

# Delta, waning immunity reduced Pfizer vaccine's effectiveness in households

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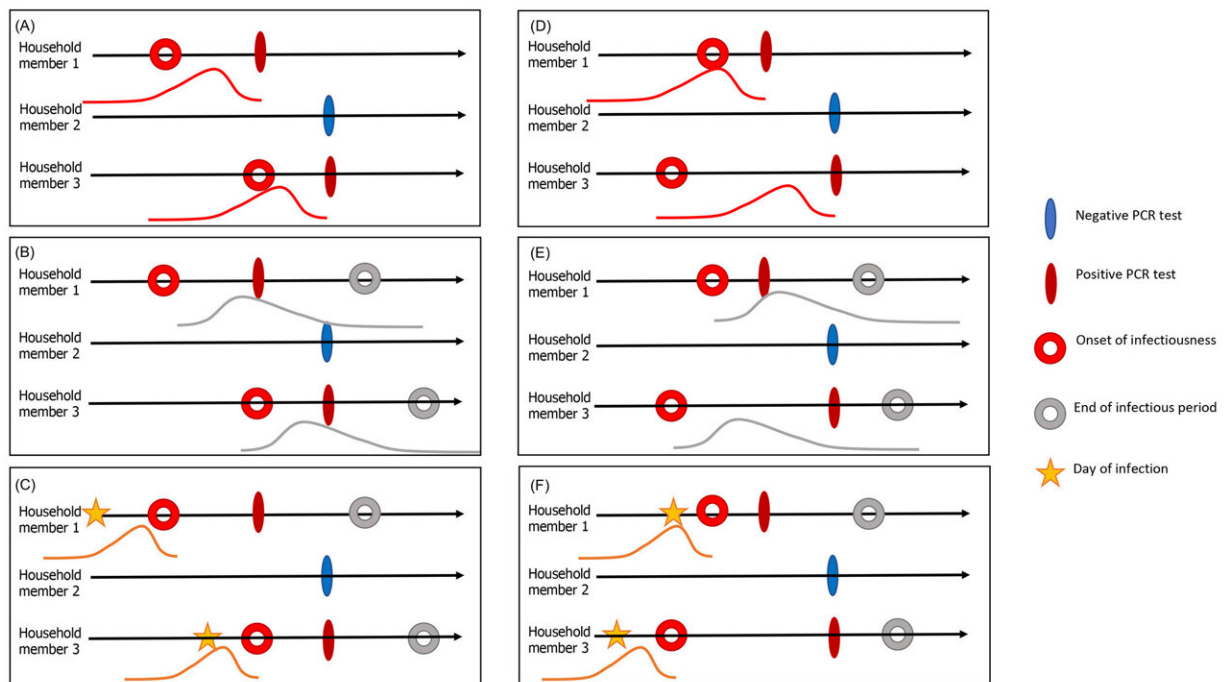


FIG. 1. Schematic representation of the multiple imputation process for an example household. Each infected household member is associated with: (A and D) a distribution for time from onset of infectiousness to testing; (B and E) a distribution for the infectious period; and (C and F) a distribution for the latent period to infer the time of infection. The filled ovals represent observed events, and the circles and stars represent unobserved events in the infection timeline. Panels (A to C) and (D to F) represent two possible sample sets from the delay distributions, each with a different index case, who is not necessarily the first person to test positive in the household. We generated 100 samples of the latent data for each infected individual. Credit: DOI: 10.1126/science.abl4292

A new study by Yale School of Public Health (YSPH) researchers suggests that the Pfizer-BioNTech vaccine was more than 91 percent effective at reducing transmission of coronavirus in Israeli households before the emergence of the delta variant. However, the combined effect of the new variant and waning vaccine-induced immunity considerably reduced the vaccine's effectiveness against transmission over time.

The findings are based on an analysis of medical information from 2.5 million people—about a quarter of Israel's population—contained in a centralized database maintained by Maccabi Health Services, a state-mandated, not-for-profit health care delivery organization in Israel.

Between June 1, 2020 and July 28, 2021, nearly 1.5 million people in the dataset received two doses of the Pfizer vaccine, and only about 6,500 tested positive for coronavirus following the second dose.

Using this information, the scientists developed a household transmission model to assess the risk of infection based on an individual's vaccination status and that of other household members. Before the emergence of the [delta variant](#) in Israel, vaccination reduced the risk of being infected by 89 percent and lowered the risk that people with [breakthrough infections](#) would transmit the virus to other household members by 23 percent. After the emergence of the delta variant, however, vaccination no longer reduced the infectiousness of breakthrough cases and provided slightly less protection against infection, the scientists found. Instead, people who had received their second dose of [vaccine](#) more than 3 months ago were only 40 percent less likely to be infected compared to an unvaccinated person and may have actually been more likely to transmit the delta variant to other [household members](#) if they were infected.

"Our analysis suggests that while vaccines provide good protection against coronavirus infection, this protection wanes over time," said Virginia Pitzer, an associate professor at YSPH and the study's senior author. "Moreover, vaccinated people who got infected with the delta variant were just as infectious as unvaccinated cases. This emphasizes the need for booster doses and for people who are infected to isolate regardless of whether or not they are vaccinated."

The findings are published in the journal *Science*.

The results mirror other studies performed in different parts of the world. In England, researchers found that both the Pfizer and AstraZeneca vaccines halved the risk of transmission from a household member with a breakthrough [infection](#) during the period when the alpha variant was dominant, but another study found vaccinated and unvaccinated cases with the delta variant infected a similar proportion of their household contacts.

**More information:** Ottavia Prunas et al, Vaccination with BNT162b2 reduces transmission of SARS-CoV-2 to household contacts in Israel, *Science* (2022). [DOI: 10.1126/science.abl4292](https://doi.org/10.1126/science.abl4292)

Provided by Yale University

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