

First nation-wide data shows 2 doses of Pfizer vaccine highly effective against COVID infection, hospitalization, death

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A medical assistant prepares a dose of a COVID-19 vaccine to be administered to a patient. Credit: Public domain image courtesy of Lisa Ferdinando, U.S. Department of Defense

Two doses of the Pfizer-BioNTech COVID-19 vaccine provide more than 95% protection against infection, hospitalisation, severe illness, and death, including among the elderly, according to the first national-level observational assessment of its effectiveness in Israel, published in *The Lancet*.

The analysis, based on de-identified national data, also reveals for the first time the public health benefits of a national vaccination programme, which was found to be the key driver of a decline in COVID-19 infections in Israel.

While the findings are encouraging, the authors stress that a number of challenges to controlling the pandemic remain. The duration of immunity to COVID-19—both from [infection](#) and immunisation—remains unknown, and it is possible that new, [vaccine](#)-resistant variants could emerge in the future. In addition, achieving herd immunity will require a continued increase of vaccination coverage worldwide.

By April 2021, COVID-19 had resulted in over 131 million cases and more than 2.8 million deaths worldwide. Preliminary vaccine effectiveness (VE) estimates of one dose of the Pfizer-BioNTech vaccine—which was approved for emergency use in Israel in December 2020—have been reported in the UK, Denmark, Israel, and the U.S.. VE estimates for two doses have also been carried out in a subset of the population in Israel. However, until now, national-level VE estimates of two doses of the Pfizer-BioNTech vaccine—the only COVID-19 vaccine available in Israel during the study period of 24th January to 3rd April 2021—were not available for a range of key outcomes, including VE among the elderly.

Lead author, Dr. Sharon Alroy-Preis, of the Israel Ministry of Health, says: "As the country with the highest proportion of its population vaccinated against COVID-19, Israel provides a unique real-world opportunity to determine the effectiveness of the vaccine and to observe wider effects of the vaccination programme on public health.

"Until this point, no country in the world had described the national public health impact of a nationwide COVID-19 vaccination campaign. These insights are hugely important because, while there are still some considerable challenges to overcome, they offer real hope that COVID-19 vaccination will eventually enable us to control the pandemic."

The authors used national pandemic surveillance data recorded by the Israel Ministry of Health to produce VE estimates of two doses of the vaccine against outcomes including COVID-19 infection, severe and critical hospitalisations, and deaths. Data was analysed in groups based on participants' age. The average follow-up time for people who had received two doses was 48 days. An

evaluation of the nationwide impact of Israel's vaccination programme on public health, in terms of COVID-19 cases, was also conducted.

Vaccinations with the Pfizer-BioNTech vaccine began amid a surge of infections that led to a national lockdown on 27th December 2020. Daily infections peaked at 10,213 cases on 20th January 2021, and lockdown was lifted on 7th March 2021. By 3rd April, 2021, 72% (4,714,932/6,538,911) of people over 16 years, and 90% (1,015,620/1,127,965) of those over 65 years, had received two doses of the Pfizer-BioNTech vaccine.

During the analysis period, there were 232,268 confirmed COVID-19 infections in the country. The most prevalent strain was B.1.1.7—also known as the UK variant—which accounted for 94.5% (8,006/8,472) of specimens tested through Israel's free and widely available PCR testing service. Two-thirds of cases were in people over 16 years (66.6%, 154,648/232,268), and there were 7,694 hospitalisations—of which 4,481 were severe and 188 were critical—and 1,113 deaths.

The analysis revealed that the Pfizer-BioNTech vaccine is highly effective against COVID-19 for all people over the age of 16 years, providing 95.3% protection against infection and 96.7% protection against death seven days after the second dose. Protection against symptomatic and asymptomatic infection was 97.0% and 91.5%, respectively. The vaccine is also highly effective for preventing hospitalisations and [severe illness](#), providing 97.2% protection against hospitalisation overall and 97.5% protection against severe and critical hospitalisation. By 14 days after vaccination, protections conferred by a second dose increased to 96.5% protection against infection, 98.0% against hospitalisation, and 98.1% against death. More data on the duration of VE will become available over time.

Protections among the elderly were as strong as those for younger people, with analysis indicating that people over 85 years had 94.1% protection against infection, 96.9% against hospitalisation, and 97% against death 7 days after receiving their second dose. People aged 16-44 years had 96.1% protection against infection, 98.1% against

hospitalisation, and 100% against death.

By assessing VE after one dose of the Pfizer-BioNTech vaccine, the authors demonstrated the importance of fully vaccinating adults. Protections were considerably lower between seven and 14 days after receiving the first dose compared to two doses, with 57.7% protection against infection, 75.7% against hospitalisation, and 77.0% against death. The authors also highlight that little is known about the duration of protection of one dose and how this compares to two doses, and caution that one dose may provide a shorter window of protection, particularly in an environment where new variants continue to emerge.

Observed correlations between declines in national COVID-19 infections and the timing of high vaccine uptake for each age group, rather than the start of lockdown on 27th December, suggest that the vaccination programme also had public health benefits.

Infections among those over 65 years continued to rise until mid-January, peaking at around 55 cases per 100,000. However, infections started to decline as people began receiving their second vaccine doses, with daily cases of around 30 per 100,000 by the first phase of reopening on 7th February. Daily infections continued to decline markedly as more people received the vaccine. Steeper and swifter declines were observed for people over 65 years of age—reflecting higher and earlier vaccination rates among older people—however, similar patterns were identified in all age groups.

"As vaccination programmes continue to ramp up around the world, more data is needed urgently about the effectiveness of the Pfizer-BioNTech vaccine against severe disease and death, and about the levels of protection it provides to [elderly people](#). Research examining long-term vaccine effectiveness will ultimately play a vital role in tackling the pandemic," says Dr. Luis Jodar, Senior Vice President and Chief Medical Officer, Vaccines at Pfizer, Inc., U.S.

The authors acknowledge some limitations. Given the differences between countries in how vaccines are rolled out and how the pandemic continues to

evolve, caution should be used in generalising these findings to other nations. Further real-world studies of the Pfizer-BioNTech vaccine, and other vaccines, in other countries and settings are needed.

The dominant COVID-19 strain during the study period was the B.1.1.7 variant. However, another prominent variant, B.1.351—known as the South Africa variant—has recently been identified in Israel. It was not possible to produce VE estimates for B.1.351 in this report due to the limited number of identified B.1.351 infections in Israel during the analysis period, so this should be investigated in future studies. While VE estimates accounted for factors including age and sex, there was no analysis of the possible effects of other covariates, race/ethnicity, socioeconomic status, or likelihood of seeking a COVID-19 test, and these should be evaluated in future research. With nearly seven weeks of follow-up after the second vaccine dose, the study has the longest reported follow-up to date. However, longer-term data on effectiveness are needed. Variations in the time from symptom onset to hospitalisation and death may have prevented identification of all hospitalisations and deaths during the analysis period.

Writing in a linked Comment, Prof Eyal Leshem of the Chaim Sheba Medical Centre, Israel, and Prof Annelies Wilder-Smith of the London School of Hygiene & Tropical Medicine, who were not involved in the study, note, "Haas and colleagues' findings from Israel suggest that high vaccine coverage rates could offer a way out of the pandemic. Regrettably, rapid population-level coverage cannot be easily replicated in many other countries. The global use of BNT162b2 vaccine is limited by supply issues, high costs, and ultra-cold chain storage requirements."

They continue, "Israel's experience provides impetus for countries to proactively pursue high vaccine coverage to protect the population; however, rollout would need to follow the WHO prioritisation roadmap to maximise the [public health](#) impact, in light of vaccine supply constraints. More post-introduction vaccine effectiveness studies will be required. Timely reporting of vaccine effectiveness against variants of concern, the

duration of protection across age groups and geographical settings, and the effectiveness of alternative dosing regimens is crucial to provide data-driven immunisation policies."

More information: Eric J Haas et al, Impact and effectiveness of mRNA BNT162b2 vaccine against SARS-CoV-2 infections and COVID-19 cases, hospitalisations, and deaths following a nationwide vaccination campaign in Israel: an observational study using national surveillance data, *The Lancet* (2021). [DOI: 10.1016/S0140-6736\(21\)00947-8](https://doi.org/10.1016/S0140-6736(21)00947-8)

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