



NGĀ KAWEKAWE O MATE KORONA
IMPACTS OF COVID-19 IN AOTEAROA

Technical Report and Supplementary Tables

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Te Hikuwai Rangahau Hauora | Health Services Research Centre

Te Herenga Waka-Victoria University of Wellington

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Kimi Tāngata | Recruitment

All people that Manatū Hauora | Ministry of Health were aware of, as informed by COVID-19 surveillance undertaken by The Institute of Environmental Science and Research Ltd (ESR), were sent a letter of invitation to take part in the study. The inclusion criteria for the study were:

- Having had a positive COVID-19 test or being a probable case through having symptoms and having been in contact with a positive case before 1 December 2021.
- Being over 16 years of age.
- Not living in a dementia unit.

The letter was written by the research team, and translated from English into Te Reo Māori, Samoan and Tongan. It was sent via Manatū Hauora | Ministry of Health to preserve the privacy of potential study participants. Accompanying the letter of introduction was a covering letter from the then Director General of Health, Dr Ashley Bloomfield, encouraging participation. Potential participants were advised they could take part directly through a website (covidatearora.com) or contact the study team on an 0800 number or through a dedicated email address.

Quantitative data was gathered between February and June 2022. On 8 February 2022, the study's Pou Tikanga launched the study through 'Te Uakitanga o Ngā Kawekawe o Mate Korona'. Due to the prevalence of Omicron, most people attended virtually. To coincide with the study launch, Te Reo Māori, Samoan, Tongan, Cook Island Māori and English language media releases were made. The study was promoted through a wide social media campaign and stakeholder emails sent to personal and professional contacts of the study team, and on 14 February 2022, a reminder text message Short Message Service (SMS) was sent, with a second SMS sent on 16 May 2022. The survey was closed on 10 June 2022.

Participation in the quantitative part of the study involved completing one or more of four online surveys, accessed through the website and hosted on the Qualtrics platform. The surveys covered the areas of i) support and wellbeing; ii) health and health services; iii) costs of COVID-19; and iv) Long COVID. Where participants requested, the surveys could be completed over the phone with a researcher. No questions were compulsory, and participants could leave the survey and re-start if they wanted to. The final number of people who completed at least one survey was 990.

From the completed surveys, as well as from people who made contact with the study team but did not want to complete a survey, interview participants were identified for the qualitative component of the study. Qualitative information was gathered between April and July 2022. Many more people were interested in being interviewed than was possible, so priority was given to those who were experiencing the ongoing impacts of COVID-19, including Long COVID, at the time of contact. Interviewers fluent in Te Reo Māori, New Zealand Sign Language (NZSL), Samoan and Tongan were available for anyone who requested an interview in one of these languages. A total of 58 interviews were conducted with 62 people. Six of the interviews were not included in the analysis that findings were drawn from for this report because they did not meet the criteria for inclusion (e.g., they were with people who contracted COVID-19 after the study period which ended 1 December 2021). Two of the included interviews were conducted in languages other than English (one in Samoan, one in Tongan).

Tātari Raraunga | Data Analysis

Tātari tatau | Quantitative analysis

Quantitative data analysis was conducted using standard epidemiological techniques, including cross tabulation, chi-squared tests, and logistic regression. Appropriate denominators were used for each analysis, based on the number of people who had answered relevant questions. These are identified throughout the results sections. Missing data was either omitted from analysis, or combined with the “unexposed” group, as deemed appropriate for each question.

Logistic regression was used to estimate associations between exposures and dichotomous outcomes and reported as odds ratios (ORs) with associated 95% confidence intervals (CIs). Adjustment for gender, and for age (in age groups) allowed the calculation of adjusted ORs (aOR). Where reference is made in the full report to “Supplementary Tables”, these are included in this Technical Report.

In keeping with the Te Tiriti Relationship Framework underpinning the study, all quantitative analyses were stratified into Tangata Whenua and Tāngata Tiriti. Where the data allowed, results for Pasifika people were also presented. In these cases, Tāngata Tiriti are described as mutually exclusive groups “Pasifika peoples” and “non-Pacific Tāngata Tiriti”. There is an overlap between the “Pasifika peoples” group and Tangata Whenua (i.e. people who identify as Māori and as Pasifika are included in both). An exception to the Tangata Whenua and Tāngata Tiriti stratified approach was made for the regression modelling relating to Long COVID. As there were insufficient data for stratified analysis, data for Tangata Whenua and Tāngata Tiriti were combined. Results were adjusted for prioritised ethnicity (Māori, Pacific, Asian and Other) for these analyses.

Chi-squared P values were calculated, comparing Tangata Whenua with non-Pacific Tāngata Tiriti and Pasifika peoples with non-Pacific Tāngata Tiriti. We were guided in our interpretation by, but did not use as a strict definition of, the conventional measure of statistical significance ($P < 0.05$), as many of our strata were small in size.

An assessment of potential selection bias was conducted by comparing the demographics of the survey respondents with all those who were eligible to take part.

Tātari kounga | Qualitative analysis

All Tangata Whenua and non-Pacific Tāngata Tiriti interviewees were given two options with regard to the presentation of their information. The first was that all of their information, including name, address and any other identifying details, would remain confidential to the research team and any identifiable information would not be used in written reports, academic publications, conferences or presentations resulting from the study findings. The second option, in recognition of data sovereignty, gave interview participants the option of being identified alongside any of their quotes used in the report of study findings to Manatū Hauora | Ministry of Health, and any associated academic publications, conferences and community presentations. This supported the continued ownership of their experiences and story. Those who indicated in the consent process that they did wish to be named, were afforded the naming convention they preferred. For example, Tangata Whenua interview participants may have wished their Iwi to be named either alongside or instead of their name. All Pasifika interviewees were given pseudonyms by the Pacific Research Team.

Interviews were transcribed verbatim. Each group of researchers - Tangata Whenua, Pasifika peoples, and non-Pacific Tāngata Tiriti - were responsible for the analysis (through identification of key themes) and interpretation of the information gathered from their representative groups (see also below 'Data Sovereignty'). Once the analysed information from the interviews was combined, an intensive review process was undertaken by senior Tangata Whenua and Tāngata Tiriti researchers to ensure consistency.

An analysis wānanga was held with the whole research team where agreement was reached to holistically present the study findings against the identified impacts of COVID-19. Mirroring Māori models of health, the importance of recognising the many parts that comprise the whole is reflected in the approach taken to the presentation of the study findings. Accordingly, physical, mental, social, whānau and family, spiritual, cultural and financial impacts identified by study participants were all determined as chapters in the full report. Additionally, we present data related to experiences of health and social services and of the Government response to COVID-19, and a separate analysis of experiences of Long COVID.

Participants had many views around the Aotearoa government response during the global pandemic. For some, these views may be tempered by the time period in which they were interviewed. As noted earlier, interviews were conducted between April and July 2022 when Aotearoa was operating under the COVID-19 Protection Framework, or the traffic light system, unlike the previous two years which had operated under the COVID-19 Alert System. However, although participants were mostly recalling events relating to the time at which they had COVID-19, their recall may have been affected by events of the pandemic that had occurred subsequently.

The Omicron variant had entered the country in 2022, with different approaches to testing and isolation/quarantine in place as case numbers grew. Alongside changes to the various traffic light settings, the phased public health response to the Omicron variant at various times also saw changes in rules to wearing face masks, vaccine passes and most mandates, while the borders also began to be opened up during this time. The voices against key aspects of the Aotearoa approach – such as closed borders, the lottery system for MIQ, and vaccine mandates, along with increasing concern over the fragility of key sectors such as tourism and hospitality – were at their loudest during this time. Inflation also began to rise at this time. Thus, there were many key contextual issues which had already occurred as part of the pandemic response when participants and their whānau/families were having their own lived experiences of COVID-19 and which continued to powerfully affect and shape their sharing of those experiences as interviewees for this study.

Inenga o te Wairangi | Measurement of Mental Distress

Mental distress was measured in three ways in the study: i) self-reported, in the list of symptoms that people experienced in the first month of having COVID-19; ii) using the Generalized Anxiety Disorder 2-item (GAD-2) scale and the Patient Health Questionnaire-2 (PHQ-2) for depression and iii) using EQ-5D-5L, a health-related quality of life scale. The latter asks people to respond on a five-point Likert scale to the following: "Please tick the ONE box that best describes your level of anxiety/depression today", and was only asked among people with Long COVID.

The GAD-2 and PHQ-2 had both been used in the National COVID-19 Health and Wellbeing surveys that were conducted in 2021. A score of 3 points is the preferred cut-off for identifying possible cases and in which further diagnostic evaluation for generalized anxiety disorder is warranted. Using a cut-off of 3, the GAD-2 has a sensitivity of 86% and a specificity of 83% for diagnosis of generalized anxiety disorder (Kroenke et al, 2007), and the PHQ-2 has a sensitivity of 83% and a specificity of 92% for major depression (Kroenke et al, 2003).

Inenga o te poapoataunu | Measurement of Stigma

Survey respondents were specifically asked about stigma due to COVID-19, using the Stigma Scale for Chronic Illness 8 items questionnaire (Molina et al, 2013), which measures a mixture of enacted and internalised stigma. The te reo term “whakamā” was added to item 6 (see box below). Respondents were asked to rate each of eight items on a five-point Likert scale from ‘1’ (never) to ‘5’ (always). Results are reported for the proportion of people who reported agreeing with the statement ‘Often’ or ‘Always’.

The eight statements were:

1. Because I've had COVID-19, some people have seemed uncomfortable with me
2. Because I've had COVID-19, some people avoided me
3. Because I've had COVID-19, I've felt left out of things
4. Because I've had COVID-19, some people have been unkind to me
5. Because I've had COVID-19, some people have avoided looking at me
6. I've felt embarrassed or whakamā about having COVID-19
7. I've felt embarrassed because of the physical limitations COVID-19 has caused
8. Some people have acted as though it was my fault I've had COVID-19

Inenga o te KŌWHEORI Mauroa | Measurement of Long COVID

In the analyses of long COVID, we included people who had at least one of the named symptoms of COVID-19 or long COVID persisting at three months after their initial COVID-19 infection. The symptoms included were those identified from international literature as relevant to Long COVID at the time of finalising the survey (November 2021), and are shown in Supplementary Table 23.

In the analyses, we compared people with long COVID to those without long COVID. The latter group included people who answered the long COVID survey, but did not report any symptoms at 3 months or later (up to 24 months).

To avoid losing data, the two people with non-binary gender were included in the (larger) female group. In multivariable models, age at diagnosis was included as a linear term. In the adjustment of ethnicity in multivariable models, only a Tangata Whenua/ Tāngata Tiriti adjustment was used.

Inenga o ngā Kawekawe Ahumoni | Measurement of Financial Impacts

The numbers of lost days of productivity were calculated based on survey participants' answers to questions on days not at work, and days that carers were not at work. We used a human capital approach that assumes that no lost time is made up by other staff or once someone returns to their usual activity (Drummond 2015). We used a median weekly income for all days off as that from all sources (so including wages and salaries, government transfers and for self-employed people) of \$770 (Stats NZ, 2021). The same values were used for Tangata Whenua and Tāngata Tiriti.

Rārangi Rauemi | References

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Ngā Tūtohi Tāpiri | Supplementary Tables

Supplementary Table 1: Demographic details of Survey Participants

Self-identified Ethnicity*						
	Tangata Whenua (n=161)		Pasifika peoples (n=64)		Non-Pacific Tāngata Tiriti (n=779)	
	n	%	n	%	n	%
Gender						
Females	128	80%	49	77%	472	61%
Males	31	19%	13	20%	241	31%
Other	2	1%	2	3%	66	8%
P value	P<0.001		P=0.034			
Age						
16 to 24	20	12%	11	17%	73	9%
25 to 44	83	52%	36	56%	255	33%
45 to 64	39	24%	10	16%	254	33%
65+	9	6%	5	8%	90	12%
Not stated	10	6%	2	3%	107	14%
P value	P<0.001		P<0.001			
Region						
Upper North Island	87	54%	51	80%	293	38%
Central North Island	39	24%	3	5%	115	15%
Lower North Island	15	9%	7	11%	112	14%
South Island	15	9%	2	3%	147	19%
Not stated / not in Aotearoa	5	3%	1	<2%	112	14%
P value	P<0.001		P<0.001			
Education						
School	63	39%	20	31%	128	16%
Post-school	37	23%	15	23%	161	21%
University	48	30%	23	36%	388	50%
Not stated	13	8%	6	9%	102	13%
P value	P<0.001		P<0.001			
Employment*						
Homemaker	22	14%	8	13%	43	6%
Full-time	89	55%	31	48%	396	51%
Part-time	12	7%	9	14%	102	13%
Casual	7	4%	2	3%	47	6%
Unemployed	17	11%	5	8%	18	2%
Student	17	11%	11	17%	50	6%
Retired	4	2%	1	2%	59	8%
Prefer not to say	1	<1%	4	6%	12	2%
Rurality						
Main Centre	98	61%	49	77%	418	54%

Large town	13	8%	4	6%	79	10%
Smaller town	24	15%	4	6%	84	11%
Rural	19	12%	2	3%	68	8%
Not reported	7	4%	5	8%	130	17%
P value	P=0.001		P=0.14			
Disability						
Yes	35	22%	11	17%	107	14%
No	114	71%	50	78%	541	69%
Not reported	12	7%	3	5%	131	17%
P value	P=0.001		P=0.037			
People in Household						
Lives alone	15	9%	5	8%	168	22%
2-4 people	64	40%	13	20%	436	56%
5-8 people	69	43%	30	47%	168	22%
9+ people	13	8%	16	25%	7	1%
P value	P<0.001		P<0.001			
Overcrowding						
>2 people per bedroom	31	19%	25	39%	142	18%
<=2 people per bedroom	130	81%	39	61%	637	82%
P value	P=0.76		P<0.001			
Household Income						
<=\$50,000	4	2%	0		23	3%
\$50,001 to \$70,000	3	2%	0		15	2%
\$70,001 to \$100,000	7	4%	1	2%	32	4%
>\$100,000	9	6%	4	6%	104	13%
Not reported	138	86%	59	92%	605	78%
P value	P=0.095		P=0.091			

*** Notes**

Ethnicity is total response, meaning that people who identified as Māori and as Pasifika are included in both the Tangata Whenua and Pasifika Peoples columns.

Employment response categories were not mutually exclusive, so percentages sum to over 100%

Supplementary Table 2: Demographic details of Tāngata Whaikaha Māori, Disabled Pasifika peoples and Disabled Non-Pacific Tāngata Tiriti survey respondents

	Tāngata Whaikaha Māori (n=35)	Disabled Pasifika peoples (n=11)	Disabled Non-Pacific Tāngata Tiriti (n=107)
Gender			
Females	26 (74%)	8 (73%)	66 (62%)
Males	8 (23%)	2 (18%)	37 (35%)
Other	1 (3%)	1 (9%)	4 (4%)
Age			
16 to 24	1 (3%)	1 (9%)	6 (6%)
25 to 44	19 (58%)	6 (55%)	31 (30%)
45 to 64	10 (30%)	0	46 (45%)
65+	3 (9%)	4 (36%)	19 (19%)
Region			
Upper North Island	20 (57%)	8 (73%)	44 (41%)
Central North Island	10 (28%)	0	22 (21%)
Lower North Island	3 (9%)	3 (27%)	18 (17%)
South Island	2 (6%)	0	23 (22%)
Education			
School	16 (46%)	2 (18%)	23 (22%)
Post-school	7 (20%)	4 (36%)	35 (33%)
University	8 (23%)	5 (45%)	47 (44%)
Not stated	4 (11%)	0	2 (2%)
Employment			
Homemaker	9 (26%)	1 (9%)	12 (11%)
Full-time	14 (40%)	3 (27%)	42 (39%)
Part-time	4 (11%)	2 (18%)	16 (15%)
Casual	2 (6%)	1 (9%)	12 (11%)
Unemployed	7 (20%)	1 (9%)	8 (7%)
Student	3 (9%)	4 (36%)	8 (7%)
Retired	2 (6%)	0	15 (14%)
Rurality			
Main Centre	23 (66%)	8 (73%)	65 (61%)
Large town	0	1 (9%)	9 (8%)
Smaller town	6 (17%)	0	14 (13%)
Rural	5 (14%)	1 (9%)	16 (15%)
Not reported	1 (3%)	1 (9%)	3 (3%)
Disability pre-covid			
Yes	24 (69%)	6 (55%)	70 (65%)
No	11 (31%)	4 (36%)	32 (30%)
Not reported	0	1 (9%)	5 (5%)

People in Household			
Lives alone	5 (14%)	2 (18%)	14 (13%)
2-4 people	12 (34%)	3 (27%)	72 (67%)
5-8 people	12 (34%)	2 (18%)	20 (17%)
9+ people	6 (17%)	4 (36%)	1 (1%)
Overcrowding			
>2 people per bedroom	9 (26%)	6 (55%)	8 (7%)
<=2 people per bedroom	26 (74%)	5 (45%)	99 (93%)

*** Notes**

Most people (94% tāngata whaikaha Māori, 100% disabled Pasifika people and 75% disabled non-Pacific Tāngata Tiriti) did not report their household income, so no further breakdown is given.

Employment response categories were not mutually exclusive, so percentages sum to over 100%

Supplementary Table 3: Domain of disability among Tāngata Whaikaha Māori, Disabled Pasifika peoples and Disabled Non-Pacific Tāngata Tiriti survey participants

	Tāngata Whaikaha Māori (n=35)	Disabled Pasifika peoples (n=11)	Disabled Non-Pacific Tāngata Tiriti (n=107)
Sight	2 (6%)	3 (30%)	3 (3%)
Hearing	3 (9%)	1 (11%)	3 (3%)
Walking or climbing steps	5 (15%)	1 (10%)	22 (21%)
Remembering / concentrating	7 (21%)	2 (20%)	32 (30%)
Self care (washing/dressing)	1 (3%)	1 (10%)	7 (7%)
Communicating	1 (3%)	1 (11%)	5 (5%)

Supplementary Table 4: Ethnicity, place of birth and languages spoken among Pasifika survey respondents

	Pasifika peoples (n=59)	
Ethnicity*		
Samoa	24	41%
Tongan	14	24%
Cook Islands	19	32%
Other Pacific	11	19%
Māori	14	24%
European	15	25%
Place of birth		
Aotearoa New Zealand	36	61%
Elsewhere	23	39%
Languages		
Samoa	10	17%
Tongan	4	7%
Cook Islands Māori	4	7%
Te Reo Māori	8	14%
English	52	88%

* Notes

Only 59 Pacific people answered these questions

Ethnicity and language groups are not mutually exclusive and percentages may sum to greater than 100%

Supplementary Table 5: Measures of SARS-CoV-2 Infection among survey respondents with COVID-19

	Tangata Whenua (n=161)		Pasifika peoples (n=64)		Non-Pacific Tāngata Tiriti (n=779)	
Year of diagnosis						
2019/ 2020	30	19%	8	13%	304	39%
Jan to Nov 2021	131	81%	56	87%	475	61%
P value	P<0.001		P<0.001			
Positive COVID-19 test						
Yes	86	53%	36	56%	400	51%
No	8	5%	3	5%	76	10%
Not reported	67	42%	25	39%	303	39%
P value	P=0.15		P=0.39			
COVID-19 from work						
Yes	10	6%	6	9%	93	12%
No or unsure	80	50%	33	52%	372	48%
Not reported	71	44%	25	39%	314	40%
P value	P=0.10		P=0.77			
COVID-19 in household						
Yes	58	36%	26	41%	237	30%
No	28	17%	12	18%	224	29%
Not reported	75	47%	26	41%	318	41%
P value	P=0.012		P=0.13			
Region in Lockdown						
Yes	33	21%	17	27%	160	21%
No	17	11%	5	8%	135	17%
Not reported/ unsure/ overseas	111	69%	42	66%	484	62%
P value	P=0.092		P=0.11			

Supplementary Table 6: Comparison of the survey respondents with the eligible cohort

	Eligible cohort (8,753)	Respondents (n=990)
Gender		
Female	4,331 (50%)	637 (64%)
Male	4,386 (50%)	285 (29%)
Other / missing	18 (<0.1%)	68 (7%)
Age		
16 to 19	719 (8%)	21 (2%)
20 to 29	2,530 (29%)	163 (16%)
30 to 39	2,101 (24%)	192 (19%)
40 to 49	1,387 (16%)	149 (15%)
50 to 59	1,152 (13%)	178 (18%)
60 to 69	570 (7%)	106 (11%)
70+	275 (3%)	53 (5%)
Not stated/ missing	1 (<1%)	128 (13%)
Prioritised ethnicity		
Māori	2,656 (30%)	161 (16%)
Pacific	1,894 (22%)	50 (5%)
Asian	1,125 (13%)	63 (6%)
Other	3,060 (35%)	716 (72%)
Region		
Auckland / Northland	5,832 (67%)	421 (43%)
Central North Island	725 (8%)	155 (16%)
Lower North Island	341 (4%)	132 (13%)
South Island	512 (6%)	164 (17%)
Missing / overseas	1,325 (15%)	118 (12%)
Year of COVID infection		
2019/2020	1,943 (22%)	340 (34%)
2021	6,792 (78%)	650 (66%)

Supplementary Table 7: Primary health care use and experience among Tāngata Whaikaha Māori and disabled Tāngata Tiriti survey participants with COVID-19

	Tangata Whenua		Tāngata Tiriti	
	Tāngata Whaikaha Māori	Non-Disabled	Disabled	Non-Disabled
Seen a doctor				
No	3 (25%)	31 (66%)	10 (18%)	159 (53%)
1-3 times	5 (42%)	14 (30%)	29 (51%)	104 (35%)
4 or more times	4 (33%)	2 (4%)	18 (32%)	36 (12%)
Seen a nurse				
No	2 (50%)	27 (69%)	33 (66%)	231 (81%)
1-3 times	0	10 (26%)	9 (18%)	33 (12%)
4 or more times	2 (50%)	2 (5%)	8 (16%)	20 (7%)
GP spent enough time				
Yes	4 (66%)	8 (89%)	28 (85%)	76 (75%)
No	2 (33%)	1 (11%)	4 (12%)	19 (19%)
Not sure/ prefer not to say	0	0	1 (3%)	6 (6%)
Involved in decision making				
Yes	3 (60%)	7 (78%)	28	70 (76%)
No	2 (40%)	2 (22%)	4	22 (24%)

Supplementary Table 8: Difficulty getting a COVID test

	Tangata Whenua (n=94)	Pasifika peoples (n=39)	Non-Pacific Tāngata Tiriti (n=476)
Not readily available	18 (19%)	9 (23%)	90 (19%)
Doctor or helpline didn't think it was needed	6 (6%)	3 (8%)	73 (15%)
I didn't know where to get one	7 (7%)	3 (8%)	12 (3%)
I couldn't get time off work for a COVID-19 test	1 (1%)	1 (3%)	2 (<1%)
My COVID-19 test was negative, but I was not offered another test even though I was still unwell	3 (3%)	3 (8%)	20 (4%)

Supplementary Table 9: Barriers to seeing a GP for Tāngata Whaikaha Māori and disabled people

	Tangata Whenua		Tāngata Tiriti	
	Tāngata Whaikaha Māori	Non-Disabled	Disabled	Non-Disabled
Cost	2 (20%)	4 (11%)	4 (8%)	16 (6%)
P value	P=0.42		P=0.56	
Took too long to get an appointment	4 (40%)	6 (16%)	9 (18%)	36 (13%)
P value	P=0.23		P=0.57	
Owed money to the health provider	2 (20%)	2 (5%)	5 (10%)	2 (<1%)
P value	P=0.29		P<0.001	
Bad previous experience with health professionals	1 (10%)	2 (5%)	3 (6%)	13 (5%)
P value	P=0.12		P=0.95	
Too hard to get time off work	2 (20%)	1 (3%)	0	16 (6%)
P value	P=0.12		P=0.20	
Transport	1 (10%)	0	6 (13%)	4 (1%)
P value	P=0.049		P<0.001	
Childcare	2 (20%)	1 (3%)	2 (4%)	3 (1%)
P value	P=0.12		P=0.24	
No carer, support person or interpreter	2 (20%)	0	5 (11%)	2 (1%)
P value	P=0.004		P<0.001	

Supplementary Table 10: Symptoms experienced by people with COVID-19

	Tangata Whenua (n=50)	Pasifika peoples (n=18)	Non-Pacific Tāngata Tiriti (n=306)
Fever or chills	36 (73%)	15 (83%)	216 (71%)
Cough	37 (76%)	14 (78%)	218 (71%)
Shortness of breath	36 (72%)	10 (63%)	184 (60%)
Difficulty breathing	26 (52%)		126 (41%)
Coughing up mucus/ spit/ sputum	21 (42%)	10 (59%)	131 (43%)
Coughing up blood or blood in sputum/ spit	2 (4%)		13 (4%)
Wheeze/whistling in chest	20 (40%)	6 (38%)	101 (33%)
Tiredness or fatigue	49 (98%)	14 (88%)	277 (91%)
Muscle weakness	42 (84%)	13 (76%)	213 (70%)
Muscle or body aches	46 (92%)	14 (82%)	231 (76%)
Joint pain	35 (70%)	7 (44%)	150 (50%)
Headache	41 (82%)	14 (82%)	239 (79%)
Sore throat	29 (58%)	12 (67%)	179 (59%)
Congestion or runny nose	31 (62%)	12 (71%)	181 (60%)
Stomach Pain	14 (28%)		71 (24%)
Nausea or vomiting	14 (28%)		66 (22%)
Diarrhoea	13 (26%)	7 (44%)	99 (33%)
Change in appetite	35 (70%)	8 (50%)	179 (59%)
Loss of taste/other taste disorder	36 (72%)	11 (69%)	180 (60%)
Loss of smell/other smell disorder	35 (70%)	9 (56%)	178 (59%)
Fast-beating or pounding heart ("palpitations")	23 (46%)	6 (38%)	125 (42%)
Skin rash	8 (16%)		30 (10%)
Chest pain	13 (26%)	6 (35%)	74 (25%)
Dizziness on standing (light- headedness)	31 (62%)	11 (65%)	155 (52%)
Tingling (pins-and-needles) feeling	15 (30%)	6 (38%)	59 (20%)
Sleep difficulties	30 (60%)	8 (50%)	156 (52%)
Hair loss	8 (16%)		37 (12%)
Difficulty thinking or concentrating ("brain fog")	37 (74%)		197 (66%)
Mood changes: depression	26 (52%)	10 (63%)	113 (38%)
Mood changes: anxiety	28 (57%)	12 (75%)	154 (51%)
Changes in menstrual period cycles	6 (17%) – based on 36 wāhine		27 (13%) – based on 210 female respondents

Note: Percentages are calculated based on the number of people who answered the question, so differ from symptom to symptom

Supplementary Table 11: Symptoms among Tāngata Whaikaha Māori and disabled Non-Pacific Tāngata Tiriti survey participants

	Tāngata Whaikaha Māori (n=9)	Disabled Non-Pacific Tāngata Tiriti (n=47)
Fever or chills	8 (89%)	34 (72%)
Cough	6 (75%)	32 (68%)
Shortness of breath	8 (89%)	35 (76%)
Difficulty breathing	7 (78%)	31 (67%)
Coughing up mucus/ spit/ sputum	6 (67%)	19 (41%)
Coughing up blood or blood in sputum/ spit	1 (11%)	5 (11%)
Wheeze/whistling in chest	5 (56%)	20 (43%)
Tiredness or fatigue	9 (100%)	43 (93%)
Muscle weakness	9 (100%)	39 (85%)
Muscle or body aches	9 (100%)	37 (80%)
Joint pain	9 (100%)	28 (61%)
Headache	9 (100%)	40 (87%)
Sore throat	7 (78%)	29 (63%)
Congestion or runny nose	6 (67%)	26 (57%)
Stomach Pain	7 (78%)	13 (28%)
Nausea or vomiting	7 (78%)	14 (30%)
Diarrhoea	6 (67%)	20 (43%)
Change in appetite	8 (89%)	37 (80%)
Loss of taste/other taste disorder	8 (89%)	30 (65%)
Loss of smell/other smell disorder	8 (89%)	27 (59%)
Fast-beating or pounding heart ("palpitations")	8 (89%)	27 (60%)
Skin rash	4 (44%)	6 (13%)
Chest pain	3 (33%)	21 (47%)
Dizziness on standing (light-headedness)	9 (100%)	32 (71%)
Tingling (pins-and-needles) feeling	6 (67%)	18 (40%)
Sleep difficulties	7 (78%)	26 (58%)
Hair loss	3 (33%)	6 (13%)
Difficulty thinking or concentrating ("brain fog")	9 (100%)	35 (78%)
Mood changes: depression	6 (67%)	23 (51%)
Mood changes: anxiety	7 (78%)	25 (56%)
Changes in menstrual period cycles	3 (38%) – based on 8 wāhine	3 (9%) – based on 33 women

Note: Percentages are calculated based on the number of people who answered the question, so differ from symptom to symptom

Supplementary Table 12: Prevalence of pre-existing conditions among people with COVID-19

	Tangata Whenua (n=22)	Pasifika peoples (n=6)	Non-Pacific Tāngata Tiriti (n=105)
Allergies	10 (48%)	4 (67%)	50 (48%)
Anxiety	10 (50%)	2 (33%)	23 (22%)
Arthritis (including rheumatoid arthritis, osteoarthritis, gout)	4 (19%)	2 (33%)	22 (21%)
Asthma	14 (64%)	4 (67%)	42 (41%)
Cancer (diagnosis or treatment in the last 5 years)	1 (5%)	0	4 (4%)
Chronic Obstructive Pulmonary Disease (COPD)	1 (5%)	0	3 (3%)
Chronic Pain	5 (24%)	1 (17%)	20 (19%)
Depression	4 (19%)	1 (17%)	19 (18%)
Diabetes	3 (14%)	3 (50%)	15 (14%)
Heart disease	3 (14%)	1 (17%)	12 (12%)
High BMI ($\geq 30\text{kg/m}^2$)	34 (61%)	15 (68%)	98 (29%)
High blood pressure	4 (19%)	2 (33%)	25 (24%)
Obstructive sleep apnoea requiring a machine (CPAP) at night	1 (5%)	1 (17%)	4 (4%)
Stroke	0	0	3 (3%)

Notes:

Percentages are calculated based on the number of people who answered the question, so differ between conditions

BMI calculation was based on a denominator of 56 Tangata Whenua, 22 Pasifika people and 333 Non-Pacific Tāngata Tiriti, as it was asked in a different section of the survey to other pre-existing conditions

Supplementary Table 13: Mental distress among Tāngata Whaikaha Māori and disabled Tāngata Tiriti with COVID-19

	Tangata Whenua		Tāngata Tiriti	
	Tangata Whaikaha Māori	Non-Disabled	Disabled	Non-Disabled
Self-reported symptoms	n=9	n=37	n=46	n=251
Anxiety	7 (78%)	18 (50%)	23 (57%)	127 (51%)
Depression	6 (67%)	17 (46%)	23 (50%)	92 (37%)
Anxiety or depression	7 (78%)	20 (54%)	30 (65%)	137 (55%)
Validated scales	n=17	n=55	n=68	n=340
Generalized Anxiety Disorder (GAD-2) Anxiety	9 (53%)	6 (18%)	27 (41%)	54 (16%)
Patient Health Questionnaire (PHQ)-2 Depression	10 (59%)	9 (30%)	29 (43%)	54 (16%)
GAD-2 Anxiety or PHQ-2 Depression	10 (59%)	10 (33%)	36 (54%)	74 (22%)

Supplementary Table 14: Mental health support received or needed among Tāngata Whaikaha Māori and disabled Tāngata Tiriti with COVID-19

	Tangata Whenua		Tāngata Tiriti	
	Tangata Whaikaha Māori (n=16)	Non-Disabled (n=54)	Disabled (n=59)	Non-Disabled (n=338)
Someone to talk to				
Yes, I got this help	2 (13%)	9 (17%)	10 (17%)	48 (14%)
No, I didn't get this help, but it could have been useful	10 (62%)	16 (30%)	24 (41%)	111 (33%)
No, I didn't need this help	4 (25%)	29 (54%)	25 (42%)	179 (53%)
P value	0.053		0.32	
Other mental health support				
Yes, I got this help	2 (13%)	5 (9%)	5 (9%)	34 (10%)
No, I didn't get this help, but it could have been useful	9 (56%)	14 (26%)	22 (38%)	94 (28%)
No, I didn't need this help	5 (31%)	35 (65%)	31 (53%)	210 (62%)
P value	0.049		0.29	

Supplementary Table 15: Concerns relating to having COVID-19 among Tangata Whaikaha Māori and Disabled Tāngata Tiriti

Concerns	Tāngata Whaikaha Māori	Disabled Tāngata Tiriti
I was worried I would pass COVID-19 on to my whānau/family	18 (100%)	50 (77%)
I was worried I would pass COVID-19 on to others outside my whānau/family	15 (94%)	41 (62%)
I was scared about what might happen to me	16 (100%)	50 (75%)
I felt anxious and/or depressed	16 (100%)	46 (74%)
I was discriminated against because I had COVID-19	11 (73%)	19 (32%)
I felt whakamā or embarrassed that I got COVID-19	15 (94%)	25 (40%)
People didn't understand what I was going through	13 (81%)	54 (82%)
I felt that I couldn't tell whānau/family or friends that I had COVID-19	10 (63%)	21 (32%)
I felt isolated and alone	13 (81%)	38 (60%)
I was worried that I might not get better	15 (94%)	38 (60%)
I felt I had no control over the situation	16 (100%)	53 (80%)
I had money/financial worries	14 (88%)	27 (43%)
I lost my job	3 (20%)	7 (11%)
My workplace was not understanding (e.g., wanted me to return to work before I was fully better)	1 (7%)	10 (17%)
I missed out on school/education	2 (13%)	8 (13%)

Different numbers of people answered each question; the maximum was 18 Tangata Whenua and 66 Tāngata Tiriti

Supplementary Table 16: Proportion of people with COVID-19 who agreed with each statement "Always" or "Often"

	Tangata Whenua (n=63)	Pasifika Peoples (n=23)	Non-Pacific Tāngata Tiriti (n=327)
Because I've had COVID-19, some people have seemed uncomfortable with me	16 (25%)	1 (4%)	52 (16%)
Because I've had COVID-19, some people avoided me	12 (19%)	0	32 (10%)
Because I've had COVID-19, I've felt left out of things	10 (16%)	0	37 (11%)
Because I've had COVID-19, some people have been unkind to me	10 (16%)	1 (4%)	19 (6%)
Because I've had COVID-19, some people have avoided looking at me	1 (2%)	0	12 (4%)
I've felt embarrassed or whakamā about having COVID-19	7 (13%)	2 (9%)	29 (8%)
I've felt embarrassed because of the physical limitations COVID-19 has caused	10 (17%)	3 (13%)	52 (15%)
Some people have acted as though it was my fault I've had COVID-19	6 (10%)	1 (4%)	30 (9%)

Supplementary Table 17: Social support that people received or wanted while having COVID-19

	Māori		Pasifika		Non- Pacific Tāngata Tiriti	
	n	%	n	%	n	%
Food parcels						
No, I didn't need this help	15	19%	4	11%	180	42%
Yes, I got this help	43	54%	22	63%	127	30%
No, I didn't get this help but it might have been useful	21	27%	9	26%	123	29%
Errands						
No, I didn't need this help	13	17%	7	21%	107	27%
Yes, I got this help	45	58%	19	56%	200	50%
No, I didn't get this help but it might have been useful	19	25%	8	24%	96	24%
Childcare						
No, I didn't need this help	65	89%	29	88%	344	88%
Yes, I got this help	0	0%	0	0%	13	3%
No, I didn't get this help but it might have been useful	8	11%	4	12%	34	9%
Help with dependents						
No, I didn't need this help	60	82%	26	76%	346	89%
Yes, I got this help	5	7%	4	12%	9	2%
No, I didn't get this help but it might have been useful	8	11%	4	12%	33	9%
Help with contacting kura/school/ education providers						
No, I didn't need this help	59	80%	25	74%	364	94%
Yes, I got this help	6	8%	3	9%	9	2%
No, I didn't get this help but it might have been useful	9	12%	6	18%	14	4%
WINZ application						
No, I didn't need this help	50	68%	27	82%	332	84%
Yes, I got this help	11	15%	2	6%	12	3%
No, I didn't get this help but it might have been useful	13	18%	4	12%	49	12%
Prescriptions						
No, I didn't need this help	35	47%	16	48%	233	60%
Yes, I got this help	19	26%	8	24%	83	21%
No, I didn't get this help but it might have been useful	20	27%	9	27%	72	19%
COVID-19 Information						
No, I didn't need this help	18	24%	11	33%	88	22%
Yes, I got this help	34	46%	16	48%	128	32%

No, I didn't get this help but it might have been useful	22	30%	6	18%	179	45%
Internet						
No, I didn't need this help	52	72%	18	56%	332	85%
Yes, I got this help	15	21%	11	34%	38	10%
No, I didn't get this help but it might have been useful	5	7%	3	9%	20	5%
Transport						
No, I didn't need this help	50	69%	17	52%	316	81%
Yes, I got this help	16	22%	10	30%	35	9%
No, I didn't get this help but it might have been useful	6	8%	6	18%	38	10%
Keep working						
No, I didn't need this help	51	71%	22	69%	319	82%
Yes, I got this help	7	10%	6	19%	14	4%
No, I didn't get this help but it might have been useful	14	19%	4	13%	56	14%
Accommodation						
No, I didn't need this help	43	61%	19	58%	318	82%
Yes, I got this help	15	21%	7	21%	27	7%
No, I didn't get this help but it might have been useful	13	18%	7	21%	45	12%

Note: Not all people answered each question, so percentages are based on the number of people who answered each sub-question

Supplementary Table 18: Average total out-of-pocket cost per person

	Tangata Whenua (n=42)	Tāngata Tiriti (n=268)
Medicine costs	\$48	\$33
Supplement costs	\$223	\$129
Medical tests	\$85	\$31
Ambulance costs	\$13	\$9
Non-medical direct costs (babysitting, transport, etc.)	\$122	\$291
TOTAL	\$491	\$493

Supplementary Table 19: Direct Medical Costs for Hospitalisation

	Tangata Whenua (n=8)		Tāngata Tiriti (n=26)	
	Length of stay (days)	Average total cost per person	Length of stay (days)	Average total cost per person
Hospital days	7	\$8,400	8	\$8,400
ICUs days	9	\$49,500	5	\$46,750
TOTAL		\$57,900		\$55,150

The length of stay and average cost per visit was used to calculate a total cost per person, which was then averaged across all those who used hospital services, so the average total cost does not equal the average number of visits. Average cost per hospital stay is \$1,200/day for a hospital stay and \$5,500/day for ICU (Te Pātaka Whaioranga | PHARMAC, 2018).

Supplementary Table 20: Cost of lost days of employment for people with COVID-19 and their carers

	Days off work	Costs from paid employment losses	Average days off work (carer)	Cost of unpaid carers	Av. total cost per person
Tangata Whenua (n=42)	20	\$3,808	5	\$770	\$4,578
Tāngata Tiriti (n=170)	25	\$3,850	5	\$770	\$4,620

The cost of lost days of employment was calculated on a daily income of \$154, which was based on the average weekly income from all sources in June 2021 (\$770) divided by five (Tatauranga Aotearoa | StatsNZ, 2021)

Supplementary Table 21: Association between demographic factors and Long COVID

	n/N*	OR	95%CI
Prioritised Ethnicity**			
Māori	32/61	0.99	(0.57 to 1.72)
Pasifika	2/18	0.11	(0.03 to 0.50)
Asian	9/22	0.62	(0.26 to 1.50)
European/ Other	160/134	Ref	
Gender			
Female	146/282	Ref	
Male	55/121	0.78	(0.51 to 1.19)
Age group			
16-24	20/42	0.90	(0.46 to 1.77)
25 to 44	83/165	Ref	
45 to 64	78/153	1.03	(0.66 to 1.60)
65+ years	18/40	0.81	(0.75 to 1.37)

* Number of people with Long COVID in each category / number of people in this analysis

** Prioritised ethnicity, used here to allow for comparisons between ethnic groups

Ref: reference group

Supplementary Table 22: Association between pre-existing conditions, initial COVID-19 symptoms, and Long COVID

	aOR	95%CI
Pre-existing conditions		
Allergies	2.29	(0.90 to 5.82)
Anxiety	2.73	(0.75 to 9.87)
Arthritis	0.82	(0.25 to 2.66)
Asthma	1.93	(0.73 to 5.13)
Chronic Pain	2.08	(0.69 to 6.27)
Depression	1.60	(0.51 to 5.01)
Diabetes	1.67	(0.42 to 6.70)
Heart disease	8.65	(1.29 to 57.86)
High blood pressure	1.98	(0.58 to 6.78)
High BMI \geq 25kg/m ²	2.29	(1.30 to 4.00)
Metabolic syndrome	1.66	(0.73 to 3.79)
Mental distress	2.02	(0.71 to 5.73)
Respiratory conditions	1.93	(0.73 to 5.13)
COVID-19 symptoms in first month		
Fever	1.35	(0.75 to 2.41)
Cough	1.18	(0.65 to 2.15)
Shortness of breath	1.54	(0.88 to 2.68)
Difficulty Breathing	2.15	(1.29 to 3.60)
Coughing Sputum	0.86	(0.52 to 1.43)
Coughing Blood	0.86	(0.31 to 2.41)
Wheeze	1.27	(0.76 to 2.14)
Fatigue	1.80	(0.58 to 5.56)
Weakness	1.71	(0.91 to 3.23)
Muscle aches	2.49	(1.27 to 4.85)
Joint pain	1.05	(0.62 to 1.79)
Headache	1.43	(0.74 to 2.77)
Sore throat	0.91	(0.54 to 1.55)
Runny nose	0.77	(0.45 to 1.32)
Tummy pain	1.05	(0.60 to 1.86)
Nausea / vomiting	1.29	(0.71 to 2.35)
Diarrhoea	1.04	(0.61 to 1.78)
Appetite change	1.60	(0.91 to 2.79)
Change in taste	2.11	(1.23 to 3.62)
Change in smell	1.94	(1.13 to 3.33)
Tachycardia	1.20	(0.70 to 2.06)
Skin rash	1.73	(0.78 to 3.83)
Chest pain	1.90	(1.08 to 3.37)
Dizziness	1.76	(1.04 to 2.99)
Tingling	1.74	(0.95 to 3.19)
Sleep	1.43	(0.86 to 2.40)
Hair loss	1.43	(0.67 to 3.09)
Brain fog	2.13	(1.18 to 3.86)
Depression	1.23	(0.73 to 2.07)
Anxiety	1.43	(0.84 to 2.43)

Menstrual change	1.16	(0.48 to 2.81)
Attended Hospital due to COVID-19	1.23	(0.62 to 2.47)

OR: Odds Ratios; CI: Confidence Interval

Note: All ORs are adjusted for age, gender and ethnicity

Those shown in bold meet conventional levels of statistical significance ($P < 0.05$)

Supplementary Table 23: Symptoms about which people who had had COVID-19 were asked, to elicit the presence of Long COVID

Reported Symptoms	
	Fever or chills
	Cough
	Shortness of breath
	Difficulty breathing
	Tiredness or fatigue
	Muscle weakness
	Muscle or body aches
	Joint pain
	Headache
	Sore throat
	Congestion or runny nose
	Stomach pain
	Nausea or vomiting
	Diarrhoea
	Change in appetite
	Loss of taste/other taste disorder
	Loss of smell/other smell disorder
	Fast-beating or pounding heart (“palpitations”)
	Skin rash
	Chest pain
	Dizziness on standing (lightheadedness)
	Tingling (pins-and-needles) feeling
	Sleep difficulties
	Hair loss
	Changes in menstrual period cycles
	Difficulty thinking or concentrating (“brain fog”)
	Depression
	Anxiety
	Symptoms of Post-traumatic Stress Disorder (PTSD), please write below...
	Other... please write below

Note: For each symptom, participants were asked to indicate at which time point since COVID-19 diagnosis they had this: (1, 3, 6, 12, 18, 24 months). Anyone who reported at least one symptom at least 3 months or longer since COVID-19 diagnosis was included in the analysis of Long COVID.