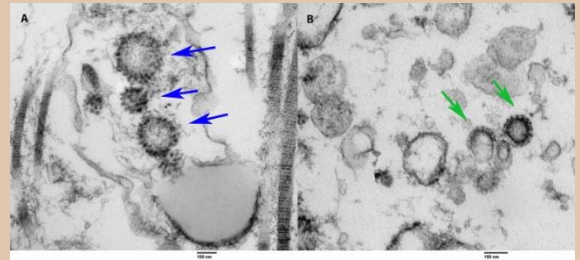


# Protection From Reinfection

## Does previous COVID infection protect from reinfection?

*If we contract COVID, are we protected from reinfection, and if so, how long does that protection last? These questions have been raging throughout the pandemic with “experts” weighing in on both sides of the debate. In this study, researchers in Denmark used a nationwide registry of PCR test results to investigate the risk of reinfection in people who had previously tested positive for COVID-19. During the first wave of infections, 11,068 positive tests were identified versus 514,271 negative tests. During the second wave in the fall of 2020, those who were previously positive had an infection rate of 5.4 cases per 100,000 person-days compared with 27.1/100,000 for the PCR-negative group. This resulted in estimated protection of 80.5%. There were no differences based on sex or amount of time in follow-up. Of note, however, was a drop-off in protection for those over age 65 years (47.1% protection).*



### Abstract

- **Background:** The degree to which infection with SARS-CoV-2 confers protection towards subsequent reinfection is not well described. In 2020, as part of Denmark's extensive, free-of-charge PCR-testing strategy, approximately 4 million individuals (69% of the population) underwent 10.6 million tests. Using these national PCR-test data from 2020, we estimated protection towards repeat infection with SARS-CoV-2.
- **Methods:** In this population-level observational study, we collected individual-level data on patients who had been tested in Denmark in 2020 from the Danish Microbiology Database and analysed infection rates during the second surge of the COVID-19 epidemic, from Sept 1 to Dec 31, 2020, by comparison of infection rates between individuals with positive and negative PCR tests during the first surge (March to May, 2020). For the main analysis, we excluded people who tested positive for the first time between the two surges and those who died before the second surge. We did an alternative cohort analysis, in which we compared infection rates throughout the year between those with and without a previous confirmed infection at least 3 months earlier, irrespective of date. We also investigated whether differences were found by age group, sex, and time since infection in the alternative cohort analysis. We calculated rate ratios (RRs) adjusted for potential confounders and estimated protection against repeat infection as  $1 - \text{RR}$ .
- **Findings:** During the first surge (ie, before June, 2020), 533 381 people were tested, of whom 11 727 (2.20%) were PCR positive, and 525 339 were eligible for follow-up in the second surge, of whom 11 068 (2.11%) had tested positive during the first surge. Among eligible PCR-positive individuals from the first surge of the epidemic, 72 (0.65% [95% CI 0.51–0.82]) tested positive again during the second surge compared with 16 819 (3.27% [3.22–3.32]) of 514 271 who tested negative during the first surge (adjusted RR 0.195 [95% CI 0.155–0.246]). Protection against repeat infection was 80.5% (95% CI 75.4–84.5). The alternative cohort analysis gave similar estimates (adjusted RR 0.212 [0.179–0.251], estimated protection 78.8% [74.9–82.1]). In the alternative cohort analysis, among those aged 65 years and older, observed protection against repeat infection was 47.1% (95% CI 24.7–62.8). We found no difference in estimated protection against repeat infection by sex (male 78.4% [72.1–83.2] vs female 79.1% [73.9–83.3]) or evidence of waning protection over time (3–6 months of follow-up 79.3% [74.4–83.3] vs  $\geq 7$  months of follow-up 77.7% [70.9–82.9]).
- **Interpretation:** Our findings could inform decisions on which groups should be vaccinated and advocate for vaccination of previously infected individuals because natural protection, especially among older people, cannot be relied on.

*Nearly 10% of the US population has tested positive for COVID and it is very likely that the true number of people infected during the pandemic is much higher (likely over three times higher per CDC estimates). Figuring out the amount of protection from reinfection provided by natural immunity as well as the length of immunity are important for us to know as we work toward the ever-elusive “herd immunity” through a combination of immunity from natural infection and vaccination.*

*From this study, it appears that the following are true:*

- *Natural infection provides 80% protection from reinfection.*
- *The protection appears to be long-lasting (no decline over at least 6 months).*
- *There is a significant reduction in protection in people over age 65 (80% to 47%).*

*Based on this information, it appears that the protection from reinfection in those over 65 is significantly diminished. I would strongly recommend vaccination for those over age 65 any other higher-risk individuals under age 65 who have had a COVID infection. Even in younger people, there is approximately a 20% chance of reinfection. Another study of young Marines found that although prior infection reduced the rate of infection by 80%, around 10% did become reinfected. The vaccines are excellent at “boosting immunity” in people who have had the infection and will provide more protection from reinfection (including variants). I also recommend vaccination for everyone eligible regardless of previous infection status.*

Assessment of Protection Against Reinfection With SARS-CoV-2 Among 4 Million PCR-Tested Individuals in Denmark in 2020: A Population-Level Observational Study *Lancet* 2021 Mar 17; [EPub Ahead of Print], CH Hansen, D Michlmayr, SM Gubbels, K Mølbak, S Ethelberg.