

Briefing

SARS-CoV-2 Reinfection update – April 2023

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To: Hon Dr Ayesha Verrall, Minister of Health	

Contact for telephone discussion

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Minister's office to complete:

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|---|------------------------------------|--|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Decline | <input type="checkbox"/> Noted |
| <input type="checkbox"/> Needs change | <input type="checkbox"/> Seen | <input type="checkbox"/> Overtaken by events |
| <input type="checkbox"/> See Minister's Notes | <input type="checkbox"/> Withdrawn | |

Comment:

SARS-CoV-2 Reinfection update

Security level: IN CONFIDENCE

Date: 6 April 2023

To: Hon Dr Ayesha Verrall, Minister of Health

Purpose of report

1. To summarise how increasing rates of reinfection from SARS-CoV-2 may impact the rate of infection and severity of disease.
2. This report discloses all relevant information.

Summary

3. Every SARS-CoV-2 infection incurs some level of risk of severe outcomes. However, the combination of vaccination and previous infection (hybrid immunity) provides substantial and enduring protection from serious outcomes and moderate protection from reinfection.
4. The risk of severe outcomes from COVID-19 is primarily a function of an individual's age and comorbidity balanced against their current immunity status. Therefore, the risk of severe outcomes from COVID-19 reinfection for most individuals in Aotearoa New Zealand is solely the risk associated with an individual's hybrid immunity status and (as stated above) reflects a substantially lower risk than that of the first SARS-CoV-2 infection and other factors such as age or comorbidities.
5. Reinfections have the potential to exacerbate existing health inequalities on the basis that the risk of severe outcomes is increased for Māori, Pacific peoples, and people with disabilities. Furthermore, vaccination rates against COVID-19 are lower in Māori than in other ethnic groups, putting them at higher risk of severe outcomes from subsequent infections.
6. In many overseas countries, the proportion of the population having experienced a previous SARS-CoV-2 infection is estimated to be over 90% but is lower in elderly populations who are most at risk of severe outcomes. The proportion of individuals in Aotearoa New Zealand who have experienced at least one COVID-19 infection is unknown but is likely to be less than other western nations.
7. Recurrent infections with SARS-CoV-2 will continue to cause morbidity and mortality but will also change the immune landscape and clinical outcomes from COVID-19, most likely in the direction of less severe disease and lower impacts on hospital and health services over time.

Recommendations

We recommend you:

- a) **Note** the most recent information outlined within this report regarding SARS-CoV-2 reinfection and how this may affect the population in the future with regards to infection rates and severity. **Noted**



Dr Andrew Old
Deputy Director-General
Public Health Agency | Te Pou Hauora Tūmatanui
Date: 5/4/23



Hon Dr Ayesha Verrall
Minister of Health

Date: 17/4/23

SARS-CoV-2 Reinfection update

Background of reinfection with SARS-CoV-2

1. The current Aotearoa New Zealand definition of a reinfection is a case of COVID-19 occurring at 29 days or more from the onset of a previous infection.¹ Reinfection is diagnosed when an individual has evidence of SARS-CoV-2 infection, from testing or clinical signs and symptoms which cannot be attributed to a prior or existing infection.
2. There will be situations in which reinfections occur within the 29 day period, but it is difficult to distinguish a true reinfection from persistent infection, a persistent positive test, or coinfection with multiple SARS-CoV-2 variants.
3. There will be some individuals with persistent infection or intermittent excretion of virus over a prolonged period who could be falsely diagnosed with a reinfection, particularly if polymerase chain reaction (PCR) is used as a diagnostic technique.² However, this is likely to be a rare occurrence and neither of these events will be considered further in this discussion.

Reinfection with the Omicron variant

4. As Omicron has become the dominant variant globally since 2022, multiple Omicron reinfections are the most common form of reinfection.
5. Evolution of the Omicron variant has made reinfections more common due to each subvariant being slightly more infective and immune evasive than the previous, allowing it to more effectively escape immunity conferred by prior infection.

Previous infection and hybrid immunity are protective

6. A systematic review of the effectiveness of previous SARS-CoV-2 infection and hybrid immunity to prevent infection with Omicron or severe disease included 11 studies reporting the protective effect of infection and 15 studies reporting the effectiveness of hybrid immunity.³
7. The review concluded that both previous infection alone and previous infection combined with previous vaccination (i.e., hybrid immunity) conferred rapidly waning protection against Omicron infection, but high and sustained protection against hospital admission or severe disease due to the Omicron variant.
8. The effectiveness of hybrid immunity against hospital admission or severe disease was 97.4% (95% CI: 91.4 – 99.2) at 12 months with primary series vaccination and 95.3% (95% CI: 81.9 – 98.9) at 6 months with the first booster vaccination after the most recent infection or vaccination.

¹ [COVID-19 reinfection advice updated | Ministry of Health NZ](#)

² [Persistent viral RNA shedding in COVID-19: Caution, not fear - eBioMedicine \(thelancet.com\)](#)

³ [Protective effectiveness of previous SARS-CoV-2 infection and hybrid immunity against the omicron variant and severe disease: a systematic review and meta-regression - The Lancet Infectious Diseases](#)

9. Previous infection was found to provide higher protection against reinfection and more sustained protection against hospital admission or severe disease than vaccination alone.⁴
10. The evidence presented within the systematic review strongly suggests that the risk of reinfection and the severity of the outcome of reinfection is less than that for a primary infection, particularly in those with previous vaccination against COVID-19. Therefore, the impact of COVID-19 on a population's health will be influenced by the proportion of the population who have previous immunity from infection and/or vaccination.
11. The relevance of previous studies on the severity of Omicron infection after prior infection with other variants are limited in the context of Aotearoa New Zealand, where most individuals have had their primary infection with the Omicron variant.

Reinfections in Aotearoa New Zealand

Reinfections are increasing and affect those aged between 20-29 years the most

12. As of 17 January 2023, 2.16 million cases of COVID-19 had been reported in Aotearoa New Zealand. Across the motu, the proportion of reported cases of COVID-19 which were reinfections continues to increase, accounting for 30% of cases in the week ending 18 December 2022.⁵
13. Reinfections are more common in individuals aged between 20-29 years than any other age group and least common in those under the age of 10 years and over the age of 80 years. As Māori and Pacific people have a younger age distribution, this puts them at an overall higher risk of reinfection compared to other ethnicities in Aotearoa New Zealand.
14. Seroprevalence surveys have been used in other countries to estimate the total proportion of the population that has been infected with COVID-19. This data is not available for Aotearoa New Zealand, but it is inevitable that the proportion of people in Aotearoa New Zealand who have experienced an infection will increase, as has occurred in other countries, with rates approaching 100% reported in the UK⁶ and USA.⁷

Reinfections in Aotearoa New Zealand are likely to exacerbate existing health disparities

15. Reinfections have the potential to exacerbate existing health inequalities on the basis that the risk of severe outcomes is increased for Māori, Pacific peoples, and people with disabilities.⁸ Furthermore, vaccination rates against COVID-19 are lower in Māori than in other ethnic groups, putting them at higher risk of severe outcomes from subsequent infections.

⁴ [Protective effectiveness of previous SARS-CoV-2 infection and hybrid immunity against the omicron variant and severe disease: a systematic review and meta-regression - The Lancet Infectious Diseases](#)

⁵ [COVID-19 Trends and Insights Report 9 September 2022 \(health.govt.nz\)](#)

⁶ [COVID-19 vaccine surveillance report: week 2 \(publishing.service.gov.uk\)](#)

⁷ [Changes in population immunity against infection and severe disease from SARS-CoV-2 Omicron variants in the United States between December 2021 and November 2022 | medRxiv](#)

⁸ [Māori and Pacific people in New Zealand have a higher risk of hospitalisation for COVID-19 | OPEN ACCESS \(nzma.org.nz\)](#)

Total numbers of reinfections are likely to be higher due to underreporting

16. Due to under-reporting, the true number of reinfections is likely to be higher than recorded. A recently published meta-analysis of the efficacy of hybrid immunity in preventing disease estimated that 35.7% of individuals were asymptomatic during initial and repeat infection and that only 19.5% were symptomatic during both episodes.⁹
17. Reporting of hospitalised cases will be close to 100%, which suggests that the under-reporting will be occurring in individuals who are not hospitalised and/or are asymptomatic.

Under-reporting will affect the analysis of reinfection on healthcare resource impacts

18. The variation in under-reporting rates in groups with different severity of disease has implications for the analysis of the impact of reinfection on healthcare resources.
 - a. Public health interventions could be emphasised toward preventing infection in vulnerable populations, if it is found that individuals who are not hospitalised (after the initial or most recent episode of COVID-19) are at low risk of severe disease in the future.
 - b. A key assumption for this approach is that it is possible to prevent infection in the vulnerable population using the current interventions available, by directing these interventions to that group. The counterfactual is that it will not be possible to obtain a meaningful decrease in the risk of infection in vulnerable groups without suppressing the rate of infection in the entire population.
 - c. A second key assumption is that individuals who are not hospitalised will not contribute to the overall health burden. As yet the health burden from long COVID from reinfection compared to primary infection remains unclear.

The risk of reinfection for developing long COVID is unknown

19. It is currently unknown how reinfections affect the risk of developing long COVID or worsening long COVID symptoms.
20. It is thought that the more times a person is infected by SARS-CoV-2, the greater their absolute risk of developing long COVID. However, hybrid immunity from vaccination and prior infection likely has a protective effect, meaning the relative risk of each infection may be lower compared to the first infection.
21. A study published in November 2022 reported an increased risk of death, hospitalisation, and sequelae with reinfection compared to no reinfection.¹⁰ These results were widely reported; however, these require careful interpretation as the follow-up time after symptom onset is not the same between comparison groups (no reinfection group and the reinfection group). Furthermore, it is unsurprising that people who have had a reinfection more recently report more symptoms than those who had one infection in the past.

⁹ [Protective effectiveness of previous SARS-CoV-2 infection and hybrid immunity against the omicron variant and severe disease: a systematic review and meta-regression - The Lancet Infectious Diseases](#)

¹⁰ [Acute and postacute sequelae associated with SARS-CoV-2 reinfection | Nature Medicine](#)

22. The UK Office for National Statistics published results in February 2023 showing that adults who are infected for a second time were approximately 30% less likely to report a new onset of long COVID compared to people who were infected for the first time. This study found no significant difference in the risk of long COVID between the first and second infection in young people.¹¹

Reinfection in other countries

Australia

23. A population seroprevalence survey undertaken by the Kirby Institute in September 2022 reported that the overall incidence of anti-spike antibodies, which indicate immune exposure either via vaccination and / or infection was 99.6% with little variation across states or age groups.¹²
24. The prevalence of nucleocapsid antibodies, which is indicative of previous infection but not vaccination was 65%.
25. The sensitivity of the nucleocapsid assay used was 84%, which would indicate that 15-20% of infections may be missed by these seroprevalence estimates, suggesting that the true prevalence may be closer to 80%.

United Kingdom

26. The UKHSA reports seropositivity using an assay which detects antibodies against the nucleocapsid (N) protein of SARS-CoV-2.
27. Antibodies generated against the N protein are through infection by or exposure to the SARS-CoV-2 virus. Seroprevalence surveys using this as a measure give an indication of the level of previous infection amongst the population.
28. Estimates of overall seropositivity was 82.5% as of November / December 2022 with a range of 68.5% for individuals aged 70–84 years to 89.4% for individuals aged 17-29 years.
29. Considering the sensitivity of this assay as discussed above, it is expected that most individuals in the UK have now had COVID-19.¹³
30. Although individuals aged 70-84 years are at the greatest risk of severe outcomes, the levels of antibodies in this population are high.

United States of America

31. A mathematical model of COVID-19 in the United States, indicated that 94% of the population has been infected by SARS-CoV-2 at least once and that accounting for

¹¹ [New-onset, self-reported long COVID after coronavirus \(COVID-19\) reinfection in the UK - Office for National Statistics](#)

¹² [COVID19-Blood-Donor-Report-Round3-Aug-Sep-2022.pdf \(unsw.edu.au\)](#)

¹³ [COVID-19 vaccine surveillance report: week 2 \(publishing.service.gov.uk\)](#)

vaccination, 97% of the population have some prior immunological exposure to the virus.¹⁴

Equity

32. Reinfections have the potential to exacerbate existing health inequalities on the basis that the risk of severe outcomes is increased for Māori, Pacific peoples, and people with disabilities.¹⁵
33. Reinfections are most frequent in those aged under 40 years. As Māori and Pacific peoples have a lower age distribution, this puts them at an overall higher risk of reinfection compared to other ethnicities in Aotearoa New Zealand.
34. Furthermore, vaccination rates for COVID-19 are lower in Māori than in other ethnic groups, putting them at higher risk of severe outcomes from subsequent infections.

Next Steps

35. The Public Health Agency, Te Pou Hauora Tūmatanui within Manatū Hauora will continue to monitor the developing science on SARS-CoV-2 reinfection and its impacts across populations.

ENDS.

¹⁴ [Changes in population immunity against infection and severe disease from SARS-CoV-2 Omicron variants in the United States between December 2021 and November 2022 | medRxiv](#)

¹⁵ [Māori and Pacific people in New Zealand have a higher risk of hospitalisation for COVID-19 | OPEN ACCESS \(nzma.org.nz\)](#)