

Final report summary

COVID-19 and National Immunisation
Programme research

Submitted by
Auckland UniServices Ltd

Project title
PROP-047 Examining vaccine effectiveness of
two and three doses of Comirnaty mRNA vaccine
during the 2022 Omicron wave in Aotearoa

Section 1: Reporting

1.1 Overview

- **Background**
 - At the beginning of 2022, Aotearoa New Zealand (NZ) was almost unique among high-income countries in: i) having full border controls in place until the end of February 2022 and ii) almost exclusive use of the Pfizer mRNA COVID-19 vaccine. This afforded two months during which to increase uptake of doses, especially third doses, prior to widespread community transmission of the Omicron variant from the beginning of March 2022.
- **State of play**
 - In NZ, widespread community transmission, first occurred with the Omicron variant in the context of an infection-naïve population with high coverage of at least two Pfizer mRNA vaccine doses and substantial recent receipt of a third Pfizer vaccine dose in people aged 50 years and over.
 - Most evidence on COVID-19 relative vaccine effectiveness has been derived from high-income countries which had experienced substantial community transmission of SARS-CoV-2 during COVID-19 vaccine rollout in 2021, which rapidly accelerated after the emergence of the Omicron variant from December 2021.
 - Considering this, we aimed to examine: i) trends in vaccine coverage and reported SARS-CoV-2 infection by age group, ethnicity and geography during 2022 and ii) the relative effectiveness of three versus two doses of Pfizer mRNA COVID-19 vaccine against severe outcomes (hospitalisation and death) in the context of rapidly increasing exposure to SARS-CoV-2 infection.
- **Key findings**
 - By the end of February 2022, prior to widespread Omicron community transmission in March 2022, more than 50% of the adult population and around 80% of adults 65 years and over had received a third mRNA vaccine dose. However, there were disparities in third dose uptake by age, ethnicity and residential area deprivation score, with coverage in all adults over 18 years varying from 69.3% in least deprived quartile to 48% in most deprived quartile and from 63.4% in European to 40.8% in Māori. Coverage increased with age from 38.8% 18-24 years to 72.4% 54-64 and 84.1% in those over 75 years. Notably, in the Asian population, although only 5% of adults <65 years were unvaccinated, this increased to around 8% over 75 years.
 - We found clear improvements in relative vaccine effectiveness of three versus two doses, especially for severe outcomes (i.e. hospitalisation and/or death) where the risk of bias from non-ascertainment of infection was lower. Importantly, protection was equivalent or slightly higher for Māori and Pacific Peoples.
- **Implementation issues**
 - Efforts to promote the uptake of third vaccine doses were mostly successful in NZ and were highest in the age groups at greatest risk of severe disease. However, uptake was not as high in older Māori and Pacific adults or in the oldest Asian adults compared to the European population. Targeted vaccination campaigns focusing on access and communication appropriate for underserved communities would be most likely to maximise vaccine uptake.

1.2 What is the problem or issue that your research investigated?

Following ethical approval (AH24986) we focussed on two key issues: i) the rapidly changing dynamics of vaccine uptake and infection in 2022 in NZ and ii) challenges in accurate measurement of relative vaccine effectiveness in this context. We first assessed vaccine uptake and identified SARS-CoV-2 infection through use of the Integrated Data Infrastructure enabling the eligible resident population to be identified by age, sex, ethnicity and by geography. Our research thus focussed on the most important issue – incremental protection against severe disease due to SARS-CoV-2 – which required detailed age-stratified analysis of curated data in the context of rapidly changing vaccine coverage to provide better guidance for the public and for vaccine strategy assessment.

1.3 What are the practical solutions and implementation options that you recommend?

Part 1) Vaccination coverage

Prior to the widespread community transmission of the Omicron variant in March 2022, significant efforts were made to vaccinate the NZ population to protect against severe disease and death. Positively, our findings showed that by the end of February, over half the adult population and around four out of five adults aged 65 years and over had received a third vaccine dose. There were noticeable trends by age group, with those aged 55 and over having a much higher uptake of a third vaccine dose for all ethnic groups. In contrast, those aged 18–24 and 25–34 had much lesser uptake of the third vaccine dose. This may be related to the older population becoming eligible for the booster much earlier, to young people becoming infected and therefore not eligible for a booster until later, or to a lack of engagement past the first two doses. Despite this, our findings show less uptake of a third vaccine dose for Māori and Pacific Peoples when compared to the European/Other population. Additionally, a higher percentage of zero doses were seen in young people (aged 18–34 years) for Māori and in older people (aged 75+) for Pacific Peoples. Our results also demonstrate a gradient by deprivation with less uptake of a third vaccine dose in the most deprived areas for all ethnic groups, which was most pronounced for Māori. Further research is needed to explore the populations who have zero doses.

Part 2) Relative vaccine effectiveness

We identified three key findings with respect to relative vaccine effectiveness (rVE) in the period March–October 2022 coinciding with the Omicron wave of infection in NZ. First, across adults aged 18+ years, three vaccine doses provided significantly greater protection against severe outcomes than two doses. Relative to people who had two recorded doses, those with three (rVE 32%, 27-37) or four doses (rVE=50% [46–53%]) were at reduced risk of a hospitalisation meeting criteria with COVID-19. Second, as expected due to the higher risk of severe outcomes in adults 50 years and over, incremental protection from two vs three doses was higher in this age group (rVE=44.6, 39.8-49.1) Third, rVE for Māori was 32% (20-43%) and 48% (38-57%) for Pacific Peoples. This was at least equivalent to other ethnicities, highlighting the important role of vaccines in reducing inequities in infectious disease burden. There was evidence of waning rVE of three doses across the study period – rVE measurement restricted to the months March–June 2022 was higher among all adults (45%, 42-47%) than in the period March to October. Relative vaccine effectiveness (three versus two doses), against the most serious outcomes, ICU admission or death, was similar (all ages and adjusted for age, sex, deprivation and ethnicity) at 36% (33-39%) It was consistent for Māori (rVE=40%, 34-46%) and Pacific Peoples (rVE=36%, 25–45%) and those aged over 50 years (rVE=37%, 34-40%. Examination of the rVE (three versus two doses) for the truncated period (52%, 49-55%) indicated some waning of rVE.

1.4 What considerations need to be taken into account implementing the solutions?

Part 1) Vaccination coverage

The COVID-19 response targeted older populations at highest risk of severe outcomes successfully but was lower among older Pacific Peoples and Māori. Future planning could consider a 'whole of whanau' approach, vaccinating entire households simultaneously. This strategy, involving healthcare providers, community hubs, and maraes, aims to reduce visits and enhance accessibility. To implement this, collaboration with Iwi-Māori and other local planning groups is vital. It is important to note when examining coverage that the Health Service User and Estimated Resident Population give different denominators in terms of population especially for Māori populations.

Part 2) Relative vaccine effectiveness

Substantial incremental relative vaccine effectiveness against the initial Omicron variant from a third and in the latter part of 2022 a fourth dose of mRNA vaccine against the ancestral strain of SARS-CoV-2 for severe disease outcomes confirmed their value in 2022. Evaluation of the need for repeated booster doses in 2024 will require more recent data on relative vaccine effectiveness, focussed on severe outcomes in adults over 50 years and younger people with severe comorbidities.