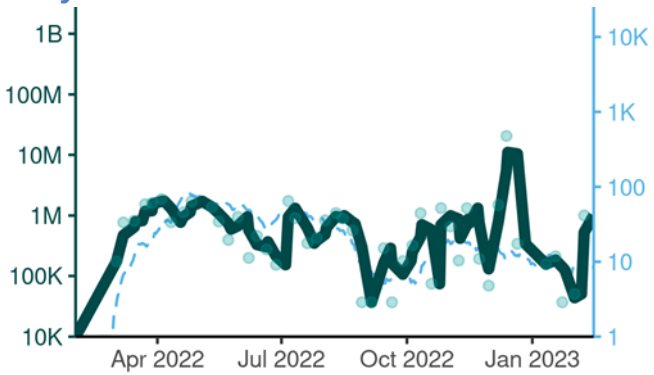
Timaru *Autosampler 28.0K*



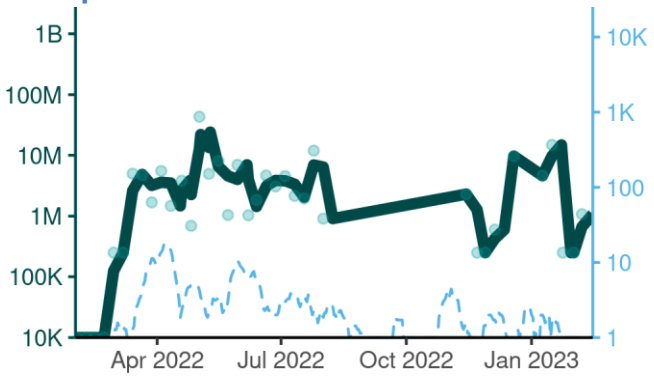
Kaiapoi *Grab 12.5K*



Greymouth *Grab 10.0K*

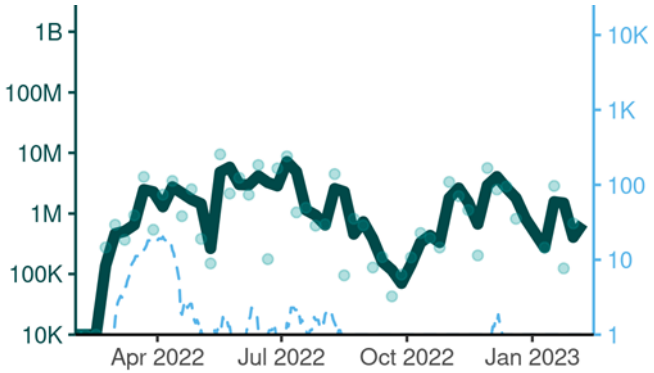


Westport *Grab 5.0K*

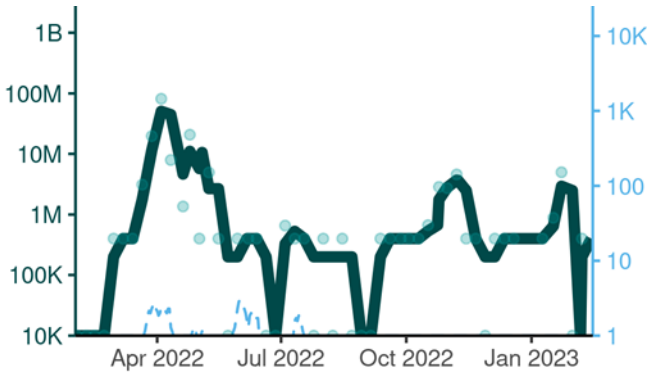


SARS-CoV-2 genome copies / day / person

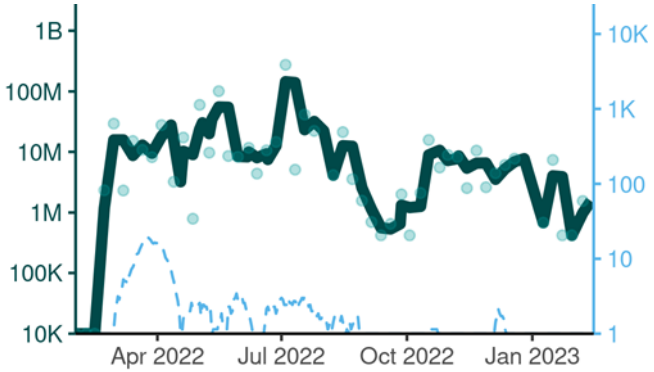
Woodend *Grab 7.6K*



Reefton *Grab 1000*



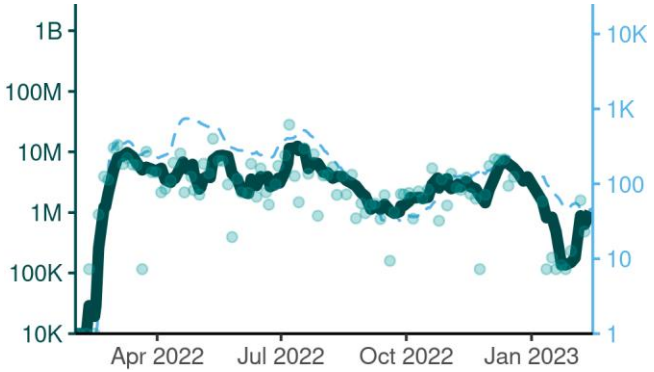
Leeston *Autosampler 3.9K*



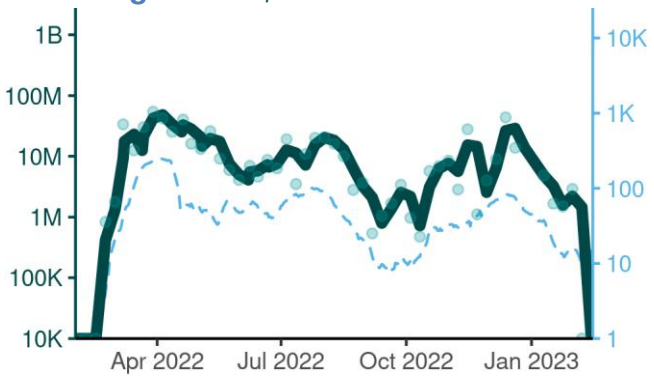
Cases - 7 day rolling average

Otago and Southland

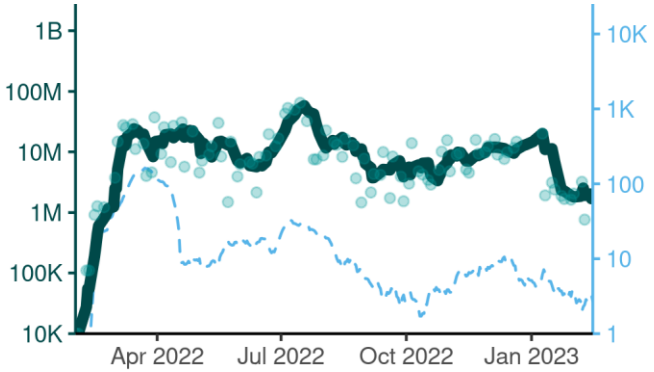
Dunedin (Tahuna) *Autosampler 84.0K*



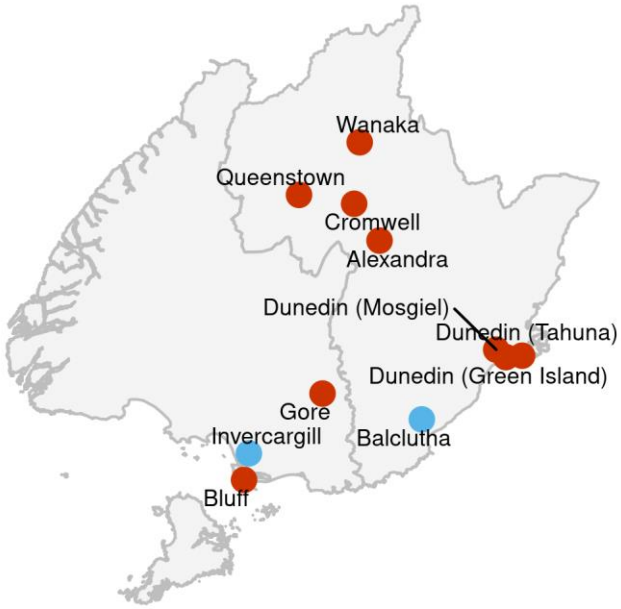
Invercargill *Autosampler 50.0K*



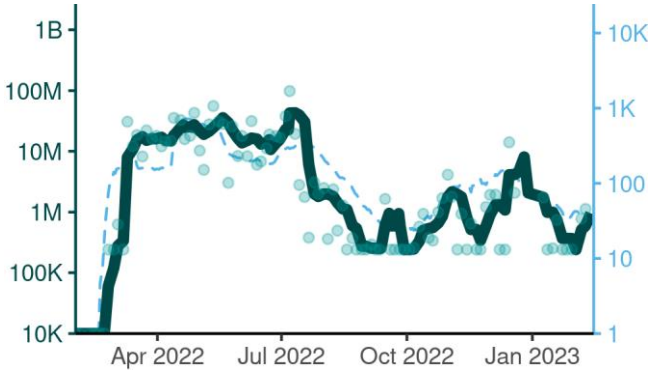
Queenstown *Autosampler 40.0K*



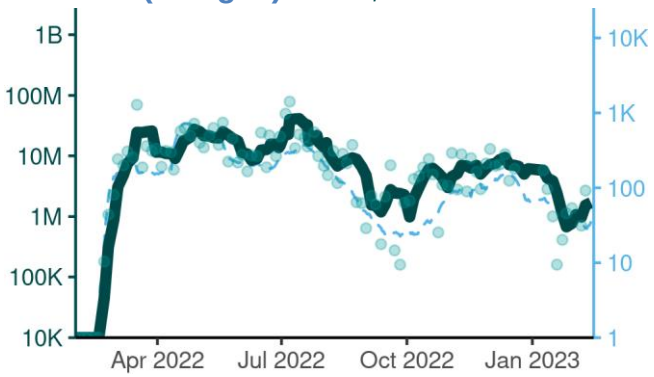
SARS-CoV-2 genome copies / day / person



Dunedin (Green Island) *Autosampler 22.9K*

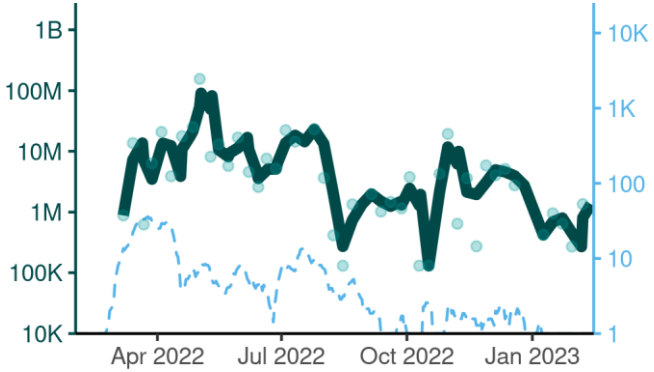


Dunedin (Mosgiel) *Autosampler 14.6K*

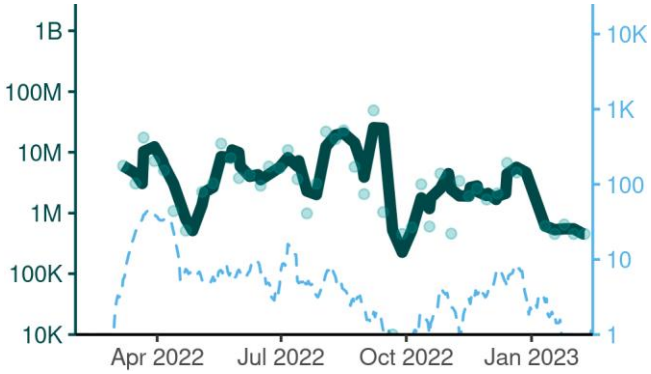


Cases - 7 day rolling average

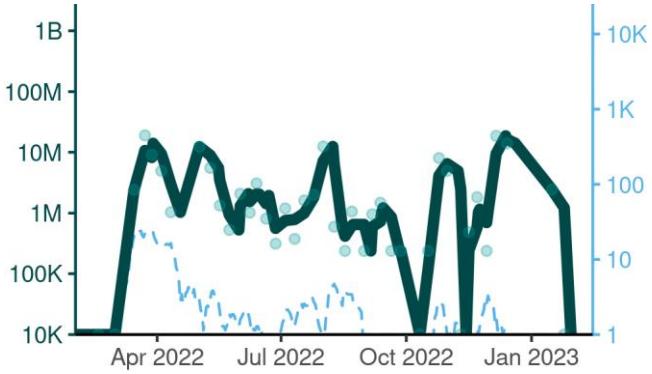
Wanaka *Grab 14.5K*



Gore *Autosampler 8.0K*

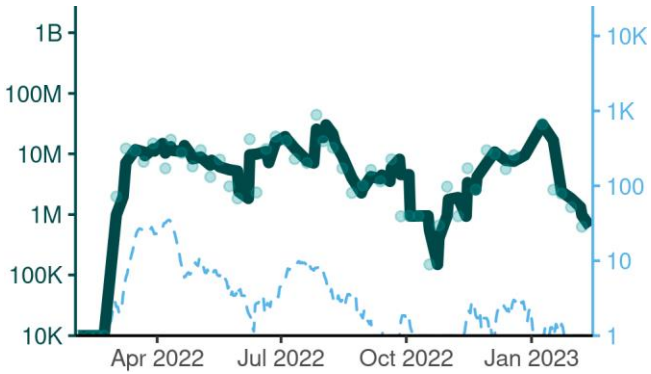


Balclutha *Grab 4.1K*

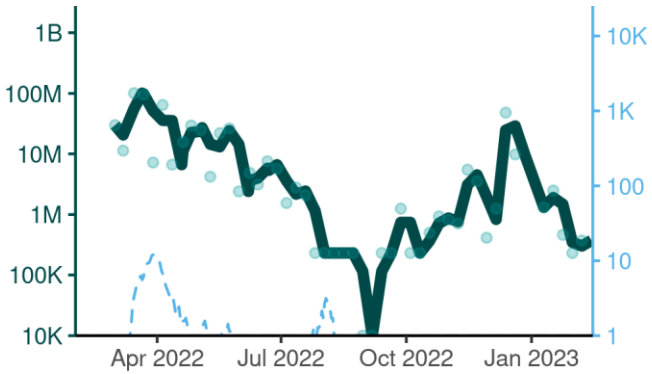


SARS-CoV-2 genome copies / day / person

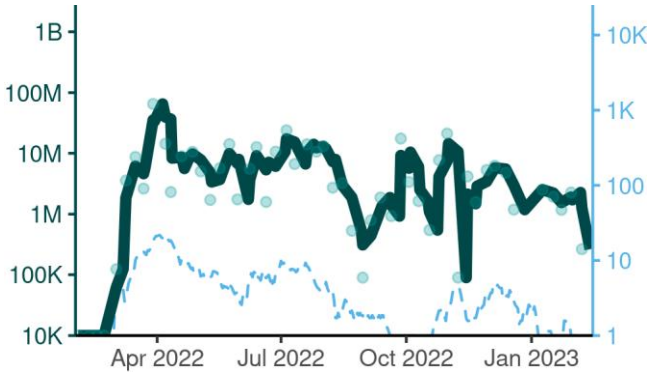
Cromwell *Autosampler 7.1K*



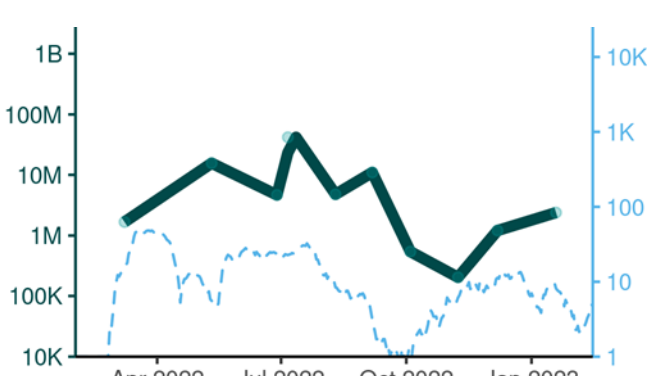
Bluff *Autosampler 2.0K*



Alexandra *Autosampler 6.2K*



Oamaru *Autosampler 12.0K*



Cases - 7 day rolling average

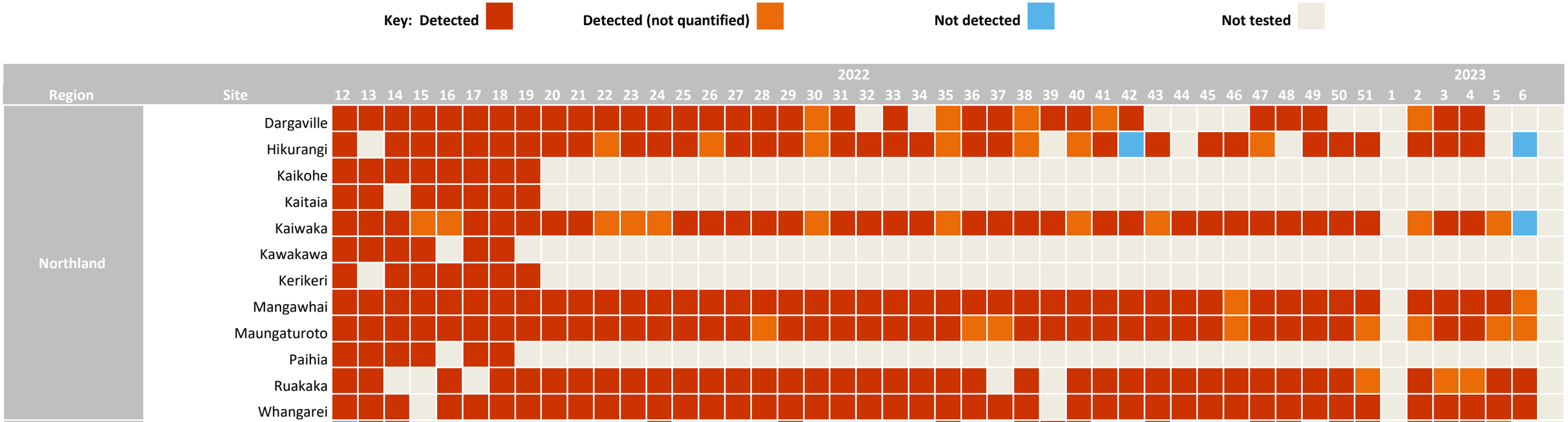
Table 2: Results for weeks 5 & 6 (ending 30 January and 12 February 2023)

Wastewater testing results. Grab samples are collected usually over 15-30 minutes. Autosampler are 24-hour composites.

				January 2023					February 2023				
Region	Site	Population	Sample Type	Mon 30	Tue 31	Wed 01	Thu 02	Fri 03	Mon 06	Tue 07	Wed 08	Thu 09	Fri 10
Northland	Hikurangi	1,730	Grab							Not detected			
	Kaiwaka	400	Grab		Not detected		Detected			Not detected			
	Mangawhai	1,100	Grab		Detected		Detected				Detected		
	Maungaturoto	1,300	Grab		Detected		Detected			Detected			
	Ruakaka	4,500	Grab		Detected					Detected			
	Whangarei	65,000	Autosampler			Detected					Detected		
Auckland	Army Bay	42,000	Autosampler		Detected								
	Auckland East	680,000	Autosampler	Detected					Detected		Detected		
	Auckland West	315,000	Autosampler	Detected					Detected		Detected		
	Beachlands	6,760	Grab			Detected					Detected		
	Helensville	3,800	Autosampler		Detected					Detected			
	Kawakawa Bay	600	Grab			Detected							
	North Shore	240,000	Autosampler			Detected					Detected		
	Pukekohe	20,900	Autosampler			Detected					Detected		
	Snells/Algies	4,000	Autosampler							Detected			
	Waiuku	7,900	Grab			Detected							
	Warkworth	3,500	Autosampler		Detected					Detected			
Waikato	Cambridge	20,100	Autosampler			Detected						Detected	
	Hamilton	169,000	Autosampler	Detected	Detected					Detected	Detected		
	Taupo	23,000	Auto/grab		Detected		Detected			Detected			
	Te Awamutu	13,100	Autosampler			Detected						Detected	
	Thames	7,500	Autosampler								Detected		
Bay of Plenty	Katikati	5,500	Autosampler							Detected			
	Kawerau	7,000	Autosampler							Detected			
	Maketu	1,300	Autosampler								Detected		
	Mt Maunganui/Papamoa	65,000	Autosampler		Detected		Detected			Detected		Detected	
	Opotiki	3,800	Autosampler			Detected	Detected			Detected		Detected	
	Rotorua	59,000	Autosampler		Detected		Detected			Detected			
	Tauranga	50,000	Autosampler		Detected		Detected			Detected		Detected	
	Te Puke	9,700	Autosampler								Detected		
	Waihi Beach	3,600	Autosampler							Detected			
	Whakatane	21,020	Autosampler				Detected				Detected		
Gisborne	Gisborne	37,000	Autosampler			Detected					Detected		
Hawke's Bay	Hastings	80,000	Autosampler		Detected	Detected					Detected	Detected	
	Napier	55,000	Autosampler	Detected		Detected				Detected	Detected		
	Waipukurau	4,610	Autosampler		Detected					Detected			
Taranaki	Eltham	2,006	Autosampler		Detected						Detected		
	Hawera	12,000	Autosampler		Detected	Detected					Detected	Detected	
	New Plymouth	88,000	Autosampler		Detected		Detected			Detected		Detected	
Manawatu-Whanganui	Dannevirke	5,696	Grab	Detected							Not detected		
	Levin	21,200	Autosampler		Detected		Detected					Detected	
	Palmerston North	90,000	Autosampler		Detected		Detected			Detected		Detected	
	Taumarunui	4,000	Grab		Detected		Detected			Detected		Detected	
	Whanganui	44,500	Autosampler		Detected		Detected			Detected		Detected	
	Woodville	1,657	Grab	Detected							Not detected		

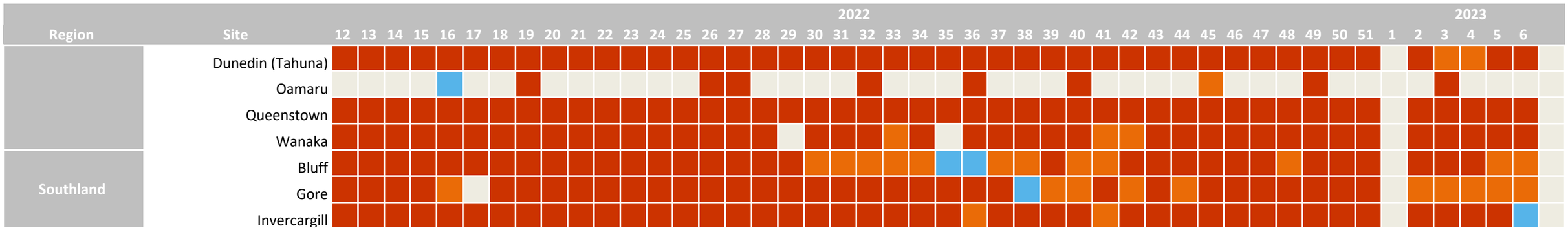
Region	Site	Population	Sample Type	January 2023					February 2023				
				Mon 30	Tue 31	Wed 01	Thu 02	Fri 03	Mon 06	Tue 07	Wed 08	Thu 09	Fri 10
Wellington	Carterton	5,800	Grab	Detected			Detected			Detected		Detected	
	Featherston	2,500	Grab		Detected		Detected			Detected		Detected	
	Greytown	2,438	Grab		Detected		Detected			Detected		Detected	
	Hutt Valley	133,000	Autosampler	Detected			Detected			Detected		Detected	
	Martinborough	1,641	Auto/grab		Detected		Detected			Detected		Detected	
	Masterton	20,700	Auto/grab		Detected	Detected					Detected	Detected	
	Otaki	3,500	Autosampler		Detected					Detected			
	Paraparaumu	49,000	Autosampler		Detected						Detected		
	Porirua	85,000	Autosampler	Detected			Detected			Detected		Detected	
	Wellington (Moa Point)	168,000	Autosampler	Detected						Detected		Detected	
	Wellington (Western)	14,000	Autosampler	Detected			Detected			Detected		Detected	
Nelson	Nelson Central/North	26,000	Autosampler		Detected	Detected				Detected	Detected		
	Richmond/Nelson South	60,000	Autosampler								Detected	Detected	
Marlborough	Blenheim	31,000	Autosampler		Detected			Detected				Detected	
	Picton	5,000	Autosampler		Detected					Detected			
West Coast	Greymouth	10,000	Grab			Detected					Detected		
	Reefton	1,000	Grab		Not detected					Detected			
	Westport	5,000	Grab			Detected				Detected			
Canterbury	Ashburton	18,000	Autosampler		Detected	Detected					Detected		
	Christchurch	368,000	Autosampler	Detected		Detected				Detected			
	Kaiapoi	12,500	Grab		Detected								
	Leeston	3,900	Autosampler	Detected						Detected			
	Rangiora	19,000	Grab		Detected		Detected					Detected	
	Rolleston & Eastern Selwyn	35,000	Autosampler	Detected		Detected				Detected	Detected		
	Timaru	28,000	Autosampler		Detected						Detected		
	Woodend	7,600	Grab		Detected								
Otago	Alexandra	6,200	Autosampler	Detected						Detected			
	Cromwell	7,100	Autosampler	Detected						Detected			
	Dunedin (Green Island)	22,900	Autosampler	Detected					Detected			Detected	
	Dunedin (Mosgiel)	14,600	Autosampler	Detected					Detected			Detected	
	Dunedin (Tahuna)	84,000	Autosampler	Detected					Detected			Detected	
	Queenstown	40,000	Autosampler	Detected		Detected				Detected		Detected	
	Wanaka	14,500	Grab	Detected						Detected			
Southland	Bluff	2,000	Autosampler		Detected					Detected			
	Gore	8,000	Autosampler			Detected						Detected	
	Invercargill	50,000	Autosampler		Detected					Not detected			

Table 3: Weekly Summary of Wastewater Sampling Results for SARS-CoV-2



Region	Site	2022 12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	2023 1	2	3	4	5	6
Bay of Plenty	Te Awamutu																																														
	Thames																																														
	Waihi																																														
	Whangamata																																														
	Whitianga																																														
	Katikati																																														
	Kawerau																																														
	Maketu																																														
	Mt Maunganui/Papamoa																																														
	Opotiki																																														
	Rotorua																																														
	Tauranga																																														
	Te Puke																																														
	Waihi Beach																																														
	Whakatane																																														
Gisborne	Gisborne																																														
Hawke's Bay	Hastings																																														
	Mahia																																														
	Napier																																														
	Otane																																														
	Porangahau																																														
	Takapau																																														
	Te Paerahi																																														
	Waipawa																																														
	Waipukurau																																														
	Wairoa																																														
Taranaki	Eltham																																														
	Hawera																																														
	Kaponga																																														
	Manaia																																														
	New Plymouth																																														
	Opunake																																														
	Patea																																														
	Stratford																																														
	Waverley																																														
Manawatu-Whanganui	Dannevirke																																														
	Eketahuna																																														
	Feilding																																														
	Levin																																														
	Pahiatua																																														

Region	Site	2022 12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	2023 1	2	3	4	5	6
	Palmerston North																																															
	Taumarunui																																															
	Whanganui																																															
	Woodville																																															
Wellington	Carterton																																															
	Featherston																																															
	Greytown																																															
	Hutt Valley																																															
	Martinborough																																															
	Masterton																																															
	Otaki																																															
	Paraparaumu																																															
	Porirua																																															
	Wellington (Moa Point)																																															
	Wellington (Western)																																															
Tasman	Motueka																																															
Nelson	Nelson Central/North																																															
	Richmond/Nelson South																																															
Marlborough	Blenheim																																															
	Picton																																															
West Coast	Greymouth																																															
	Hokitika																																															
	Reefton																																															
	Westport																																															
Canterbury	Amberley																																															
	Ashburton																																															
	Christchurch																																															
	Hanmer Springs																																															
	Kaiapoi																																															
	Kaikoura																																															
	Leeston																																															
	Rangiora																																															
	Rolleston & Eastern Selwyn																																															
	Timaru																																															
	Woodend																																															
Otago	Alexandra																																															
	Balclutha																																															
	Cromwell																																															
	Dunedin (Green Island)																																															
	Dunedin (Mosgiel)																																															


Region
Site
2022
12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
2023
1 2 3 4 5 6
Dunedin (Tahuna)
Oamaru
Queenstown
Wanaka
Bluff
Gore
Invercargill
Southland

Acknowledgements

This work represents the combined efforts of a large number of individuals and organisations.

We continue to be indebted to the teams across the country who are collecting the wastewater that underpins this work.

The wastewater analysis has been undertaken at ESR by a team which may on any given week include contributions from Joanne Chapman, Dawn Croucher, Joanne Hewitt, Joycelyn Ho, Anower Jabed, Olivia Macrae, Ashley McDonald, Andrew Ng, Ashley Orton, and Fatiha Sulthana. Data science analysis, visualisation and reporting is the result of team effort from: Franco Andrews, Bridget Armstrong, Raewyn Campbell, Joanne Chapman, Lei Chen, Gerhard de Beer, Richard Dean, Brent Gilpin, Joanne Hewitt, Dawen Li, Jonathan Marshall, Helen Morris and Leighton Watson. Ongoing support for this work from the Ministry of Health and ESR management is appreciated.

Notes

Sites and frequency of sample collection: The catchment population sites selected for the surveillance range from approximately 400 to over 1,000,000 individuals. The sites cover all regions of the country. Most major towns and all cities, as well as many smaller communities, are included. In early 2023, the wastewater catchment areas cover over 75% of the population connected to wastewater treatment plants. The sites from which samples have been collected have varied over the last 12 months. New sites may be added over time, and/or sampling may reduce in frequency or cease for other sites. The selection and frequency of sampling vary depending on the local population, access to wastewater collection points, staff availability to collect samples and risk factors. When included, samples are collected at least weekly, with twice weekly sampling being common.

Sampling method: The preferred option is to automatically collect a 24 hour 'composite' sample. This is where a pump automatically collects a small volume of wastewater every 15 minutes over 24 hours using a composite sampler. These samplers are available in some wastewater treatment plants. When composite samplers are not available, 'grab' samples are collected. These range from a sample being taken at a single point in time, to 3 samples taken over 30 minutes, to samples collected over a day. Grab samples represent only the composition of the source at that time of collection and may not be as representative as a 24-hour composite sampler. More variation may be expected with grab samples.

Laboratory analysis of wastewater samples: Samples are sent from each wastewater treatment plant to ESR. Processing of each sample commences within an hour or two of receipt. Processing involves the concentration of virus from 250 mL sample to approx. 1 mL using centrifugation and polyethylene glycol. Viral RNA is then extracted from a small volume of 0.2 mL concentrate to give a final volume of 0.05 mL The presence of SARS-CoV-2 RNA is determined using RT-qPCR. SARS-CoV-2 is considered detected when any of the RT-qPCR replicates are positive.

RT-qPCR: Reverse transcription (RT) to convert RNA to complementary DNA (cDNA), followed by quantitative PCR (qPCR). RT-qPCR is used for detection and quantification of viral RNA.

Method sensitivity: The protocol used to concentrate SARS-CoV-2 from wastewater allows for the sensitive detection of SARS-CoV-2 by RT-qPCR. ESR has shown that when 10 individuals are actively shedding SARS-CoV-2 RNA in a catchment of 100,000 individuals, there was a high likelihood of detecting viral RNA in wastewater (https://doi.org/10.1016/j.watres.2021.118032). Shedding by one individual may be detected in wastewater, but it does depend on many factors including the amount and duration of shedding. Very low levels in wastewater may be not able to be quantified (i.e., less than the limit of quantification- see below).

SARS-CoV-2 RNA detected (positive result): A positive detection in the wastewater indicates that at least one person has been shedding SARS-CoV-2 into the wastewater at some point during the time period that the sample was being

collected. In some cases, detections could also be due to the shedding of low levels of SARS-CoV-2 RNA by a recently recovered case. The detection of SARS-CoV-2 RNA does not indicate that infectious virus is present.

SARS-CoV-2 RNA not detected (negative result): A negative result can occur because there are no active 'shedding' cases in the catchment or because the SARS-CoV-2 RNA concentration is too low to be detected, most likely because there are a very low number of cases in the wastewater catchment. Therefore, negative finding does not necessarily guarantee the absence of COVID-19 in the community

Viral loads and normalisation: When detected, the SARS-CoV-2 RNA concentration is calculated as genome copies per L of wastewater. This is then converted to a viral load of **genome copies/day/person**. This conversion takes into account the flow rate of wastewater entering the treatment plant (the influent) and the population in the catchment. The **flow rate** is the total volume (m3 per day) recorded at the inlet of the wastewater treatment plant over 24 hours. This is a **population-normalised viral load**. Currently, the flow rate is the average annual flow rate, but will be replaced with daily flow rate when available (note that rainfall may significantly increase the flow rate at the inlet, diluting the sample, and may result in lower concentrations and a false negative result).

Limit of quantification: The lowest concentration of the target that can be reliably quantified is referred to as the limit of quantification. For those samples where SARS-CoV-2 is detected but cannot be quantified, a value of 5 genome copies/mL wastewater is used. While a standard method is being used, virus recovery can vary from sample to sample, and this may affect the quantitation.

Data subject to change: Data generated for the New Zealand Wastewater COVID-19 Surveillance Programme should be considered provisional and may be subject to change. Data may be incomplete for the most recent 2-week period due to processing, testing and reporting delays.

Data not shown:

- Results from certain samples may not be shown, as the result was either deemed invalid, or the sample could not be tested (e.g., leaked in transit, not labelled).

For further information please contact

Joanne Hewitt
Science Leader
Joanne.hewitt@esr.cri.nz

Jo Chapman
Senior Scientist
Joanne.chapman@esr.cri.nz