

THE LANCET

Infectious Diseases

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Mostaghimi D, Valdez CN, Larson HT, et al. Prevention of host-to-host transmission by SARS-CoV-2 vaccines. *Lancet Infect Dis* 2021; published online Sept 14. [http://dx.doi.org/10.1016/S1473-3099\(21\)00472-2](http://dx.doi.org/10.1016/S1473-3099(21)00472-2).

Supplementary Appendix

Table of Contents

| | |
|--|----|
| Supplementary Table 1. Infection reduction in clinical trials | 2 |
| Supplementary Table 2. Infection or transmission reduction in observational studies | 4 |
| Supplementary Table 3. Infection reduction in observational studies involving the Delta variant | 13 |
| Supplementary References. | 17 |

Supplementary Table 1. Empirical evidence for a vaccine-mediated reduction in SARS-CoV-2 infection from a comprehensive list of randomized clinical trials. *95th percentile confidence intervals (CI) not published.

| | N | Time of assessment | Positives in vaccinated | Positives in control | Efficacy | Study Design | Key Results |
|---|---|--|-------------------------|----------------------|-----------------------------|--|--|
| Moderna Randomized Controlled Trial ^{1,2} | N(vaccinated) = 14134 N(placebo) = 14073 | 7/27/2020 - 10/23/2020 Day 29, prior to second dose | 14 (0.1%) | 38 (0.3%) | 63%* | Double blind randomized clinical trial assessing efficacy of the two-dose Moderna mRNA-1273 COVID19 vaccine. Participants are tested only once after vaccination-- prior to their second dose, so this trial does not test full efficacy of the Moderna mRNA-1273 vaccine on limiting infection. | Moderate efficacy against asymptomatic SARS-CoV-2 infection after one dose of the Moderna vaccine. |
| Johnson & Johnson Randomized Controlled Trial ³ | N(vaccinated) = 19301 N(placebo) = 19162 | 9/21/2020 - 1/22/2021 After day 29 | 22 (0.1%) | 54 (0.3%) | 59.7% (CI: 32.8 - 76.6%) | Double blind randomized clinical trial assessing efficacy of one-dose Johnson and Johnson vaccine. Participants tested by PCR or serology at day 29 and 71 after vaccination. If the participant has 1) no symptoms on the day before, at or after the PCR positive test and 2) has a SARS-CoV-2 positive RT-PCR/molecular test result or develops a positive serology (non-S protein) test, they are considered a positive result. Other metrics are used to assess efficacy in the citation. | Moderate efficacy against asymptomatic SARS-CoV-2 infection after one dose of the Johnson & Johnson vaccine. |
| UK Phase I/II AstraZeneca Randomized Controlled Trial (COV002) ⁴ | N(vaccinated) = 4244 N(control) = 4290 | 10/1/2020 - 1/14/2021 >14 days after second dose | 173(4.1%) | 347(8.1%) | 50.9% (CI: 41.0 - 59.0%) | Double blind randomized control trial held in the UK (COV002) assessing efficacy of two-dose AstraZeneca ChAdOx1 vaccine against a control vaccine. Participants are given a nose and throat swab after being vaccinated weekly for the duration of the study. Results reported are among the participants who received two standard doses. | Low efficacy against any NAAT-positive SARS-CoV-2 test after both doses of the AstraZeneca vaccine. |

Supplementary Table 2. Empirical evidence for a vaccine-mediated reduction in SARS-CoV-2 infection and/or transmission from a comprehensive list of observational studies. *95th percentile confidence intervals (CI) not published.

| | N | Time of assessment | Positives in fully vaccinated | Positives in partially vaccinated | Positives in unvaccinated | Effectiveness or Relative Risk | Study Design | Key Results |
|--|---|--|-------------------------------|-----------------------------------|---------------------------------|--|---|---|
| Pfizer-BioNTech Vaccine Effectiveness in Israel ⁵ | N(vaccinated) = 596,618 N(unvaccinated) = 596,618 | 12/20/2020 – 2/1/2021 Fully vaccinated = 7 days after second dose Partially vaccinated = 21 – 27 days after first dose | NA | NA | NA | Fully vaccinated vs unvaccinated: 92% (CI: 88-95%) Partially vaccinated vs unvaccinated: 60% (CI: 53-66%) | Retrospective study with matched controls assessing the effectiveness of Pfizer-BioNTech vaccination on preventing spread in Israel. Asymptomatic infection was defined as PCR positivity without patient-reported symptoms during follow-up. | High effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| SIREN Study of UK Healthcare Workers ⁶ | N(fully vaccinated) = 20978 person-days N(partially vaccinated) = 87278 person-days N(unvaccinated) = 710,587 person-days | 12/7/2020 – 2/5/2021 Fully vaccinated = 1 week after second dose Partially vaccinated = 21 days after first dose | 9 (4 per 10,000 person-days) | 71 (8 per 10,000 person-days) | 977 (14 per 10,000 person-days) | Fully vaccinated vs unvaccinated: 85% (CI: 74-96%) Partially vaccinated vs unvaccinated: 70% (CI: 53-87%) | Prospective study among UK healthcare workers assessing Pfizer-BioNTech and AstraZeneca vaccine effectiveness on infection (biweekly PCR tests). Study mostly white and female. Cohort includes a large number of seropositive participants (~1/3 cohort). | High effectiveness against SARS-CoV-2 infection in a cohort of individuals fully vaccinated with either the Pfizer-BioNTech or AstraZeneca vaccine. |
| Pfizer-BioNTech Vaccine Effectiveness in Qatar (vs B.1.1.7) ⁷ | N(vaccinated) = 515 N(unvaccinated) = 32,293 | 2/1/2021– 3/31/2021 Fully vaccinated = 14 days after second dose | 50 (9.7%) | NA | 16,354 (50.6%) | Fully vaccinated vs unvaccinated: 89.5% (CI: 85.9–92.3%) | Case-control study assessing rates of SARS-CoV-2 infection among vaccinated and matched unvaccinated individuals in Qatar. Prevalence of B.1.1.7 and B.1.351 comprised the majority of infections in Qatar at the time, so effectiveness is determined for each of these variants individually. The mass immunization campaign in Qatar primarily used the Pfizer-BioNTech vaccine, so the effectiveness of this vaccine. | High effectiveness against SARS-CoV-2 B.1.1.7 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| Pfizer-BioNTech Vaccine Effectiveness in Qatar (vs B.1.351) ⁷ | N(vaccinated) = 877 N(unvaccinated) = 38,273 | | 179 (20.4%) | NA | 19,396 (50.7%) | Fully vaccinated vs unvaccinated: 75.0% (CI: 70.5–78.9) | | Moderately high effectiveness against SARS-CoV-2 B.1.351 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |

| | | | | | | | | |
|---|---|---|---|---|---|--|---|--|
| Mayo Clinic Pre-procedure Testing of Patients ⁸ | N(vaccinated) = 3006 N(unvaccinated) = 45327 | 12/17/2020 – 2/8/2021 Partially vaccinated = any vaccination given before screening test | NA | 42 (1.4%) | 1,436 (3.2%) | Adjusted relative risk of vaccinated vs unvaccinated: 0.35 (CI: 0.26 – 0.47) | Frequency of PCR+ asymptomatic infections among vaccinated and unvaccinated healthcare workers. Results reflect the effectiveness of the Pfizer-BioNTech vaccine. | Moderate effectiveness against asymptomatic SARS-CoV-2 infection among individuals partially vaccinated with the Pfizer-BioNTech vaccine. |
| Mayo Clinic and Associated Health System Patients ⁹ | N(vaccinated) = 31,069 N(unvaccinated) = 31,069 | 12/1/2020 – 2/8/2021 Fully vaccinated = 36 days after first dose (2 doses) Partially vaccinated = days 22-28 after first dose | 4 cases/ 8,041 (82,686 person-days) [0-048%] | 22 cases/ 19,634 (129,119 person-days) [0-17%] | Overall: 661 /31,069 (825,106 person-days) [2-13%] | Fully vaccinated vs unvaccinated: 88.7% (CI: 68.4-97.1%) Partially vaccinated vs unvaccinated: 74.2% (CI: 58.4-84.7%) | Retrospective study comparing PCR positivity among vaccinated and unvaccinated patients within the Mayo Clinic and associated health system. | High effectiveness against asymptomatic SARS-CoV-2 infection among fully vaccinated individuals. |
| Healthcare workers in Cambridge University Hospitals NHS Foundation Trust ¹⁰ | N(fully vaccinated) = 1,989 tests N(partially vaccinated) = 3,535 tests N(unvaccinated) = 3,252 tests | 1/18/2021 – 1/31/2021 Partially vaccinated <12 days post dose 1 Fully vaccinated >12 days post dose 1 or unvaccinated | >12 days post vaccine: 4 (0.20%) | <12 days post vaccine: 13 (0.37%) | 26 (0.80%) | >12 days post vaccine vs unvaccinated: 75%* <12 days post vaccine vs unvaccinated: 54%* | Healthcare workers in Cambridge University Hospitals NHS Foundation Trust system were tested weekly for asymptomatic COVID19. Results reflect the effectiveness of the Pfizer-BioNTech vaccine. | Moderately high effectiveness against asymptomatic SARS-CoV-2 infection among individuals >12 days after vaccination with the Pfizer-BioNTech vaccine. |
| Healthcare workers in the University of Texas Southwestern Medical Center ¹¹ | N(vaccinated) = 8,121 N(partially vaccinated) = 6,144 N(unvaccinated) = 8,969 | 12/15/2020 – 1/28/2021; Fully vaccinated = 7 days after second dose of BNT162b2 or 14 days after second dose of mRNA-1273 Partially vaccinated = first dose to 7 days after | 4 (0.05%) | 112 (1.82%) | 234 (2.61%) | Fully vaccinated vs unvaccinated: 98%* | This study compares the rates of SARS-CoV-2 infection among healthcare workers in the UTSW Medical Center, stratified by vaccination status. | High effectiveness against SARS-CoV-2 infection among fully vaccinated individuals. |

| | | | | | | | | |
|--|--|---|------------|-------------|----------------|--|---|--|
| | | second dose of BNT162b2 or 14 days after second dose of mRNA-1273 | | | | | | |
| Healthcare workers in UCSD and UCLA ¹² | N(fully vaccinated) = 4,167 N(partially vaccinated) = 5,794 | 12/16/2020 – 2/9/2021; Fully vaccinated = 15 days after second dose Partially vaccinated = 1-7 days after first dose | 7 (0-17%) | 145 (2-50%) | NA | Fully vaccinated vs partially vaccinated: 93%* | This study compares the rates of SARS-CoV-2 infection among healthcare workers in the UCSD and UCLA, stratified by vaccination status. | High effectiveness against SARS-CoV-2 infection among fully vaccinated individuals. |
| Healthcare workers at Hadassah Hebrew University Medical Center ¹³ | N(fully vaccinated) = 4,079 N(partially vaccinated) = 5,297 | 12/20/2020 – 1/31/2021; Fully vaccinated = 6-7 weeks after first dose Partially vaccinated = between first dose and 1 week since first dose | 5 (0-12%) | 50 (0-94%) | NA | Fully vaccinated vs partially vaccinated: 87%* | This study compares the rates of SARS-CoV-2 infection among healthcare workers in the Hadassah Hebrew University Medical Center, stratified by vaccination status. Results reflect the effectiveness of the Pfizer-BioNTech vaccine. | High effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| Pfizer-BioNTech Vaccine Effectiveness in U.K. Household Transmission ¹⁴ | N(visits by fully vaccinated individuals) = 89,257 N(visits by partially vaccinated individuals) = 216,823 N(visits by unvaccinated individuals) = 1,235,803 | 12/1/2020 – 5/8/2021 Fully vaccinated: Visits post-second dose ≥21d following first dose Partially vaccinated: 0 to 21+ days after first dose, no second dose | 72 (0-08%) | 718 (0-33%) | 11,469 (0-93%) | Fully vaccinated vs unvaccinated: 80% (CI: 73-85%) Partially vaccinated vs unvaccinated: 66% (CI: 60-71%) | This study examines the impact of Pfizer-BioNTech and AstraZeneca immunization on the number of new SARS-CoV-2 infections in the general public through a large-scale community-based survey across the United Kingdom. Results reflect the effectiveness of the Pfizer-BioNTech and AstraZeneca vaccines on community-wide transmission. | High effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with Pfizer-BioNTech vaccine. |

| | | | | | | | | |
|--|--|--|-------------|-------------|----------------|--|--|--|
| ChAdOx1 Vaccine Effectiveness in U.K. Household Transmission ¹⁴ | N(visits by fully vaccinated individuals) = 47,413 N(visits by partially vaccinated individuals) = 350,523 N(visits by unvaccinated individuals) = 1,235,803 | | 21 (0.04%) | 534 (0.15%) | 11,469 (0.93%) | Fully vaccinated vs unvaccinated: 79% (CI: 65-88%) Partially vaccinated vs unvaccinated: 61% (CI: 54-68%) | | Moderately high effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with AstraZeneca vaccine. |
| Nursing Home Residents in the US ¹⁵ | N(fully vaccinated) = 13,048 N(partially vaccinated) = 5,194 N(unvaccinated) = 3,990 | Until 3/31/2021 Fully vaccinated: >14 days following second dose Partially vaccinated: 15-28 days after first dose Unvaccinated: 0-14 days after first dose | 29 (0.2%) | 179 (1.0%) | 115 (2.9%) | Fully vaccinated vs unvaccinated: 93%* Partially vaccinated vs unvaccinated: 66%* | Residents of nursing homes were tested for infection every 3-7 days during outbreaks within the nursing home or upon development of symptoms or exposure. Asymptomatic infection was defined as no documented symptoms 5 days before the positive test to 14 days afterwards. Results reflect the effectiveness of Pfizer-BioNTech and Moderna vaccines. | High effectiveness against asymptomatic SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech or Moderna vaccine. |
| Healthcare Workers at the Tel Aviv Sourasky Medical Center ¹⁶ | N(fully vaccinated) = 57,274 person-days N(unvaccinated) = 25,359 person-days | 12/20/2020 - 2/25/2021 Fully vaccinated: >7 days following second dose Unvaccinated: 0-14 days after first dose | 4 (0.0070%) | NA | 17 (0.067%) | Fully vaccinated vs unvaccinated: 90%* (Adjusted) | This retrospective cohort study screened healthcare workers on a weekly or monthly basis for infection. Vaccinated and unvaccinated individuals were matched by multiple demographics and number of PCR tests obtained. Asymptomatic infection was defined as presence of characteristic COVID-19 symptoms at the time of testing. Results reflect the effectiveness of the Pfizer-BioNTech vaccine. | High effectiveness against asymptomatic SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |

| | | | | | | | | |
|---|---|--|-----------------|-------------|-----------------|--|--|---|
| Nationwide Public Health Surveillance in Israel ¹⁷ | N(fully vaccinated) = 2.02x10 ⁸ person-days N(unvaccinated) = 1.20x10 ⁸ person-days | 1/24/2021 - 4/3/2021 Fully vaccinated: >7 days following second dose | 3,632 (0.0018%) | | 49,138 (0.041%) | Fully vaccinated vs unvaccinated: 91.5% (Adjusted CI: 90.7-92.2%) | This study used nationwide surveillance data to retrospectively assess the effect of the Pfizer-BioNTech vaccine on asymptomatic infection. Asymptomatic infection was defined as lack of characteristic COVID-19 symptoms at the time of interview. | High effectiveness against asymptomatic SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| Pfizer-BioNTech Vaccine among Essential Workers in the US within the HEROES-RECOVER Network (CDC) ¹⁸ | N(fully vaccinated) = 120,653 person-days N(partly vaccinated) = 49,516 person-days N(unvaccinated) = 127,971 person-days | 12/14/2020 - 4/10/2021 Fully vaccinated: ≥14 days following second dose Partially vaccinated: ≥14 after dose 1 and ≤14 days after dose 2 | 3 (0.0025%) | 8 (0.016%) | 156 (0.12%) | Fully vaccinated vs unvaccinated: 93% (Adjusted CI: 78-98%) Partially vaccinated vs unvaccinated: 80% (Adjusted CI: 60-90%) | Prospective nationwide study assessing SARS-CoV-2 positivity among vaccinated and unvaccinated first responders with weekly nasal samples, regardless of symptomatic status. Results reflect the effectiveness of the Pfizer-BioNTech and the Moderna vaccines. | High effectiveness efficacy against asymptomatic SARS-CoV-2 infection in a cohort of individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| Moderna Vaccine among Essential Workers in the US within the HEROES-RECOVER Network (CDC) ¹⁹ | N(fully vaccinated) = 40,394 person-days N(partly vaccinated) = 31,231 person-days N(unvaccinated) = 127,971 person-days | Unvaccinated: unvaccinated or <14 days after first dose | 2 (0.0049%) | 3 (0.0096%) | 156 (0.12%) | Fully vaccinated vs unvaccinated: 82% (Adjusted CI: 20-96%) Partially vaccinated vs unvaccinated: 83% (Adjusted CI: 40-95%) | Prospective nationwide study assessing SARS-CoV-2 positivity among vaccinated and unvaccinated first responders with weekly nasal samples, regardless of symptomatic status. Results reflect the effectiveness of the Pfizer-BioNTech and the Moderna vaccines. | High effectiveness against asymptomatic SARS-CoV-2 infection in a cohort of individuals fully vaccinated with the Moderna vaccine. |
| Effect of ChAdOx1 Vaccine on Household Transmission of SARS-CoV-2 in England ¹⁹ | N(contacts of vaccinated) = 3,424 N(contacts of unvaccinated) = 960,765 | 1/4/2021 - 2/28/2021 Vaccinated index case: ≥21 days following <i>first</i> dose | NA | 196 (5.72%) | 96,898 (10.1%) | Vaccinated vs unvaccinated adjusted odds ratio: 0.52 (CI: 0.43-0.62) | The household contacts of vaccinated or matched unvaccinated individuals who test positive for SARS-CoV-2 were monitored for whether they themselves test positive 2-14 days after the index case. Note: most vaccinated individuals in this study had received only one dose of a two-dose course. The results reflect the ability of the Pfizer-BioNTech or ChAdOx1 vaccines to directly prevent transmission. | Moderate effectiveness of the Pfizer-BioNTech or ChAdOx1 vaccines at preventing transmission of SARS-CoV-2 after one dose. |
| Effect of Pfizer-BioNTech Vaccine on | N(contacts of vaccinated) = 5,939 | | NA | 371 (6.25%) | | Vaccinated vs unvaccinated adjusted | | |

| | | | | | | | | |
|---|--|---|----|----|------------|--|---|---|
| Household Transmission of SARS-CoV-2 in England ¹⁹ | N(contacts of unvaccinated) = 960,765 | | | | | odds ratio: 0.54 (CI: 0.47–0.62) | | |
| Effect of Moderna vaccine among Mayo Clinic and Associated Health Personnel ²⁰ | N (fully vaccinated) = 3,115 N (partially vaccinated) = 1,166 N (unvaccinated) = 23,931 | 1/1/2021 - 3/31/2021 Fully vaccinated: >14 days after second dose Partially vaccinated >14 days from first dose and ≤14 days from second dose | NA | NA | 997 (4.2%) | Fully vaccinated vs unvaccinated: 91.2% (CI: 80.6–96.1%) Partially vaccinated vs unvaccinated: 98.6% (CI: 90.1–99.8%) | Retrospective study assessing SARS-CoV-2 positivity among vaccinated and unvaccinated healthcare personnel undergoing routine testing. The results reflect the ability of the mRNA vaccines to prevent infection. | High effectiveness against SARS-CoV-2 infection in a cohort of individuals fully vaccinated with either the Moderna or Pfizer-BioNTech vaccine. |
| Effect of Pfizer-BioNTech vaccine among Mayo Clinic and Associated Health Personnel ²⁰ | N (fully vaccinated) = 40,887 N (partially vaccinated) = 2,038 N (unvaccinated) = 23,931 | | NA | NA | | Fully vaccinated vs unvaccinated: 78.1% (CI: 71.1–82.0%) Partially vaccinated vs unvaccinated: 96.8% (CI: 95.3–97.8%) | | |

| | | | | | | | | |
|---|--|--|--------------------------|--------------|---------------------------|--|---|---|
| Healthcare workers of St. Jude Children's Research Hospital ²¹ | N(fully vaccinated) = 149,718 person-days N(partially vaccinated) = 32,481 person-days N(unvaccinated) = 116,700 person-days | 12/17/2020 - 3/20/2021 Fully vaccinated: ≥7 days after second dose Partially vaccinated ≥12 days from first dose and before second dose | 6 (0.031%) | 10 (0.0051%) | 29 (0.019%) | Fully vaccinated vs unvaccinated incident rate ratio: 0.10 (CI: 0.04–0.22) Partially vaccinated vs unvaccinated incident rate ratio: 0.58 (CI: 0.30–1.13) | This study utilized routine SARS-CoV-2 testing to determine the effectiveness of the Pfizer-BioNTech vaccine on asymptomatic infection among healthcare workers. | High effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| Effectiveness of Vaccination an Outbreak of the R.1 Variant within a Skilled Nursing Home in Kentucky ²² | N(vaccinated) = 71 N(unvaccinated) = 8 | 3/1/2021 - 3/30/2021 Fully vaccinated: ≥14 days after second dose | 18 (25.4%) | NA | 6 (75.0%) | Fully vaccinated vs unvaccinated: 66.2% (CI: 40.5–80.8%) | A positive test in an asymptomatic healthcare worker on 3/1/2021 led to daily, rapid, point-of-care testing of all residents. Positive tests were confirmed by same-day PCR testing. Results reflect the effectiveness of the Pfizer-BioNTech vaccine to prevent infection. | Moderate effectiveness against SARS-CoV-2 infection among nursing home residents fully vaccinated with the Pfizer-BioNTech vaccine. |
| Effectiveness of the Pfizer-BioNTech Vaccine in a Nationwide Historical Cohort Study ²³ | N(total) = 6,282 | 1/1/2021 - 2/11/2021 Fully vaccinated: ≥7 days after second dose Partially vaccinated: ≥14 days after first dose and <7 days after second dose | 6 per 10,000 person-days | NA | 53 per 10,000 person-days | Fully vaccinated vs unvaccinated: 89% (CI: 82–94%) Partially vaccinated vs unvaccinated: 69% (CI: 49–79%) | A subset of individuals within a health management organization who repeatedly received SARS-CoV-2 tests were identified and stratified by vaccination status. Results reflect the effectiveness of the Pfizer-BioNTech vaccine to prevent infection. | High effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |

| | | | | | | | | |
|---|---|---|------------|----|-------------|--|---|---|
| Healthcare Workers in Treviso, Italy ²⁴ | N(fully vaccinated) = 216,098 person-days N(unvaccinated) = 77,073 person-days | 12/27/2020 - 3/24/2021 Fully vaccinated: ≥ 7 days after second dose | 4 (0.018%) | | 15 (0.019%) | Fully vaccinated vs unvaccinated: 95.1% (CI: 62.4–99.4%) | Healthcare workers stratified by vaccination status were tested every 8 days or upon report of characteristic COVID-19 symptoms. Results reflect the effectiveness of the Pfizer-BioNTech vaccine to prevent infection. | High effectiveness against SARS-CoV-2 infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine. |
| Effect of Pfizer-BioNTech vaccine on Household Transmission in Israel ²⁵ | N(total) = 2,305,704 N(fully vaccinated) = 1,276,311 | 6/15/2020 - 3/24/2021 Fully vaccinated: ≥ 10 days after second dose | NA | NA | NA | Fully vaccinated vs unvaccinated: Susceptibility of infection: 80.5% (CI: 78.9–82.1%) Against infectiousness given infection: 41.3% (CI: 9.5–73.0%) Overall transmission prevention: 88.5% (CI: 82.3–94.8%) | Temporal vaccination and infection data from within households was obtained from Maccabi Healthcare Services in Israel. Vaccine effectiveness against infection, against infectiousness given infection, and overall transmission prevention were calculated using the study's household transmission model. The results reflect the ability of the Pfizer-BioNTech vaccine to directly prevent transmission. | The Pfizer-BioNTech vaccine has high overall effectiveness against transmission by significantly reducing primary infection and mildly reducing infectiousness of vaccinated individuals. |

Supplementary Table 3. Empirical evidence for a vaccine-mediated reduction in SARS-CoV-2 infection from a selection of observational studies with the Delta variant.

| | N | Time of assessment | Positives in fully vaccinated | Positives in partially vaccinated | Positives in unvaccinated | Effectiveness or Relative Risk | Study Design | Key Results |
|---|---|---|-------------------------------|-----------------------------------|--|--|--|---|
| Effectiveness of Pfizer-BioNTech Vaccine against symptomatic Delta infection in England ²⁶ | N(fully vaccinated) = 15,749 N(partially vaccinated) = 8,641 N(unvaccinated) = 96,371 | 4/5/2021 - 5/12/2021 Fully vaccinated: ≥14 days after second dose Partially vaccinated: ≥21 days after first dose up to the day before second dose was received | 122 (0.10%) | 137 (0.11%) | 4,043 (3.35%) | Fully vaccinated vs unvaccinated: 88.0% (CI: 85.3–90.1%) Partially vaccinated vs unvaccinated: 35.6% (CI: 22.7–46.4%) | Test-negative case-control study comparing vaccine effectiveness against symptomatic infections caused by the Alpha and Delta variants in England, during the period of circulating Delta variant. | High effectiveness against symptomatic infection among individuals fully vaccinated with the Pfizer-BioNTech vaccine, and moderate effectiveness among individuals vaccinated with the ChAdOx1 vaccine against symptomatic infection caused by the Delta variant. |
| Effectiveness of ChAdOx1 Vaccine against symptomatic Delta infection in England ²⁶ | N(fully vaccinated) = 8,244 N(partially vaccinated) = 42,829 N(unvaccinated) = 96,371 | | 218 (0.15%) | 1,356 (0.92%) | 4,043 (2.74%) | Fully vaccinated vs unvaccinated: 67.0% (CI: 61.3–71.8%) Partially vaccinated vs unvaccinated: 30.0% (CI: 24.3–35.3%) | | |
| Effectiveness of Pfizer-BioNTech Vaccine against Delta infection in Qatar ²⁷ | N(fully vaccinated) = 877,354 N(partially vaccinated) = 906,078 | 3/23/21 (when Delta variant was detected in community) - 7/21/21 Fully vaccinated: ≥14 days after second dose | 209 | 19 | 1621 against fully vaccinated 1602 against partially vaccinated | Fully vaccinated vs unvaccinated: 59.6% (CI: 50.7–66.9%) Partially vaccinated vs unvaccinated: 65.5% (CI: 40.9–79.9%) | Matched test-negative, case-control study examining effectiveness of Pfizer-BioNTech and Moderna vaccines against SARS-CoV-2 infections caused by Delta variants in Qatar. | Moderate effectiveness among individuals vaccinated with the Pfizer-BioNTech vaccine, and high effectiveness among individuals vaccinated with the Moderna |

| | | | | | | | | |
|--|--|--|-------|----|--|--|--|---|
| Effectiveness of Moderna Vaccine against Delta infection in Qatar ²⁷ | N(fully vaccinated) = 409,041 N(partially vaccinated) = 490,828 | Partially vaccinated: ≥ 14 days after first dose, no second dose | 22 | 11 | 1,644 against fully vaccinated 1,629 against partially vaccinated | Fully vaccinated vs unvaccinated: 86.1% (CI: 78.0–91.3%) Partially vaccinated vs unvaccinated: 79.7% (CI: 60.8–89.5%) | | vaccine against infection by the Delta variant. |
| Effectiveness of Pfizer-BioNTech Vaccine against SARS-CoV-2 infection in Nursing Home Residents During Widespread Circulation of the Delta Variant ²⁸ | N(visits by fully vaccinated individuals) = 3,248,732 N(visits by unvaccinated individuals) = 953,861 | 6/21/21-8/1/21, period when $\geq 50\%$ of SARS-CoV-2 viruses sequenced were the Delta variant Fully vaccinated: ≥ 14 days after second dose | 1,939 | NA | 1,397 | Fully vaccinated vs unvaccinated: 52.4% (CI: 48.0–56.4%) | U.S. Nursing Home Residents undergoing regular SARS-CoV-2 testing were identified and stratified by vaccination status. Results reflect the effectiveness of the Pfizer-BioNTech or Moderna vaccines to prevent infection during circulation of the Delta variant. | Mild effectiveness against infection of SARS-CoV-2 during widespread circulation of Delta variant among individuals fully vaccinated with the Pfizer-BioNTech or Moderna vaccine. |
| Effectiveness of Moderna Vaccine against SARS-CoV-2 infection in Nursing Home Residents During Widespread Circulation of the Delta Variant ²⁸ | N(visits by fully vaccinated individuals) = 1,763,014 N(visits by unvaccinated individuals) = 953,861 | | 1,060 | NA | 1,397 | Fully vaccinated vs unvaccinated: 50.6% (CI: 45.0–55.7%) | | |

| | | | | | | | | |
|--|---|--|------------|------------|------------|---|---|---|
| <p>REACT-1 Round 13 Final report: Effectiveness of Pfizer-BioNTech and ChAdOx1 Vaccines against infection during widespread Delta circulation²⁹</p> | <p>N(fully vaccinated) = 59,662 N(partially vaccinated) = 13,425 N(unvaccinated) = 11,357</p> | <p>5/20/21-7/12-21 Fully vaccinated: ≥ 14 days after second dose</p> | <p>197</p> | <p>102</p> | <p>153</p> | <p>Fully vaccinated vs unvaccinated adjusted odds ratio: 0.25 (CI: 0.20-0.30) Partially vaccinated vs unvaccinated adjusted odds ratio: 0.56 (CI: 0.44-0.73)</p> | <p>Community-wide national representative surveillance program in England based on swab results from individuals tested for SARS-CoV-2. Results reflect the effectiveness of the Pfizer-BioNTech and ChAdOx1 vaccines to prevent infection during widespread circulation of the Delta variant amongst individuals with linked vaccination status.</p> | <p>High effectiveness against infection of SARS-CoV-2 during widespread circulation of Delta variant among individuals fully vaccinated with the Pfizer-BioNTech or ChAdOx1 vaccines.</p> |
|--|---|--|------------|------------|------------|---|---|---|

Supplementary References:

- 1 US Food and Drug Administration. Briefing document FDA. Moderna COVID-19 vaccine. 2020. <https://www.fda.gov/media/144453/download> (accessed Jul 8, 2021).
- 2 Baden LR, El Sahly HM, Essink B, et al. Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. *N Engl J Med* 2021; **384**: 403–16.
- 3 US Food and Drug Administration. Briefing document FDA. Janssen Ad26.COV2.S vaccine for the prevention of COVID-19. 2021. <https://www.fda.gov/media/146217/download> (accessed Jul 8, 2021).
- 4 Emary KRW, Golubchik T, Aley PK, et al. Efficacy of ChAdOx1 nCoV-19 (AZD1222) vaccine against SARS-CoV-2 variant of concern 202012/01 (B.1.1.7): an exploratory analysis of a randomised controlled trial. *Lancet* 2021; **397**: 1351–62.
- 5 Dagan N, Barda N, Kepten E, et al. BNT162b2 mRNA Covid-19 vaccine in a nationwide mass vaccination setting. *N Engl J Med* 2021; **384**: 1412–23.
- 6 Hall VJ, Foulkes S, Saei A, et al. COVID-19 vaccine coverage in health-care workers in England and effectiveness of BNT162b2 mRNA vaccine against infection (SIREN): a prospective, multicentre, cohort study. *Lancet* 2021; **397**: 1725–35.
- 7 Abu-Raddad LJ, Chemaitelly H, Butt AA. Effectiveness of the BNT162b2 Covid-19 vaccine against the B.1.1.7 and B.1.351 variants. *N Engl J Med* 2021; **385**: 187–89.
- 8 Tande AJ, Pollock BD, Shah ND, et al. Impact of the COVID-19 vaccine on asymptomatic infection among patients undergoing pre-procedural COVID-19 molecular screening. *Clin Infect Dis* 2021; published online March 10. <https://doi.org/10.1093/cid/ciab229>.
- 9 Pawlowski C, Lenehan P, Puranik A, et al. FDA authorized mRNA COVID-19 vaccines are effective per real-world evidence synthesized across a multistate health system. *Med (NY)* 2021;**2**: 979–92.e8.
- 10 Jones NK, Rivett L, Seaman S, et al. Single-dose BNT162b2 vaccine protects against asymptomatic SARS-CoV-2 infection. *eLife* 2021; **10**: e68808.
- 11 Daniel W, Nivet M, Warner J, Podolsky DK. Early evidence of the effect of SARS-CoV-2 vaccine at one medical center. *N Engl J Med* 2021; **384**: 1962–63.
- 12 Keehner J, Horton LE, Pfeffer MA, et al. SARS-CoV-2 infection after vaccination in health care workers in California. *N Engl J Med* 2021; **384**: 1774–75.
- 13 Benenson S, Oster Y, Cohen MJ, Nir-Paz R. BNT162b2 mRNA Covid-19 vaccine effectiveness among health care workers. *N Engl J Med* 2021; **384**: 1775–77.
- 14 Pritchard E, Matthews PC, Stoesser N, et al. Impact of vaccination on new SARS-CoV-2 infections in the UK. *medRxiv* 2021; published online June 9. <https://doi.org/10.1101/2021.04.22.21255913> (preprint).

- 15 White EM, Yang X, Blackman C, Feifer RA, Gravenstein S, Mor V. 1 62 Incident SARS-CoV-2 infection among mRNA-
vaccinated and unvaccinated nursing home residents. *N Engl J Med* 2021; **385**: 474–76.
- 16 Angel Y, Spitzer A, Henig O, et al. Association between vaccination with BNT162b2 and incidence of symptomatic and
asymptomatic 5 SARS-CoV-2 infections among health care workers. *JAMA* 2021; **325**: 2457–65.
- 17 Haas EJ, Angulo FJ, McLaughlin JM, et al. Impact and effectiveness of mRNA BNT162b2 vaccine against SARS-CoV-2
infections and 64 COVID-19 cases, hospitalisations, and deaths following a nationwide vaccination campaign in Israel: an
observational study using national surveillance data. *Lancet* 2021; **397**: 1819–29.
- 18 Thompson MG, Burgess JL, Naleway AL, et al. Prevention and attenuation of Covid-19 with the BNT162b2 and mRNA-
1273 vaccines. *N Engl J Med* 2021; **385**: 320–29.
- 19 Harris RJ, Hall JA, Zaidi A, Andrews NJ, Dunbar JK, Dabrera G. Effect of vaccination on household transmission of
SARS-CoV-2 in England. *N Engl J Med* 2021; **385**: 759–60.
- 20 Swift MD, Breeher LE, Tande AJ, et al. Effectiveness of mRNA 67 COVID-19 vaccines against SARS-CoV-2 infection in
a cohort of healthcare personnel. *Clin Infect Dis* 2021; published online April 26. <https://doi.org/10.1093/cid/ciab361>.
- 21 Tang L, Hijano DR, Gaur AH, et al. Asymptomatic and symptomatic SARS-CoV-2 infections after BNT162b2 vaccination
in a routinely screened workforce. *JAMA* 2021; **325**: 2500–02.
- 22 Cavanaugh AM, Fortier S, Lewis P, et al. COVID-19 outbreak associated with a SARS-CoV-2 R.1 lineage variant in a
skilled nursing facility after vaccination program—Kentucky, March 2021. *MMWR Morb Mortal Wkly Rep* 2021; **70**: 639–
43.
- 23 Zacay G, Shasha D, Bareket R, et al. BNT162b2 vaccine effectiveness in preventing asymptomatic infection with SARS-
CoV-2 virus: a nationwide historical cohort study. *Open Forum Infect Dis* 2021; **8**: ofab262.
- 24 Fabiani M, Ramigni M, Gobetto V, Mateo-Urdiales A, Pezzotti P, Piovesan C. Effectiveness of the Comirnaty
(BNT162b2, BioNTech/ Pfizer) vaccine in preventing SARS-CoV-2 infection among healthcare workers, Treviso
province, Veneto region, Italy, 27 December 2020 to 24 March 2021. *Euro Surveill* 2021; **26**: 2100420.
- 25 Prunas O, Warren JL, Crawford FW, Gazit S, Patalon T, Weinberger DM, Pitzer VE. Vaccination with BNT162b2 reduces
transmission of SARS-CoV-2 to household contacts in Israel. medRxiv. 2021 Jul 16.
- 26 Bernal JL, Andrews N, Gower C, Gallagher E, Simmons R, Thelwall S, Stowe J, Tessier E, Groves N, Dabrera G, Myers
R. Effectiveness of Covid-19 vaccines against the B. 1.617. 2 (Delta) variant. *New England Journal of Medicine*. 2021 Aug
12.
- 27 Tang P, Hasan MR, Chemaitelly H, Yassine HM, Benslimane F, Al Khatib HA, AlMukdad S, Coyle P, Ayoub HH, Al
Kanaani Z, Al Kuwari E. BNT162b2 and mRNA-1273 COVID-19 vaccine effectiveness against the Delta (B. 1.617. 2)
variant in Qatar. medRxiv. 2021 Aug 31.
- 28 Nanduri S. Effectiveness of Pfizer-BioNTech and Moderna vaccines in preventing SARS-CoV-2 infection among nursing
home residents before and during widespread circulation of the SARS-CoV-2 B. 1.617. 2 (Delta) Variant—National

Healthcare Safety Network, March 1–August 1, 2021. MMWR. Morbidity and Mortality Weekly Report. 2021;70
ACCESSED SEPT 2 2021

- 29 Elliott P, Haw D, Wang H, Eales O, Walters C, Ainslie K, Atchison C, Fronterre C, Diggle P, Page A, Trotter A. REACT-1 round 13 final report: exponential growth, high prevalence of SARS-CoV-2 and vaccine effectiveness associated with Delta variant in England during May to July 2021.